

Unsustainable Population

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Acknowledgements

This book was researched using excellent online materials from the Intergovernmental Panel on Climate Change, departments of the United Nations, Wikipedia and some other sources. It is believed that all materials are free from copyright. We apologise if this is not the case in any particular detail.

Prologue

There is considerable dismay behind this book. The "end of history" was announced in 1991 when the Soviet bloc collapsed. History is still being made. Early suspicions that the planet was getting hotter have been amply confirmed, but the possibility of reversing warming is getting ever more remote. Animals and plants are continuing to disappear at an accelerating rate, despite the best efforts of conservationists. It then comes to us that the underlying problem may be that there are just too many people on the planet.

This little book is written in broad sympathy with the aims of the UK charity Population Matters. Some ideas are the author's own and discussion is welcome.

People and oil

The aim of this e-book is to put sustainable population on the agenda. We hope to move towards general agreement about small families. We ask women everywhere to consider a child-free life, one child, or at most two. This will require governments to provide healthcare and other services. Sustainable population has implications for migration, benefits, climate change, energy and other political discussions, but is not derived from them.

Malthus

Robert Malthus published his “essay on the principle of population” in 1798. It argues quite directly “that the increase of population is necessarily limited by the means of subsistence; that population does invariably increase when the means of subsistence increase, and that the superior power of population is repressed, and the actual population kept equal to the means of subsistence, by misery and vice”. Malthus argued that two types of checks hold population within resource limits: positive checks, which raise the death rate; and preventive ones, which lower the birth rate. The positive checks include hunger, disease and war; the preventive checks, abortion, birth control, prostitution, postponement of marriage and celibacy. As a cleric, Malthus saw this situation as divinely imposed to teach virtuous behaviour.

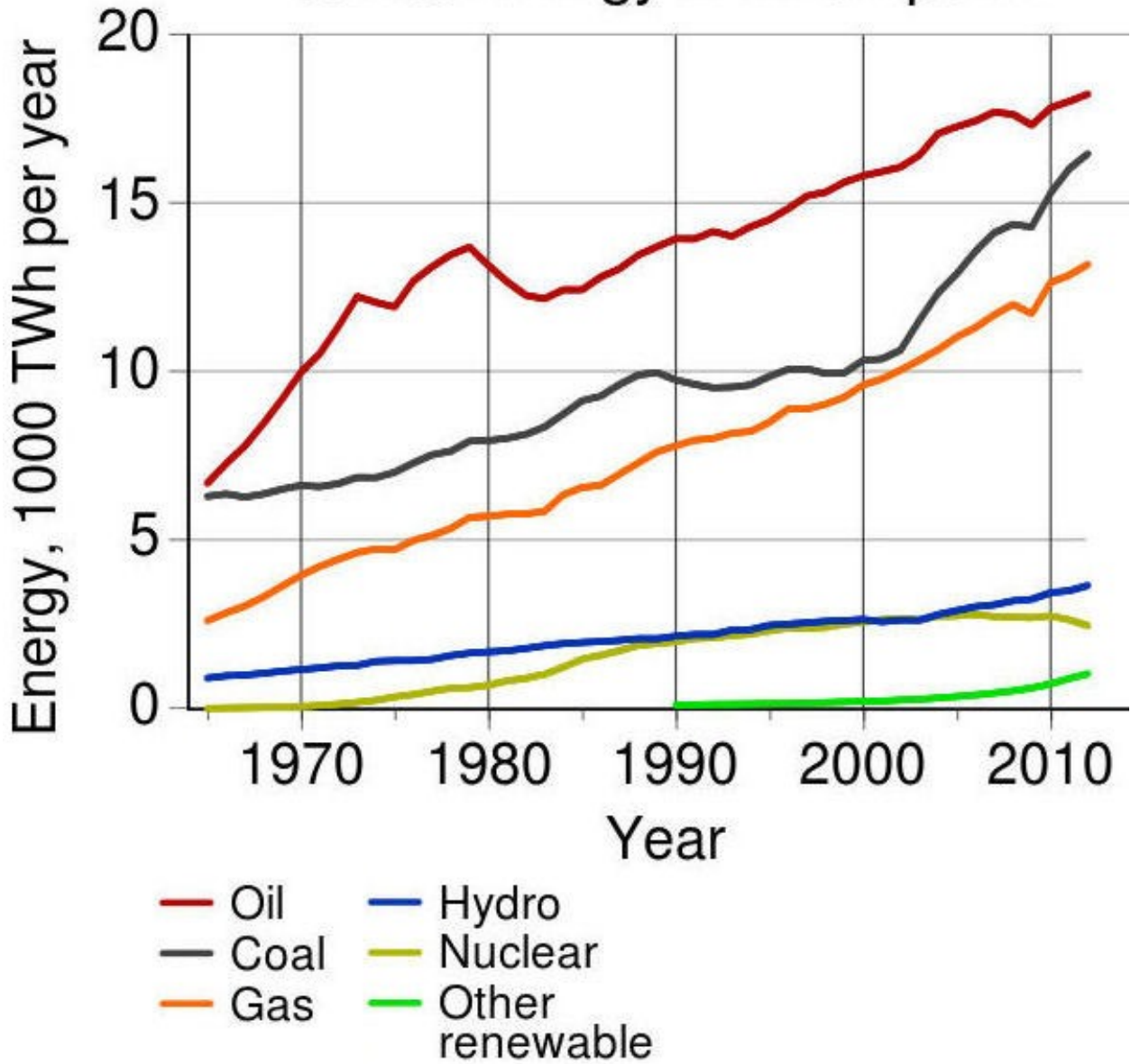
Malthus was too pessimistic about food production: agricultural efficiency continues to increase, so in principle the world population of $7 * 10^9$ people in 2012 could all be fed and fuelled. In fact food supply is in excess in most continents except Africa. An ODI report found the world overall produces 2,830 calories per person per day – well above the nutritional requirements. Obesity in Mexico, South Africa and China is comparable with European (though not US) rates. However, most of the remaining rain forest would be felled, edible fish would disappear, and most species other than humans would become extinct in the process. The next advances in food technology, notably golden rice, would involve withdrawal of the bans on genetic modification.

Therefore Malthus’ “means of subsistence” are principally energy. Each person in the UK has a daily per capita energy consumption of about $450 * 10^6$ Joules. (Scientific notation is generally easier to understand than words such as “exa-” “penta-” and so on, and avoids the ambiguity of British vs American “billions”.) This resolves into:

transport	35%
hot air	26%
hot water	8%
lighting	6%
process	10%
other	15%

Only 9.2×10^6 J of this, the daily nutritional requirement of 2,200 kCal for a sedentary adult male, is food. 91% of the 2012 world energy needs - 550×10^{18} J - comes from burning hydrocarbons: 80% fossil fuels and 11.3% bio-energy (mainly wood); the other 9% is 5.5% nuclear, 2.2% hydro, and 0.4% from other renewables. It is therefore reasonable to treat human energy requirements in terms of oil equivalents. In headline terms, each adult in the UK (or another advanced country) requires the equivalent of “a tank of petrol (or diesel) every five days”.

World energy consumption



Despite a general awareness of global warming, the burning of fossil fuels continues to increase. There is little reason for optimism after Kyoto that carbon emissions can be reduced by agreement between governments. The graph above shows that the burning of hydrocarbons – oil, coal and gas – continues to increase year on year.

The probable effect of greenhouse gases in increasing the temperature of the planet is well-known, though some still do not accept it. The gases are carbon dioxide and methane, and to a lesser extent nitrous oxide and chlorofluorocarbons. The 2013 IPCC statement declares 95% confidence in the judgment that global warming is a result of human activity. The idea that global warming is the result of unsustainable population is less well-known.

Gaia's evil twin

An optimistic view of climate change was proposed by Lovelock, using the Greek myth of Gaia. Lovelock noted the greening of cold areas such as Siberia every spring, with a resulting increase in carbon dioxide uptake. The evolution of life and its environment may affect each other. An example is how the activity of photosynthetic bacteria during Precambrian times has completely modified the Earth atmosphere to turn it aerobic, and as such supporting evolution of life (in particular eukaryotic life).

It is rather difficult to believe that the human species could poison itself out of existence. Yet the scientific evidence is that similar mass extinctions have happened several times before. A successful species has created disastrous climate effects several times in Earth's history. Peter Ward uses a different Greek myth, that of Gaia's evil twin Medea, to describe this.

Hydrogen sulphide has been a poison several times, and oxygen once or twice. Oxygen is a poison to some organisms, and free oxygen released by cyanobacteria in the atmosphere caused an extinction 2.5 billion years (bya) ago. Excess of oxygen may also have been the reason for a severe ice age 2.3 bya, as it can oxidise methane, a greenhouse gas. Hydrogen sulphide poisoning occurs in low oxygen seas. H₂S blooms still occur at times now off the coast of Namibia. The previous mass extinctions according to Ward were:

- Methane crisis 3.7 bya
- Oxygen catastrophe 2.5 bya
- First snowball earth 2.3 bya
- Second snowball earth 700 mya
- Ordovician mass extinction 443 mya
- Devonian mass extinction 364 mya
- Carboniferous glaciation 300-350 mya
- End Permian mass extinction 251 mya
- Triassic/ Jurassic mass extinction 200 mya
- Toarcian mass extinction 183 mya
- End Jurassic mass extinction 145 mya
- Cenomanian/ Turonian 93mya
- Cretaceous/ Tertiary extinction 65 mya (asteroid)

- Paleocene/ Eocene 55 mya

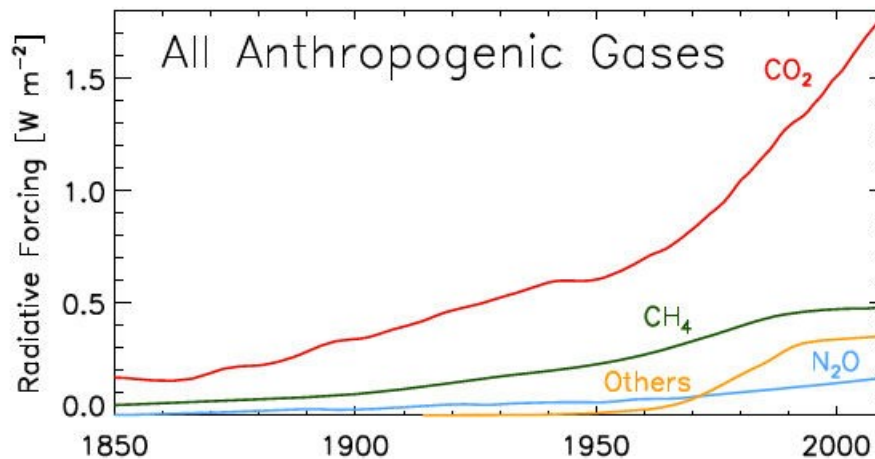
Greenhouse gases

The IPCC Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Summary for Policymakers says this: “Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since AR4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.”

Carbon dioxide is the human waste product implicated in climate change. CO₂ emissions in 2011 from fossil fuel combustion and cement production were 9.5 gigatonnes of CO₂ (GtC). From 1750 to 2011, CO₂ emissions from fossil fuel combustion and cement production have released 375 GtC to the atmosphere, while deforestation and other land use change are estimated to have released 180 GtC. In a balanced carbon cycle all the human CO₂ would be absorbed in land sink - plants and rocks. The imbalance is in the carbon distributed to air and ocean. The cumulative anthropogenic emissions of 555 GtC have been distributed as follows: 240 GtC in the atmosphere, 155 GtC in the oceans, and 160 GtC in land sink. If CO₂ were the only criterion for sustainable population, we could say that this 160 GtC would be the sustainable level.

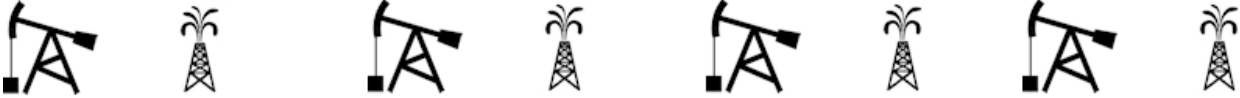
The pH of ocean surface water has decreased by 0.1 since the beginning of the industrial era. The IPCC makes this judgment with “high confidence”. The CO₂ distributed to the air reflects radiated heat back to the earth’s surface, which is the reason it is called a “greenhouse gas”. The graph below shows how the 240 GtC that stay in the atmosphere are contributing to radiative forcing. CO₂ is measured at Mauna Loa in Hawaii continues to increase by 2.2 parts per million each year. In Summer 2014 it should pass 400 ppm.

Methane is the second most powerful greenhouse gas and is emitted by several biological processes. Cows and other ruminants are a major source. By one estimate 97% of large animals are now domesticated by man, so methane is also anthropogenic.



World population passed the seven billion mark in 2013. Smail argues that “prudent and increasingly reliable scientific estimates suggest that the Earth's long-term sustainable human carrying capacity, at what might be defined as an “adequate” to “moderately comfortable” developed-world standard of living, may not be much greater than 2 to 3 billion”. The sustainable level was probably passed somewhere around the second world war.

Reduction of the birth rate, perhaps to 1.3 births per woman across the globe, would eventually cause the global population to decline. Yet small families are hardly on the political agenda. The important issue now is to gain widespread agreement on the importance of fewer babies.



People, other animals, plants

Our species has dominated other large animals for tens of thousands of years, and now exercises a decisive influence on all other living things. Humans may relate to other animals as sources of food, rivals, or sometimes only as objects of curiosity or wonder.

Thinking first about animals we regard as food, we come to large animals that have been hunted. In hunter-gatherer times some species such as seals and deer were sustainable, but others were hunted to extinction. Birds that had evolved to island life and lost the power of flight, such as the Moa and Dodo, rapidly succumbed when humans arrived. The woolly mammoth disappeared only 40,000 years ago, probably as the result of hunting. There are numerous recently extinct game species in Australia. In North America the arrival of Clovis hunters around 11,000 BCE coincided with the extinction of the Shasta ground sloth and Harrington's mountain goat within a few centuries. Horses, lions, camels, cheetahs and numerous other animals also quickly disappeared.

Guns, germs and steel

Jared Diamond has shown in the book with this title that most animals that can be domesticated come from the fertile crescent in the middle east. Humans found it possible to keep herds of cows, sheep, pigs and chickens. Horses, donkeys, and oxen could be trained to pull loads. Humans in the other continents were much less fortunate in their animal companions. Africa has many large animals, but hardly any would submit to the plough or the saddle. A zebra can with difficulty be trained to pull a load, but it will never stop attempting to bite its handler. The rhinoceros is perhaps the best bet as a plough animal – a daunting thought for the ploughman. In south America the four species of camelids can be domesticated to a degree, but even the largest, the llama, can only carry about 30 kilos. Consequently wheeled vehicles and cavalry never developed in the Americas.

Turning to our rivals, we think first about predators such as wolves and big cats. Wolves were hunted to extinction in Britain because they took domesticated animals. The recent reintroduction of wolves in Yellowstone park had a surprisingly large effect on biodiversity. By predated the big browsing species, some plants revived, beaver returned, the water table rose and other plant species returned. Wolves are now reintroducing themselves naturally in Spain. Marine predators include sharks and tuna. Humans have tended to hunt them rather than taking the trouble to kill them as rivals. By removing these predators, we inadvertently expand the next species down, such as the Humboldt's squid.

Honey bees

Human domination over animal species does not extend far down the size range. Insects that share our food sources, such as aphids, weevils or locusts are treated as rivals and attacked with insecticides. A few insects – ants, scorpions, crickets - are hunted as a food source, particularly in Cambodia. There is only one major partner insect for humans, the honey bee. Unfortunately for humanity, this species is now under severe threat. The reasons for colony collapse disorder remain uncertain, but key suspects are varroa, viruses, neonicotinoids, and monoculture. Each of these is a consequence of human activity: the varroa mite and Israeli paralyzing virus travelled when hives were exported. Insecticides such as Indomethacin with nicotine-like properties have been shown to disorient bees' ability to find their hives, so a precautionary ban was introduced by the European Union in 2013. This ban will reduce farmers' control of pest species and increase the price of food. Monoculture may be a contributory factor where farms are turned over to one crop. Bees in central London are currently thriving, perhaps because they feed on garden plants, and can get all the trace nutrients they need.

Animal life at the microscopic scale is much less subject to human domination. We are grimly aware of our rivals – the HIV virus, the malaria parasite, and the tubercle bacillus. Doctors have managed to enlist the help of some rivals in microbiological warfare: moulds such as penicillin can prevent bacteria reproducing. While germs used to be thought of as the enemy, we have learned recently that many microbes are essential to us. The human gut carries 10^{12} microorganisms, outnumbering human cells by a factor of 10. Commensals are organisms that “eat at the same table” as humans and are neutral to us. Others are essential to humans, for example those that produce vitamin K.

The evidence just presented might provoke strong feelings about animal rights or veganism. But strong emotion is usually evoked by study of microbiology. Finding out about our bacteria and parasites can be quite alarming. None of these reactions is intended here. Our main concern is human population numbers. Our role as the apex predator is unavoidable so we need to take on our responsibility for biodiversity in the future.

The plant world too has been hugely altered by mankind for our own needs. Discovery of the way to cultivate rice was a key moment in the move from hunter-gatherer to settled agricultural society. When wild rice is grown in copious water and then subjected to drought, the plant's response is to put its reserves into grain production. Selective breeding also allowed wheat and other cereals to be grown with hugely increased yields.

Cultivation has been highly successful, but at the expense of biodiversity. Rain forest in Brazil is cut down to grow soya, while in Indonesia it is felled to grow oil palms. This reduces the area of jungle and some species will die out. However, we should remember that the Amazonian jungle is not primeval wildness. Most of the Amazonian flood plain is actually abandoned farmland, cultivated on raised dykes before the arrival of European diseases decimated the native Americans.

Global warming is significantly affecting food production. Most coffee growing areas of the world are expected to become too hot and dry, so coffee may become a rarity. The Sahara is extending southwards. But there are also gains. The cultivable area is moving north in Siberia and Canada. Sea Bass can now be caught around Britain and the Arctic will become open for

fishing. The picture may be swings and roundabouts, rather than catastrophe. Optimists believe that food production can continue to improve as the world population heads for ten billion. There is some justice in this. Global hunger continues to decline, except in parts of Africa. In fact obesity is becoming a problem in countries at middle levels of development: one in four Chinese is overweight, and Mexican obesity is comparable with European. Yet there are significant risks to humanity in the relentless expansion of agriculture.

Monoculture

Monoculture is one risk. The Irish potato blight of 1846 was the result of planting only two potato varieties, both vulnerable to the blight. It was a major factor in the deaths of one million people and the emigration of about two million. (A more comprehensive account would include land ownership: many Irish families lived from only half an acre of land, so only an efficient crop such as the Peruvian potato was suitable). The collapse of the European wine industry in the late 19th century through phylloxera was attributable to monoculture. Rice grassy stunt virus struck rice fields from Indonesia to India in the 1970s. Of 6,273 varieties tested for resistance only one was resistant. It formed a hybrid with other varieties and is now widely grown. Coffee rust attacked coffee plantations in Sri Lanka, Brazil, and Central America in 1970 until a resistant variety was found in Ethiopia.

Species extinctions are now occurring at rates hundreds of times higher than background rates. Some studies suggest that 25% of all mammal species could be extinct in the 20 years from 2012. Votes now have to be taken about which species warrant the cost of conservation. It is possible but expensive to rescue some species. Whooping Cranes were on the brink of extinction by 1941 after unregulated hunting and loss of habitat, with just 21 wild and two captive individuals. As of 2011, there are an estimated 437 birds in the wild and more than 165 in captivity. Hatching eggs and raising chicks in captivity with intention of release is an arduous and expensive activity – perhaps \$100,000 per chick. Some recent extinctions might in principle be resurrected from preserved DNA. The gastric-brooding frog of Queensland was a genus that consisted of only two species, both of which became extinct in the mid-1980s.

The biological area which a greatly expanded humanity dare not ignore is microbiology. Bacteria are evolving to become antibiotic resistant, at the same time as no new antibiotics are under development. Cultivation of phages, each of which digest a specific bacterium, is a possible but expensive option. The emergence of a new lethal influenza strain is highly likely. In a densely populated and interconnected world it will spread rapidly. The counter-strategy would be close surveillance of farming areas where pigs, fowl and humans live in close proximity, followed by rapid production of a new vaccine.

A world of 10 billion people with enough to eat might just be possible. It would be a hotter, stormier world with many of today's animals only to be found in zoos or film records. Epidemics would be frequent. Most of the land would be under concrete or glass. A gradual move back towards two billion would leave our descendants a more beautiful world.



Migration and conflict

Unsustainable population growth may present itself as ethnic conflict long before it appears as a fight over oil. This may not be evident on the surface, so we first need to take a long perspective. People usually migrate to improve their access to resources. The numbers in a troupe of hunter-gatherers were limited mainly by food resources they could gather each day, as they rarely carried reserves. Deaths were by predation and malnutrition in times of famine.

The incredible human journey

Alice Roberts in the book and TV series of this title shows that every single person who is not African is descended from one single group of people who left Africa around 70,000 years ago. A small group of hunter-gatherers managed to cross the arid Sahara and Red Sea to reach what is now Yemen about 70,000 years ago. Descendants of these migrants reached Siberia, the Americas, and somewhat incredibly, Australia within 10,000 years.



Some hunter-gatherers are still around in the twenty-first century. The Evenki of Siberia continue to hunt, though they also keep reindeer herds. Siberians also reached North America, spreading out to become the great variety of native Americans, including the seal-hunting Inuit. Australian Aboriginal communities are now mostly urban, but some keep alive their hunting traditions. Australian aboriginals probably arrived in Australia about 60,000 years ago, long before they reached Europe. Australian aboriginals are now quite diverse in their clan and languages. The Bushmen of the Kalahari are probably oldest continuous community of hunter-gatherers. Bushman hunting technique shows how walking on two legs and a cool skull gave early humans an advantage. A Bushman hunter can pursue a deer through the heat of the day, keeping his brain in its temperature range by sweating from the head. If the hunter can keep up the pursuit long enough, the prey animal will die of heat stroke.

Migration into a new area carries risks. These include poisons in unfamiliar foods, infections and top predators. Facial signs of infection remain a major reason for avoiding strangers, and different faces may be one of the primitive sources of racism. The biggest threat increasingly came from rivalry with other humans. Although all of us descended from common ancestors, this connection is lost within a couple of generations. Languages diversify very rapidly and human

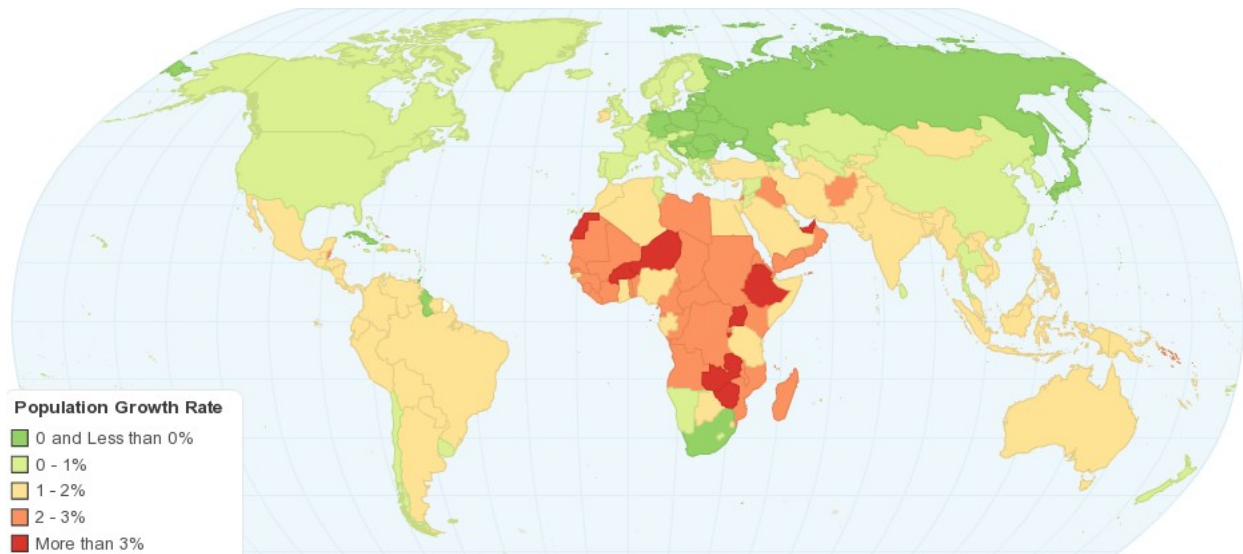
troupes would become mutually incomprehensible in half a dozen generations, so conflict avoidance had to be by signs such as the smile and handshake. Nomads such as Tajiks still rely on the fixed smile to avoid conflict when meeting another troupe. Offering the right hand shows that it is not carrying a weapon.

Boat people

Migration continues to be a source of conflict in the modern world. When resources are in shortage, people look elsewhere. “Resources” now means energy as well as food, but also security. The main emigration pressure is from countries with high birth-rate but low productivity, particularly in times of war. Highest emigration from 2000 to 2010 was from Bangladesh, Mexico, and India, each contributing about half a million. Migration prompted by war led to high emigration from Afghanistan, Iraq, Syria, and several central African countries. The risks associated with migration were well illustrated by the Lampedusa tragedy. This island is the nearest point in the European Union for emigrants from Africa. In October 2013 a boat carrying over 500 migrants, mostly from Ethiopia and Somalia, sank with the loss of 300 lives. Immigration between 1990 and 2013 was 72 million to Europe, 71 million to Asia and 25 million to North America, according to the UN’s Department of Economic and Social Affairs. In 2013, half of all international migrants lived in 10 countries, with the US hosting the largest number (45.8 million), followed by the Russian Federation (11 million); Germany (9.8 million); Saudi Arabia (9.1 million); United Arab Emirates (7.8 million); United Kingdom (7.8 million); France (7.4 million); Canada (7.3 million); Australia (6.5 million); and Spain (6.5 million).

The degree of tension between immigrants and host communities depends on the perceived level of threat. Perceptions of threat between communities depend on facial and language differences, competition for resources, and religious threat. The USA was built on immigration and is wealthy, so the host community has been able to absorb large numbers with only modest friction. Yet long-settled Tamil communities in Sri Lanka, or Rohingya in Burma, attract murderous attention from the dominant ethnic group. In Sri Lanka the dominant identity as Buddhists and Sinhalese-speakers give the basis for hostility. The hostility to the Muslim Rohingya has been led by Buddhist monks. Needless to say, colonial history aggravated the ethnic tension: the British army retreating before the Japanese in 1942 armed the Rohingya, who then used the arms against their Arakan neighbours. The extent to which these surface ethnic tensions are fuelled by competition for food, oil and jobs is harder to determine.

Ethnic violence continues to erupt in several African countries. The Rwandan genocide was the most salutary. Old tensions between Tutsi and Hutu had been manipulated by the colonial powers Germany and Belgium who favoured the Tutsi, until the Hutu revolt led to massive genocide. The tension does not appear to be about religion (Christianity) or language, but may have been about historical caste differences, current competition for resources, or population growth. This tension is apparently well-controlled under the Kagame regime, not least because coffee has greatly increased the general wealth. South Sudan had apparently achieved some stability after its independence from Sudan, but in 2013 there was a sudden eruption, which rapidly took the form of a Dinka/ Nuer conflict. The population growth rate of 4.3% is a probable factor.



The Arab Spring

The Arab spring is of particular interest for the understanding of population growth and conflict. The ethnic basis of recent conflicts is not at first sight about language or religion, since most Arabs speak one language and are Muslim. (“Arab” is the preferred self-description and is not generally considered a denigration.) European commentators have considerable difficulty in understanding the deeper issues, and tend to concentrate on a single leader. This reached its most crass level in George W. Bush’s approach to Iraq, where he saw the problem as “overthrowing Saddam” and “giving Iraqis their freedom”.

The Arab spring is not usually considered demographically. If we choose to analyse the events in this way, the key parameter is the number of disaffected males in their mid-teens in a country. Cohorts of young adults share the ethnic and religious values of their community, and express their resentments against authority and traditional enemies. This effect may be captured by the metaphor of “putting new wine into old bottles”. This saying is from Jesus in the Christian gospel of Luke. Muslims would also know this, but call it a sura of the prophet Isa in the Imjil. The parable was “... and no man putteth new wine into old bottles; else the new wine will burst the bottles, and be spilled, and the bottles shall perish”.

The next observation about the Arab spring would be the detonator effect on stored tensions. The first event in 18 December 2010 rapidly led to others: rulers were deposed in four countries, there were major demonstrations in a further eight, and lesser protests in another six countries. A further observation is the lack of economic demands: the major slogan has been “the people want to bring down the regime”; compare the Russian revolution where the slogan was “bread, peace, land”. The final question must be: what has changed? Leaderships in some countries made concessions by removal of senior people, and perhaps release of prisoners. Yet the Wikipedia page on the Arab spring describes the conflict in more than half of the 20 countries as “ongoing”, the situation in Egypt remains unresolved, and Syria is in civil war. There were large numbers of dissatisfied young adults in the Arab world; they may remain dissatisfied.

Iraq

Iraq has long been the major conflict zone in the Arab world, and this too may be partly driven by population growth. This part of Mesopotamia had 400 years of Ottoman rule, with intervals of Mamluk, Turkmen and Persian control. The religious affiliation is Sunni, which is scripture-oriented by comparison with the inheritance of the prophet system favoured by the Shia (the party of Ali). Tribal loyalties also play a part. Saddam Hussein's power-base was in this Tikrit region, where the Jibbur tribe live. The area around Falluja and Tikrit continues to be the main theatre in 2014, so the ethnic tensions there should be examined. The Iran-Iraq war may be seen as Saddam's attempt to curtail a perceived Persian expansionism and its influence through Iraqi Shias. Iran's population of 75 million is seen as a threat by non-Shia Iraqis. Iraq's revenue stream to pay the continuing costs of the war with Iran was undercut by Kuwait oil, so the invasion of Kuwait may be seen as Iraq's attempt to increase its oil revenue. The most militant Islamists adhere to Salafism, which is intolerant of Sufism and other less warlike trends within Islam. Al-Baghdadi is now the most effective al-Qaeda leader in the region, renowned for his brutal imposition of Sharia in the Tikrit region. The conflict in Falluja may therefore represent multiple tensions: Shia v Sunni, Arab v Persian, formerly powerful v recently powerful, Jibbur v other tribes, Salafi v Sufi. It is difficult to know from a distance which of these tensions are central. Our question is: what is the effect of population growth in aggravating them? Births per woman in Iraq have been 4.3, leading to a growth of 890,000 people in five years. Emigration has been 450,000 in the same period and many of them went to Syria.

Migration pressure is now seeping again into the ethnic cracks in the Lebanon. Pressure of immigrants from Palestine was the major reason for the last Lebanon war. Sunni Arabs from Palestine with no livelihood came into conflict with the Lebanese Christians. In conclusion, migration pressure may be the most urgent effect of population growth. A theoretical framework is proposed about the Arab spring. This is plausible but has yet to be rigorously tested.



Women's choices

The issue of population growth comes down essentially to many individual decisions by women. The decision about child-bearing is a private matter, somewhat influenced by immediate kin, and slightly influenced by societal values. A woman's choices might be something like this:

Eight women

Ann: "I love him madly and want his baby; I don't care what comes next" (love is blind)

Betty: "We split up and then I realised I was pregnant" (an accident)

Carol: "I think when we are ready I could have a couple of children who would feel loved and get on in life" (modern woman)

Dana: "My duty as a woman is to raise many strong sons to bring in food" (impoverished but accepting woman)

Elena: "I dread the thought of another child but it is so hard to prevent it" (impoverished woman with aspirations)

Fran: "I would get enough points for a council flat if I were pregnant" (career choice)

Gina: "My life is interesting enough; I will be child-free" (motherhood is optional)

Hannah: "I adore babies and have enjoyed my pregnancies. I thank God that I have a strong body. Being a mother is what makes me a woman" (being a woman is being a mother) .

We would have different conversations with each of these women if they wanted to discuss their decisions. Ann is likely to become pregnant no matter what anyone says and we would wish her well. Betty has a dilemma and needs the help of a pregnancy advisor: she might want a termination of pregnancy, or to bring the child up, or perhaps to put the baby up for adoption. She may also be a bit disorganised about her contraceptive pills and might do better with a depot method.

Carol represents moderately affluent women in OECD countries: she has access to contraception and can have paid work if she wants it. What influences this decision to have two children?

Darwin's principle is that fitness predicts breeding success. If that applied in modern human communities, economic success would go with having many children. The reverse seems to be true: women in the poorest areas have most children. This is the "population paradox". In the USA, There is a strong negative association between a woman's years of education and birth numbers. Daniel Nettle and Thomas Pollet at Newcastle University found low earning women

have above average births, but low-earning men do not. The most interesting association is that reported by Rebecca Sears and Paul Mathews who analysed data from 1900 UK women. Close contact with extended family is a predictor of pregnancy, after control for income, education etc. This argues that kin support is essential for child-bearing.

Dana represents women in countries where subsistence agriculture is still the norm. There is no benefits system, little healthcare, and the family's income is mainly what they can get from the land or the water. This existence close to the edge of famine was usual in Europe until recent centuries. In the 1300s infant mortality often reached 50%, so having enough children to survive epidemic and malnutrition was a woman's overriding priority. Women who moved to the Black Country or Hackney in 1820 and drew water from the canal faced a similar grim prospect for their children. The saying was "my mother had twelve children, six to live". For women in Afghanistan or Somalia this is still the case. In these situations bearing as many children as possible, and a preference for sons, is a realistic survival attitude.

Elena represents women in less-developed countries, where the economic possibilities have opened up a little, but traditional values still prevail. She might wish to stop having children, but her husband or mother might not. If she is Iraqi, the choice may be her husband's. She would like contraception if it were affordable, perhaps without telling him.

Fran is an English woman living in a provincial town where her work prospects are poor. Her decision to have a baby, perhaps without a partner, is a relatively realistic appraisal of her prospects. She may go on to have children with other partners. The food and energy needs of her children will come from the benefits system. Although pregnancy is a reasonable career choice for her, it is less good for society.

Gina has made an active choice not have children. The values of American couples choosing to be childfree are discussed in a Time magazine blog. Of the 1 in 5 American women making this choice in 2010, 1 in 8 were high income (compare 1:20 low income) and the decision was highly correlated with education. Kanazawa found that the odds of becoming a mother decreased by 25% for each 15 points increment in IQ. The main psychological difficulty is confronting the societal value that equates being a woman with being a mother. Apart from the persistent advertising pressure about motherhood, the only other downside of being childfree was loneliness in the age range 35-45, but not in later life. The child-free woman has much higher income, education and satisfaction than the mother in an affluent society.

Hannah's love of motherhood is the most challenging. She may be Nigerian. Perhaps her daughters may make different choices in the 21st century.

Economic incentives

So how can sustainable population be turned into social policy objectives for Carol, Dana, Elena and Fran? Economic incentives and family planning seem to be the main issues. These should be part of a wide voluntary choice. The incentives have to discourage multiple pregnancies, but not punish children. Contraception is almost certain to be voluntary, though abortion has sometimes been coercive. We suggest a new value to ask of prospective parents, who are already aware of

the costs such as broken sleep and loss of freedom. The new value we suggest is this: how would my child's energy needs be met?

In the United Kingdom child benefit is given to the parent for each dependent. It would be possible to discontinue this after two births, or to apply a sliding scale. There is an obvious snag with this for Betty, who has had an accidental pregnancy that will result in her third child. Without benefits, that child may get cast-off shoes and poor food. A possible solution is for Betty to seek foster parents. This would not mean “confiscating” the child, but instead giving it three parents rather than one. Social policy might also offer Fran career choices other than pregnancy. It would be a rather subtle social policy that allowed her to get a home, a job, and education rather than a flat and child benefit.

Elena may live in an African country. Her pregnancy decisions involve access to women’s healthcare, but also more income. Women’s healthcare is achievable with modest investment, as shown by the way Brazil paved the way in family planning. Faced with 6.0 births per woman and a population explosion, the government invested heavily in gynaecology and women’s health services. The birth rate fell to 1.9 in a generation. The UN publishes data on contraceptive prevalence, which is the percentage of women who are currently using, or whose sexual partner is currently using, at least one method of contraception, regardless of the method used. It is usually reported for married or in-union women aged 15 to 49. Contraceptive prevalence is reported by the UN as 84% in Britain and China, falling to 50% in Iraq, 15% in Nigeria, and only 8% in Mali.

Dana is currently resigned to multiple pregnancies. To consider limiting her family, she would need to believe that her children have a good chance of reaching adulthood. To assist Dana she would need healthcare and new sources of income. This might have to come from outside her country. The UK Department for International Development has shifted aid priorities towards sustainable population. At the London Summit on Family Planning in July 2012 the UK was a major donor, committing to £516 million over eight years.

Contraception as carbon offset

Carbon offset has been one of the ideas proposed for high carbon activities such as air travel. In principle planting saplings might increase CO₂ uptake, but it may be doubted how much actual reduction in carbon has been achieved. PopOffsets is a UK charity that offers a simple and direct approach to reducing carbon: contraception. Its web-site says, “Our case is that PopOffsets is simply the most cost-effective and environmentally beneficial way of offsetting CO₂ emissions which, because of its cumulative nature, becomes more and more effective over time.”

One of the projects PopOffsets funds is Ethiopia’s Population, Health and Environment. PHE’s first aim includes Family Planning (birth spacing, limiting births, emergency contraception, adolescent sexual and reproductive health, etc.). Health is the second aim and includes: HIV/AIDS, ARI prevention, water and sanitation, malaria prevention, primary health care, child survival, etc. The environmental aim includes conservation and natural resources management.

The decision to have a child is weighty. The joys may include the first smile, words, pride when the child performs in a Christmas play or sports day, and a degree award. The downsides include worry, lower income, loss of freedom and loss of sleep. We want to add this question to the

decision: “my baby will need a tank of fuel every five days for the whole of its life; where will it come from?”

The next chapter considers how social policy could influence some of these pregnancy decisions.



A-Z of sustainability

A sustainable population would require one of two values to be adopted by many women and their male partners: “I will live a child-free life” or “I will give one child the best possible life”. It would also require general prosperity, so that people could find well-paid work and governments could provide security, education and family planning. These are clearly ambitious goals! Discussion of the following countries may suggest some possibilities.

Afghanistan

Births per woman 7.0, declining to 5.4 in 2011. Population growth 160,000, 2 - 4%. Emigration: 400,000; Afghans resident abroad: 2 million in Pakistan, 1 million in Iran. Contraceptive prevalence in 2008: 22.8%

The central Asian nation has an economy defined by subsistence agriculture, and the social structure appropriate to it. The main food crop is wheat. The only cash crops have been opium and a small level of fruit and nut exports. As much of the country is arid, only 6% of the area is cultivated. There is no oil, but some coal. There is at least one agricultural development possible, a move to saffron cultivation. This spice commands a huge price per kilogramme. A much bigger potential source of wealth is mineral extraction. There are world-class deposits of copper (and also gold) near Kandahar, at Dusar-Shaida near the Iranian border, at Balkhab, and West of Kabul. The lithium needed for batteries exists at several sites near Lashkar Gah. Rare earths needed for semiconductors exist in world-class quantities at Khanneshin. US aid has been the major source of income in recent years, especially for the Taliban though extortion rackets. The NATO presence has done little to increase economic wealth, but Britain could still stimulate mine development from Kandahar province before troops depart. Mineral extraction would need to be on a low-skill basis, using wheelbarrows and mattocks rather than earth-movers. Lorry maintenance skills would need to be taught in schools.

Afghanistan has a complex clan structure, which can readily be found at web-sites such as Khyber.org. The main ethnic group are the Pashtuns, and the Taliban represent Pashtuns. There are 13 million Pashtun in Afghanistan and 25 million in Pakistan. The opposition to the last Taliban government was mainly from ethnic Tajiks, Uzbeks, Hazara. The Pashtun language shares a common ancestor with English. You can hear this in counting from one to five: yaw, dwa, dreh, tsalohr, peenze. Other ethnic groups may speak Dari, a dialect of Persian. The Karzai represent the Tajiks and those Pashtun tribes who are bilingual in Dari. Taliban (“students” in Arabic) were originally a religious seminary group aiming to install a caliphate.

Pashtunwali code is central to Pashtun social behaviour, and is pre-Islamic. The major tenets of Pashtunwali are:

1. Nanawatey or repentance over past hostility or inimical attitude and grant of asylum
2. Teega or a truce declared by a Jirga to avoid bloodshed between two rival factions

3. Badal or obligation to seek revenge by retaliation. A popular Pashtun saying, "Revenge is a dish best served cold", was borrowed by the British and popularized in the West.

4. Melmastia, hospitality and asylum to all guests seeking help.

While the honour and revenge values are anathema to Europeans, the hospitality and truce values can be embraced. One anecdote tells of a badly-wounded US SEAL who crawled into the house of a Taliban commander. He was given hospitality and returned to his unit. There is an obligation to defend the nation ("Pakhtun-khwa") against any type of ferengi (from the English word foreigner) incursion: defence of nation means defence of honour, values, culture, tradition, countrymen and self.

Women in Pashtun society were expected to live in purdah, an extreme form of gender segregation. A strict modesty code was enforced by draconian punishments. While acid attacks and the shooting of Malala command huge media attention, the values appropriate to a subsistence society are not revealed. The economic significance of high birth rates is to give birth to as many able-bodied sons as possible. The extreme modesty rule is to ensure proof of paternity for inheritance of land by the eldest son. These values are unlikely to change much unless Pashtun society moves beyond subsistence agriculture.

Moving towards a small family therefore requires movement into a cash economy, health care to increase the chances of infant survival, and contraception acceptable to both man and woman.

Britain

Births 2.0. Immigration: 900,000 (whole UK) in last 5 years.

Contraceptive prevalence 2008: 84%

Inward migration has become an issue in recent years in the UK, but we consider the underlying issue is world population growth. There is considerable perceived threat associated with migration. We argued in the chapter on migration and conflict that most of these threats are not borne out: the primitive fear of different skin and disease is not supported; the apparent difference of immigrants largely disappear in a generation; migrant workers do not in general take jobs from native-born workers and they make net contributions to the benefits system; etc. There is however an actual threat: a permanent rise in the resident population entails a proportional rise in oil or its equivalents. We suggested a car tank of petrol every five days as rule of thumb. Immigrants should not be thought of as a threat. Babies should also not be seen as a threat. If there is a threat, it is the line of fuel cans associated with each conception, shown on the cover of this book.

Rumania might be seen as the prime European example of unsustainable population growth. The dictator Ceausescu wanted as many Rumanians as possible (as did Chairman Mao in this early rule). He banned family planning and abortion. This meant that many children were raised in psychological and physical poverty in orphanages. Rumanian migrants often have rather low skill levels and take up work in car cleaning or collecting scrap metal. They currently attract most of the anti-immigrant feeling in the UK.

The European Union has policies of trade between its members without import taxes and free movement of labour. Expansion of membership thrust countries at different levels of development together. When East and West Germany reunited in 1991, many products from the former GDR became uncompetitive, and the enterprises often ceased trading. Indeed, the uncompetitiveness of Eastern Europe was a contributory factor to the collapse of the Soviet bloc. When Bulgaria joined the enlarged EU, its agricultural products such as wine and yoghurt often could not meet EU quality standards. This left many Bulgarians and Rumanians looking for work. Earlier migrants from Afro Caribbean areas or the Indian sub-continent now attract less ill-feeling. Polish citizens have been the most numerous migrant workers, so that about half a million people of Polish descent live in the Britain. Migrant workers in general contribute more to the economy than they take out of it. They may retire to their birth countries without permanently adding to the resident population. This is particularly true of restaurant workers from Bangla Desh, who make up 80% of the workforce in “Indian” restaurants.

How could families of more than two children be discouraged? Children born to immigrants to this country will generally conform to the advanced economy pattern of two children per couple. However, this is a considerable time lag. In principle small family size could be promoted as a British value in the UK citizenship test. However, child-free or one child values have hardly started yet and need considerable promotion.

Child benefit is currently paid at the rate of £20.30 a week for an eldest child and £13.40 a week for each subsequent child, up to age 16 or possibly up to 20 if in education. Does £13.40 a week act as an incentive to further pregnancies? This is quite doubtful. A council flat has a much higher cash value, and may act as an incentive for a few women. The idea of seeking additional foster parents for third or subsequent pregnancies has been discussed.

Britain can also act as a partner to other countries with less developed health care systems. The department for international development was a key donor at the 2012 family planning summit. Such partnership will work better if mutual respect has been established and any ill-feeling about the colonial legacy has faded.

China

Contraceptive prevalence in 2006 84.6%. 1.7 births per woman.

The world’s most populous country is famous for its early attempt to achieve sustainable population. The family planning policy encourages one child families, but there are exemptions for ethnic minorities, if the first child is a girl, or if has a handicap, or if neither parent has siblings. Despite some forced abortions and termination of girl pregnancies, a 2008 survey undertaken by the Pew Research Center reported that 76% of the Chinese population supports the policy. Mao believed that population growth empowered the country, so the population grew from around 540 million in 1949 to 940 million in 1976. The one child policy was mandated nationwide in 1979.

The Chinese population has now become somewhat skewed, in three ways: a declining proportion of young adults for the workforce; the income needs of the older population; and the excess of men over women. Feng, Cai and Gu argue that China should abandon its sustainable population policy, saying “the one child policy will have a more devastating effect than the

famine that followed the cultural revolution”. We consider that each of these problems can be addressed without China growing beyond its projected peak of 1.4 billion.

The view point is very Han-centred. Han Chinese are the world’s largest tribe: nearly a billion people, speaking one language that is hardly understood outside its borders; their renewed self-confidence is creating tensions with each of their neighbours and minorities within China. Tibetans, Uighurs and other non-Han are very much second-class citizens. China could find workers in the young adults desperate for work on the borders of Syria, Zimbabwe, Somalia and elsewhere. China would need to become genuinely multi-cultural to accept foreign-born workers, including the possibility of Chinese citizenship.

The issue of support for the elderly is posed in terms of the traditional Chinese extended family. Yet this family pattern is likely to be replaced by stem families within one or two generations of industrialisation, as has happened in other advanced countries. Older Chinese in coming decades will tend to live in elder communities, perhaps hundred of kilometres away from their children. The pension support will come more from the state (“the iron rice bowl”). A return in the next decade to the six births per woman of the late 1960s would create a youth surge in three decades, at the same time as China loses the competitive edge it has gained through cheap labour. This would leave it like Libya (median age in the mid-teens), with a new generation of disgruntled youth.

The issue of the excess of men over women (boy: girl birth ratio 118: 100) reflects the failure of the People's Republic of China to increase the status of women and confront the values of the male firstborn, filial piety and Confucianism. The problem of 30 million Chinese men looking for wife may also involve a multicultural solution. Chinese men in South Asia often married Malay women, and their daughters gave the famous Singapore beauty.

The continued rising demands for food in China has already resulted in the disappearance of fish, so that jelly fish is now the remaining food source on the Eastern seaboard. China leads the world in unsustainable demand for foods and (bogus) medicines, so these animal species are near to extinction: all elephants, tiger, rhinoceros and sharks.

A sustainable population policy for China would need to be multicultural, with female equality and nuclear families.

Nigeria

Contraceptive prevalence in 2007: 14.7%. 6.0 births per woman.

No discussion of sustainable population can ignore this west African country. It is the most populous country on the continent, with a population of 140 million, so a fifth of Africans are Nigerian. Its childbirth rate would make it the third most populous country by 2100, bigger than the European Union.

There are historical tensions between the three main ethnic groups – Yoruba, Igbo, and Hausa/Fulani. The attempted secession of the Igbos collapsed in 1970 with a million deaths, mainly from famine. Despite this, ethnic groups co-exist reasonably well at present. The other major tension is between radical Muslims of Boko Haram in the North and Christians of the south. (The name comes from English word “book” and the Arabic word “forbidden”, which is also an English loanword as “harem”; it means that Western education is sinful).

The key resource of Nigeria is oil. The wealth from oil used to go to the colonial power and now goes to a small part of the population. The government's anticorruption commission announced in 2005 that over \$US352 million had been stolen or misused since it came on tap – four times the value of all western aid to Africa in the previous 40 years. Breaking in to oil pipelines continues to be a major source of income in the delta. Food is becoming more of a problem, and the country has moved to being a net importer.

The country made a commitment to increase the contraceptive prevalence rate to 36% by 2018, a dramatic increase. However, the majority of women would still have no protection. Contraception is not only a means of preventing unwanted pregnancies but also of preventing maternal deaths in childbirth.

The values of being child-free or having one child need vigorous campaigning in Nigeria. A large family is still seen as desirable by many Nigerian women, probably for the same reason that being large is seen as desirable: it shows resistance to parasites in a country where tropical diseases are prevalent. As corruption is so endemic, it is surprising to read a 2003 survey that found that Nigerians were the happiest people on earth. This happiness seems to be associated with the good time religion of the South. In principle the oil wealth of Nigeria could be spread around more, but this will also be quite a challenge!

The government could give incentives to child-free life, for example an education grant for a woman with no children at age 21, or to a married couple over 25 with one child. Carrot is better than stick; the Chinese policy operates mainly on fines.

Syria

Births 3.0 per woman. Contraception prevalence 58%. Growth 2.52%. Emigration 4 million people – war refugees

The Syrian civil war needs to be considered in part as a consequence of unsustainable population growth. In the years before the war there were 400,000 new people a year on a base of 17 million. This "new wine" was poured into these "old bottles". There are many ethnic groups in the country, though Sunni Arabs are much the most numerous (at least 60%). Several ethnicities in Syria are defined by slightly differing views of the inheritance of the prophet, including Isma'ilis, Twelvers, Seveners, Druze, and Alawites. Alawites constitute 12% of the population and include the ruling Assad family. All tend to be closer to Iranian Shi'ahs than to Sunni Arabs. The Levantine Christians (9%) have tended to back the Alawites because of attacks from radical sunnis. Kurds (9%) fight against Assad for their own nation. Other minorities include Ismaili, Chaldean, Nusairi and Circassian, who may have Aramaic or other languages unrelated to Arabic. The ruling language of Syria is the Levantine Arabic of the West, which is largely incomprehensible to the Iraqi, Mesopotamian and Nadji Arabic of the East.

There has been marked economic decline in Syria since the drought by 2008. Agriculture declined from 25% of GDP to 17%. The main crop wheat went from export to import in 2008. Oil production declined from 600,000 barrels to 385,000 barrels in 2005 -10 and Syria could become a net importer. Water is also becoming shorter. It is doubtful that hunger or petrol prices were immediate causes of the Syrian war. It is more likely that migration from Iraq and domestic population growth formed the "new wine in old bottles".

Syria is intimately involved with Iraq, which has even greater population pressure: births per woman 4.3, growth 890,000 or 2.52%, emigration 450,000. There is a substantial Iraqi émigré community around Damascus, who tend to be Sunnis from the centre. The Free Syrian Army was being outflanked in 2013 by ISIS and the Nusra Front radical Islamist groups. ISIS has scored some spectacular successes against Assad by the use of suicide bombers.

Further migration pressures have arising from the war in Syria. While refugees in Jordan seem to be keeping a low profile, there have been assassinations in Lebanon that appear to be either by or against Syrian migrants. Palestinian refugee pressure was a major trigger for the previous Lebanese civil war. Lebanon remains highly vulnerable to religion-based sectarianism.

The prospects for a solution to the Syrian war are not good. The chance of America intervening on behalf the Sunni Arab opposition have now receded. A government led by them would probably also be unwelcome to several minorities. The Assad regime may regain control in a military sense, but the ethnic and resource tensions would only be temporarily suppressed. A third possible strategy for the UN would be to support communities within Syria that wished to declare themselves as demilitarised zones (DMZs). These would be temporary territories without changing the legal basis of the Syrian nation. DMZs would obviously need to have rigorous policing to exclude combatants. A mainly Druze DMZ with a land corridor to Jordan would host some of the one million refugees in Jordan, and another Druze DMZ north of Idlib might be acceptable. A Levantine Christian DMZ west of Homs would have a land corridor to Lebanon. Turkey could support a DMZ of Sevener Shias on its border. Syrian Kurds would no doubt favour DMZs linked to their kin in Turkey.

Despite 100,000 deaths, the number of Syrians is probably well above the food and oil resources of the region. There were 200 babies born in the main refugee camp in Jordan in the last year. The world community will need to support Syria women and their husbands to achieve smaller families as ceasefires are achieved.

Zimbabwe

Births 3.6. Contraceptive prevalence 2005/6 60.2%. Emigration: 400,000: 1 million emigrants in South Africa.

This country is characterised by economic decline and collapse of the health care system, but some commitment to family planning in spite of this. Gross Domestic Product per capita fell continuously from 1960 to 2008 before recovering slightly. Platinum and other minerals are valuable but there is no oil. Agriculture crashed with seizures of white-owned farms coinciding with drought. Although it has been independent from Britain for 34 years, anti-colonial rhetoric is still strong in ZANU-PF. After his 2013 re-election Mugabe again spoke of seizing remaining foreign owned assets.

Despite poor economic management, there is still some attempt to limit population growth. At the 2012 conference Zimbabwe committed to reducing the unmet need for contraception from 13% to 6.5% by 2020.

This completes the discussion of sustainable population in six countries, including some very problematic ones. Please now give your comments on the following questions.

Policy discussion

What number of humans on the planet is sustainable?

Is the number of babies being born the underlying reason for climate change, ethnic conflict, and energy prices?

Are immigration fears really a fear that there are too many people competing for resources?

Was the Arab spring mainly a consequence of population pressure?

What values would persuade most women to live child-free lives?

What level of population and resources would allow all governments to create conditions of moderate affluence for most of their citizens?

Further reading

1. People and oil

The most recent report of the Intergovernmental Panel on Climate Change (IPCC) may be found online at: www.climatechange2013.org/images/uploads/WGI_AR5_SPM_brochure.pdf

Graphs in this chapter are taken from the IPCC.

Lovelock, James (1995). *The Ages of Gaia: A Biography of Our Living Earth*. New York: Norton.

Ward, P. Gaia's evil twin. *New Scientist*, 20 June 2009.

Smail, K. May 5, 2008 on the Population Matters www.populationmatters.org

2. People, other animals, plants

David Attenborough's talk to the Royal Society of Arts is hyperlinked at: www.populationmatters.org/attenborough-talk/

A podcast on conservation of the whooping crane can be heard at: www.radiolab.org/story/254840-operation-migration

A podcast on gut micro-organisms is at: www.radiolab.org/story/197112-guts

3. Migration and conflict

United Nations statistics on migration may be found at: www.un.org/en/development/desa/population/publications/pdf/migration/migrationreport2013/Full_Document_final.pdf

Roberts, A. (2010). *The incredible human journey*. Bloomsbury. Also available on Kindle

http://en.wikipedia.org/wiki/Arab_Spring

4. Women's choices

United Nations statistics on contraception may be found at: www.who.int/reproductivehealth/topics/family_planning/contraceptive_prevalence/en/

The Time Magazine blog on child-free life is at: <http://ideas.time.com/childfree>

Commitments made at the London Summit on Family Planning may be found online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/67328/london-summit-family-planning-commitments.pdf

The Department for International Development site also has material and You Tube has some speeches by national delegates

www.popoffsets.com

5. A-Z of sustainability

Statistics on population growth etc are available at:

www.indexmundi.com

<https://www.cia.gov/library/publications/the-world-factbook>

Wang Feng, Yong Cai, Baochang Gu. Population, Policy, and Politics: How Will History Judge China's One-Child Policy? Article first published online: 19 Feb 2013. Population and Development Review

Material on Pashtunwali and ethnicity in Afghanistan may be found at Khyber.org

About the Author

Ed Conduit is a clinical psychologist with 40 years of practice experience. He also has degrees in linguistics and computer science. He has been involved in sustainable energy issues for over 30 years.

Ed Conduit's books include

The Body Under Stress on clinical health psychology , pub Erlbaum

The Black Country Dialect Pub Laghamon and Kindle

Lakeland Language, Pub Laghamon and Kindle

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