

THE POPULATION FACTOR: How does it relate to climate change?

Malcolm Potts and Leah Marsh
Bixby Center for Population, Health and Sustainability,
University of California, Berkeley

Introduction

The human contribution to climate change is driven primarily by high per capita consumption in the North. The poorest 1 billion people living on a dollar or two a day contribute only 3 per cent of the world's total carbon footprint, yet the loss of healthy life-years resulting from global warming could be as much as 500 times greater in Africa than in Europe (McMichael *et al.*, 2008). It is also true that 99 per cent of the projected 1-4 billion increase in global population that will occur between now and 2050 will take place in the least developed countries with the smallest carbon footprints (Figure 1). At first sight, the inequity that the nations of the North have caused over 90 per cent of global warming but suffer fewest of its adverse effects, combined with the asymmetry in population growth between the South and the North, seems to create an impossibly difficult background for policy discussions between countries and national groupings. The countries of the North could not ask the 2 billion people of the South living on one or two dollars a day to either slow economic growth or have fewer children in order to slow global warming.

But if we frame the discussion at the level of individual needs rather than national interests, then a totally different picture emerges. Surveys demonstrate that there is a large unmet need for family planning in both developed and developing regions, and analysis shows that meeting the unmet need for family planning and preventing unintended pregnancies – whether women are rich or poor – is one of the most cost-effective ways of slowing global warming. It has the potential to benefit hundreds of millions of individuals, to help the whole planet slow greenhouse gas accumulation

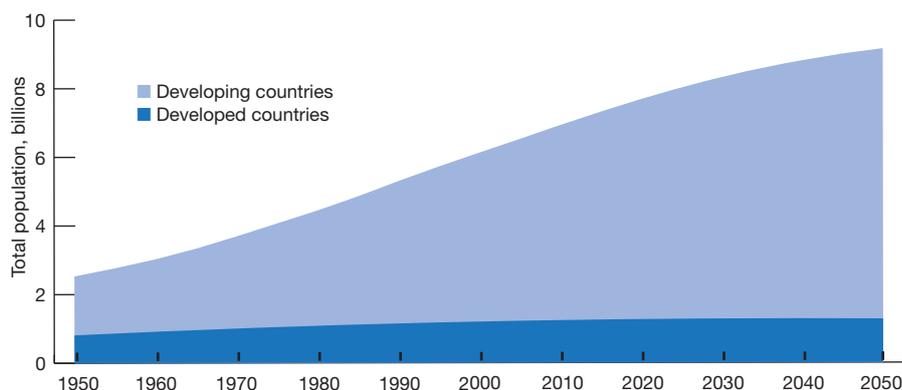


Figure 1
World population growth
1950-2050 (medium projection).
Source: United Nations, World Population
Prospects: The 2008 Revision.

and facilitate countries in adapting to climate change. As the failure of the 2009 United Nations Climate Change Conference in Copenhagen demonstrated, people do not want to consume less: they do, however, want fewer children. At the individual level, the link between climate change and family planning is a win-win strategy. But, for reasons just set out, it is also the climate strategy most likely to be misunderstood, corrupted deliberately or rejected out of hand, by those with strong feelings about human sexuality and the autonomy of women, as well as those promoting access to family planning.

The possibility that investment in family planning could prove one useful ‘wedge’ among many in any overall strategies to slow global warming is beginning to gain traction in such places as *The Lancet*, the *London Times*, *Time* magazine and *The Economist*. But if progress is to be made and wasteful arguments are to be avoided, then it is essential to develop evidence-based scenarios that begin not with environmental issues, but with the obligation everywhere to enable individuals and couples to make voluntary decisions on whether and/or when to have a child. To meet the proven, and in some places growing, unmet need for family planning it is essential to understand and to set about dismantling the many tangible and intangible barriers that all too often confront women who wish to delay the next pregnancy, curtail child-bearing altogether or terminate an unintended pregnancy.

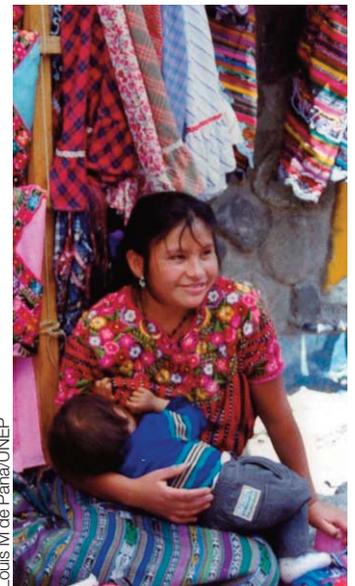
In order to navigate this controversial field we have divided the discussion into six questions. If tackled in the order suggested, we believe that answering these questions could facilitate one achievable path to empowering individual women and ameliorating global warming within an unambiguous human rights framework.

Is family planning coercive?

There have been sad and reprehensible episodes of coercion in family planning in the past. Unless we understand how these arose, no progress will be made in examining the link between population growth and global warming. For example, it is thought that the Intergovernmental Panel on Climate Change avoided dealing with the impact of population because the shadow of coercion still hangs over any debate about human numbers. The controversy that is perceived to surround family planning prevented the inclusion of the population factor and the role of family planning in the Millennium Development Goals (MDGs) articulated by the United Nations in 2000. The fact that a reference to family planning was slid into the MDGs later merely underscores the reluctance of policy makers to tackle this issue.

In the mid-1970s, the Indian prime minister Indira Gandhi began offering ‘incentives’ for sterilization operations. This degenerated rapidly into obscene episodes of coercion and led to her electoral defeat in 1977. In 1979, the Chinese government introduced a one-child policy, which was also associated with painful episodes of coercion in some communes. Extensive reporting in the Western media created a widespread revulsion, which persists to this day.

At a policy level, both episodes are puzzling. Indira Gandhi appears to have had a genuine desire to improve the status of the poor. She attempted to rein in money-lenders, limit dowries and institute adult education. So why did she go down a road



Louis Mi de Pana/UNEP

of coercive family planning? Deng Xiao-ping, who created the policies that have turned China into an economic powerhouse, felt that: ‘We must accomplish it [the one-child policy]. Otherwise, we will not be able to develop our economy, and raise the living standards of our people.’ In China the total fertility rate (TFR or average number of children a woman delivers in a fertile lifetime) had already fallen from 6 to 2.5 before the one-child policy was imposed. Today, it is 1.8, and the question arises whether China could have got there simply by continuing an obviously successful policy of voluntary family planning.

Both Gandhi and Deng Xiao-ping were misled by the traditional explanation of the demographic transition, which was almost universally accepted at the time and which remains influential today. The theory argues that poor couples want many children and that they will not make a rational decision to have a smaller family until they become richer or more educated. If such a theory were true, then it also poses a dilemma in a poor society where rapid population growth is undermining any possibility of lifting people out of poverty or achieving widespread education. Given the traditional theory of the demographic transition, India’s and China’s policy makers felt they had to choose between inaction and leaving people mired in poverty and illiteracy, or offering incentives or even legislating to have fewer children. It seems that is how Deng and Gandhi saw the situation, and it is certainly how they acted. Today, we know that such choices do not need to be made. While the traditional demographic theory continues to influence policy makers and is widely quoted in the media, it is subject to so many exceptions that it is no longer valid. We have many compelling examples of replacement-level fertility, or below, in poor societies with low literacy. In Bangladesh many women remain poor and illiterate (43 per cent of women under 20 never attended school) yet large rural areas of Bangladesh containing tens of millions of people now have replacement-level birth rates. In Iran, family size fell as rapidly as in China, but without any coercion.

The alternative to the traditional explanation of the demographic transition, which seems to have led Gandhi and Deng down the road of coercion, is that fertility decline

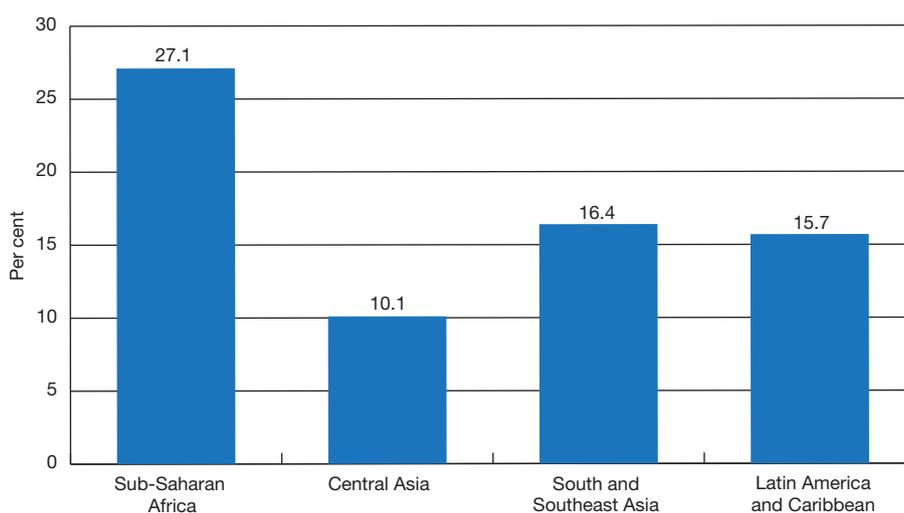


Figure 2
Unmet need for family planning: the percentage of married women aged 15 to 45 who do not want another child immediately (or never want another child) but who are not using contraception.
Source: Baudouy, 2006.

is largely driven by a woman's ability to access modern contraception, backed up by safe abortion and with correct information on contraceptive methods. Wherever this combination exists, family size has always fallen, often quite rapidly. This newer explanation of the demographic transition, sometimes called the opportunity model, posits that education makes it easier for people to overcome the many barriers that often separate them from the knowledge and technologies they need in order to manage family size, but education is not a prerequisite to choosing to have fewer children. Rapid population growth can be slowed by removing these barriers. In turn, slower population growth facilitates access to education and makes economic progress possible.

'Ready access to contraception and safe abortion has decreased family size, even in illiterate communities living on less than a dollar a day.' (Short and Potts, 2009)

The opportunity model places the autonomy of women centre-stage and it is entirely free of any shadow of coercion. It is not telling people what to do, but responding to what women need. Under this explanation, if voluntary family planning happens to help slow global warming it would be a significant added benefit, but the primary reason for making family planning as widely available as possible would remain the human right of women everywhere to choose when to have a child.

What are the barriers to family planning?

There is information from large-scale social surveys that women in practically every high-fertility country want fewer children than they are currently having (Figure 2). There is equally powerful empirical evidence that when the barriers to family planning use are removed then family size falls.

Unfortunately, there are many provider-barriers and massive levels of misinformation, making modern contraception difficult to obtain or use. For example, in Africa only 3 per cent of women can afford the full cost of modern contraception, so either access is subsidized or they cannot use a method. In Europe and America there are commercial but no scientific reasons for keeping oral contraceptives on prescription, and in developing countries women are often denied this method for non-scientific reasons – in Madagascar oral contraceptives are refused to women who do not have one child, while in Tanzania those with five children are told not to take them. Arbitrary limits on access to voluntary sterilization were common in the 1960s in the USA, and still remain in some parts of the world today where physicians impose a '120 rule' on women seeking voluntary sterilization; that is, unless the number of children the woman has, multiplied by her age, equals 120, then female sterilization is refused. (A follow-up of women requesting voluntary sterilization in Brazil found that only 58 per cent obtained the operation, and 18 per cent had an additional pregnancy because their request was refused.) Many women believe the Pill induces life-long infertility, or that it is more dangerous than childbirth. Unless such misinformation is corrected, it is sensible for women not to take it.

It is impossible to find a country with replacement-level fertility without widespread access to safe abortion. (In the case of anomalies, such as the Republic of Ireland or Malta, women travel to England or Italy for safe operations.) However, in Africa

and most of Latin America abortion remains illegal. In practice this means it is accessible to the rich but not to the poor. While respecting profound and sincere differences on abortion, the empirical evidence is that laws making abortion illegal do little or nothing to reduce the number of abortions taking place. However, medical services that ensure every woman who has an induced abortion receives good contraceptive advice can help accelerate fertility decline. In Addis Ababa, Ethiopia, a city with a great deal of poverty, linking contraception to abortion care has helped bring the TFR to a remarkably low average of 1.6 children.

Large-scale efforts are required to make contraception easy to obtain, to overcome crippling levels of misinformation and to confront the inequities found when abortion is notionally illegal.

Are unintended pregnancies in developed countries related to global warming?

The West contributes disproportionately to global warming and will continue to do so in the future. The USA, with 4 per cent of the global population, produces 21 per cent of the world’s greenhouse gases. In the first ten days of each year the average British citizen puts out as much greenhouse gas emissions as an individual in a less developed country generates in one year.

Unintended pregnancy is more common in the West than is usually appreciated. By the end of her fertile life, on average, every second American woman has had one unintended pregnancy (Figure 3). Of these 3.1 million unintended pregnancies that occur each year, half are among women who are not using contraceptives for a variety of reasons, including cost or convenience. The rest are women who use contraception inconsistently or the method they are using fails.

Preventing an unintended birth in either a developed or developing country *eliminates a lifetime accumulation of carbon emissions*. One estimate is that, on

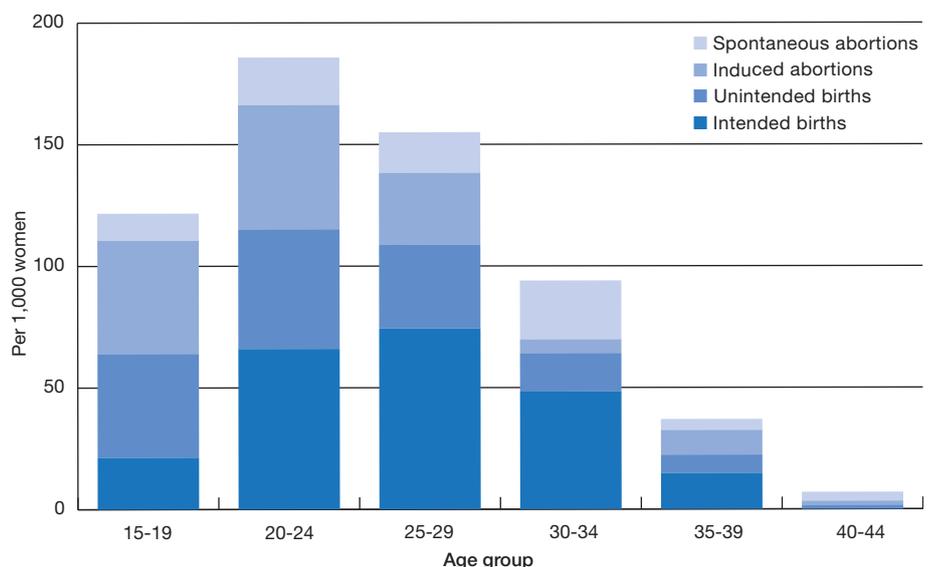


Figure 3
Intended and unintended births in the USA.

average and over a lifetime, each individual British citizen emits 744 tonnes of CO₂, or the equivalent of a seat in 620 return flights between London and New York. In the USA, where carbon emissions average 20 tonnes a year and life expectancy is 78 years, an individual's lifetime emissions add up to a staggering 1,560 tonnes.

Investment in family planning pays off, and unintended pregnancy can be reduced in rich as well as poor settings. One successful programme in California (Family PACT) has been evaluated in detail. Family PACT reimburses physicians for providing contraceptive advice (and other aspects of reproductive health care) to low-income women. The average annual reimbursement to providers (a rough approximation to the cost per couple-year of protection (CYP) ran at US\$288 in 2007/08. A 2002 evaluation found Family PACT averts almost 100,000 unintended births annually. It is estimated that these births, had they occurred, would have incurred US\$1.1 billion in health costs in the first two years after birth and US\$2.2 billion over five years – or US\$2.76-5.33 for every dollar spent. Averting 100,000 unintended births through improvements in voluntary contraception not only improves the lives of those women and the health of their families, but reduces carbon emissions in California by 156 million tonnes (100,000 x 1,560). At a modest valuation of US\$20 per tonne, the financial savings of the Family PACT adds an additional US\$3.12 billion saved to an already cost-effective programme. Carbon permits trade in the EU for US\$21 a tonne, but the International Energy Agency suggests this price may need to double by 2030.

Even in developing countries, the volume of carbon abatement from averting unintended pregnancies becomes significant. In India, the expectation of life is 63 years and the carbon footprint less than 1 tonne per year. There are an estimated 3.5 million unintended births annually, so meeting the unmet need for family planning would avert 195 million tonnes of carbon emissions each year.

Is population growth in developing countries related to global warming?

The relationship between population growth and global warming is complex and should not be overestimated. There are two ways of calculating the possible carbon emissions resulting from population growth in low-income settings. One is to assume no change in income over the lifetime of the individual, if born. The other is to try to predict whether some regions will get richer and others poorer over the lifetime of those born today. There is an international commitment to lift billions of people out of abject poverty. But as the Asian tigers show, once people emerge from poverty they do not stop wanting to get richer. For example, a projection based on the per capita income in South Korea 60 years ago, when per capita income was about US\$100 (unadjusted for inflation), would have grossly understated the impact of averting a birth at that time, now that the per capita income has risen to US\$25,000 (purchasing power parity). The Indian economy grew by 7.9 per cent in 2008, hence the estimate of 195 million tonnes carbon abatement given above is likely to prove a serious underestimate by 2050.

Alternatively, some parts of Africa, for example the countries of the Sahel, may become even poorer in the coming decades, as rapid population growth overtakes the possibility of increasing educational levels or employing the ever-growing cohorts of



David Manders/UNEP

young people. While the CO₂ per capita output of sub-Saharan Africa is one twentieth that of North America, Tim Dyson of the London School of Economics projects that, as a result of population growth and a modest increase in energy consumption, CO₂ emissions in the region will increase by 250 per cent by 2050 from 613 million tonnes in 2000 to 1,550 tonnes in 2050. Even in a poor country where, for example, women cook on charcoal or cow dung, a lifetime of emissions becomes significant.

It should also be noted that population growth can put a considerable strain on the fragile ecology, in particular leading to the destruction of the remaining trees by animal herds and as women gather firewood. One estimate for Nigeria in the 1980s was that 4,000 square kilometres of Nigerian forest were being destroyed annually, producing 40 to 60 million tonnes of carbon emissions. An econometric analysis suggested that ‘a one percentage point [decrease] in the rate of population growth would reduce annual rates of deforestation in all developing countries by between one third and one half of a percentage point, and by somewhat more than that in Africa and Asia’.

In summary, although the carbon emissions per capita are low in the least developed regions, the very large populations involved mean that averting unintended pregnancies has a significant potential to reduce greenhouse gas emissions. If a global economic miracle were to arise sometime in the 21st century when, as is now the case in South Korea, there are no more slums and only minimal unemployment, then the significance of the demographic trajectory followed by the less developed nations will assume a new, even greater meaning.

Is family planning relevant to the adaptation that developing nations need to make to global warming?

Climate change has been called ‘the biggest global threat of the 21st century’. While the North has contributed most to global warming, the South is the least well adapted to change. In 2000, climate change is estimated to have caused 5.5 million disability adjusted life years (DALYS) lost, and in the future the mortality and morbidity resulting from global warming are certain to rise, although the range of estimates is necessarily broad. Under the most optimistic scenarios, global warming will have a serious effect on the health and welfare of the least developed nations. Under the most pessimistic it could bring about catastrophic changes. For example, in the case of sea-level changes, climate models produce a range of projections. If sea levels rise by a few centimetres then most countries will be able to adapt. If levels increase by several metres, then, as one third of the world’s population lives within 60 miles of the seashore, hundreds of millions of people could be displaced.

In 2000, approximately 5 per cent of the 6 billion people in the world lived in regions with water scarcity or serious droughts. By 2025 an estimated 30 per cent of the global population of 8 billion will suffer from serious water shortages and this number is likely to increase further as global warming continues. About one fifth of the area of all the Arab speaking countries is threatened by desertification. The Nile and the Euphrates are largely depleted by the time they reach the sea, even though the populations depending on the water of these great rivers is increasing rapidly. A study by Burke *et al.* (2009) found a strong linkage between recent conflicts in Africa and temperature and ‘suggests a roughly 54 per cent increase in armed conflict



Nigel Dickinson/UNEP

incidence by 2030, or an additional 393,000 deaths'. As rapid population growth with a high ratio of young men to the rest of the population also tends to make conflict more likely, the role of family planning in ameliorating deadly future trends becomes even more salient.

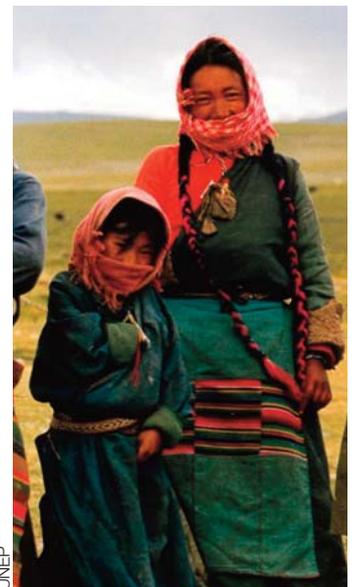
Rising ambient temperatures could reduce rice and maize yields throughout the world by between 20 and 40 per cent by the end of the century. The pressure on the fragile ecosystems of the Sahel is particularly worrying. The 1970s drought in the Sahel is thought to have killed at least 100,000 people. At that time the population of the Sahel was 25.5 million. In 2050 the population could be as high as 90 million. The scale of future disasters is difficult to grasp.

Consider Niger: it is, ranked 174 out of 178 countries on the Human Development Index. Economic growth (2.0 per cent) is lower than recent population growth (3.7 per cent). The average woman has more than seven children. Half the population is under the age of 15, and one third to one half of all children are malnourished. Only 1 per cent of women complete primary education. There are 226 doctors and 13 pharmacists for 15 million people, and the population is projected to reach over 58 million by 2050. With global warming, the summer rains are likely to become even more variable. Moderate droughts occur every two or five years, and studies of the climate based on lake sediments going back thousands of years show that droughts lasting a decade or longer have been occurring throughout the past millennia. The United Nations Environment Programme concludes, 'unfortunately, the Sahel is almost inevitably heading towards an environmental disaster'.

Paradoxically, too much rain as well as too little can threaten the poor. In 2008, floods in Bihar, India (partly resulting from the retreat of the Himalayan glaciers) affected 4.4 million people. Half the world's population now lives in cities, many in slums where drainage is poor and sewage mixes with drinking water. Diseases such as dengue and malaria will become more common.

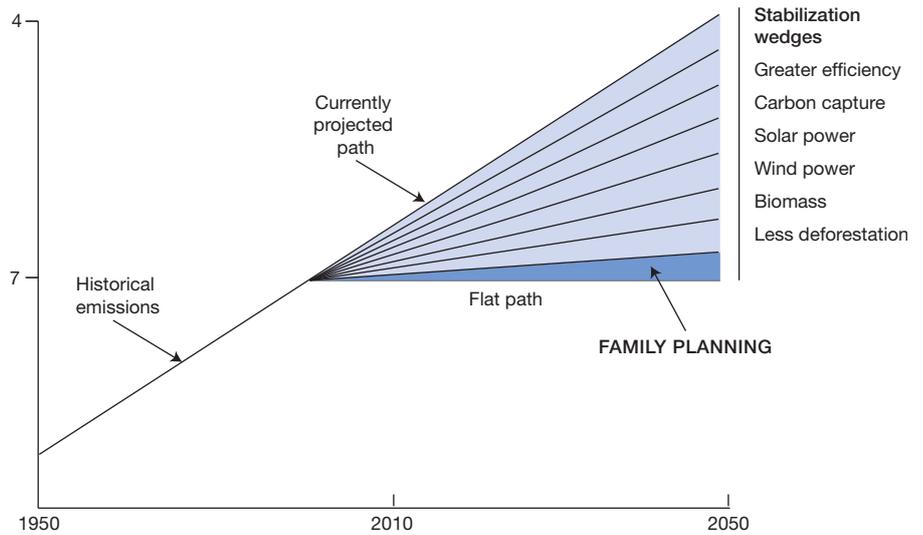
Poverty makes the solution of most problems more problematic, and rapid population growth makes it difficult or impossible for countries to lift their citizens out of poverty. It is a safe generalization that adapting to the problems arising from climate change in developing countries will be easier if the unmet need for family planning is met and population growth slows. As President Obama's science adviser, John Holdren, said in 2008 in his presidential address to the American Association for the Advancement of Science: 'Continued population growth which while not the sole cause of any of the shortfalls listed [poverty, disease, violence, wastage of human potential, maldistribution of investment and consumption], makes the remedy of all of them more difficult.'

The harsh effects of global warming fall differentially on the poorest women in the poorest communities. It is women who must go farther to find water and firewood as the climate dries. Floods in Bangladesh drown four women for every man who is washed away. In Darfur, as ethnic groups fight over diminishing resources against a backdrop of a warming climate, it is women who are raped and beaten most often. Fortunately, a policy focusing on family planning would also offer women the



UNEP

Figure 4
Averting unintended births through voluntary family planning has the opportunity to provide one more 'wedge' to slow global warming.



autonomy they so desperately need to make their own voluntary decisions on if and when to have a child.

Can family planning and global warming be linked in voluntary ways?

The one certainty in the global warming debate is that there is no single solution. It is generally agreed that any achievable strategy to reduce greenhouse gas emissions will depend on a number of complementary 'wedges'. In 1994 Robert Socolow and Stephen Pacala pointed out that stabilizing CO₂ levels would require complementary action in improving the efficiency of energy use and new less polluting strategies to generate power as well as attention to forests and agricultural soils (Figure 4). Family planning could provide a useful additional wedge.

If we assume, as seems reasonable, that mitigating greenhouse gases is a social benefit, then it is appropriate to conduct a *cost-benefit analysis* of preventing an unintended pregnancy adjusted for the varying carbon footprints of people in rich and poor countries. The first person to do this was Garland Brinkley at UC Berkeley in the 1990s. Brinkley demonstrated that averting an unintended pregnancy was a cost-effective way of reducing carbon emissions. However, this was not long after the International Conference on Population and Development in Cairo, and a judgement was made that, while the science was compelling, such an argument would be deliberately misinterpreted by some advocacy groups.

In 2009, Thomas Wire of the London School of Economics did a similar spreadsheet analysis. He assumes that investment could reduce by 72 per cent the measured levels of 'unmet need' for family planning derived from surveys. If achieved, this would lower global population in 2050 by 500,000 million, or 5 per cent below the medium UN projection, and reduce carbon emission between now and 2050 by 34 Giga (10¹⁵) tonnes. The greatest impact, measured in reduced CO₂ emissions, would be in the USA (5 gigatonnes less), China (4 gigatonnes less) and Russia (3 gigatonnes less).

The Wire study is an important step forward. No doubt some of the details will be criticized and refinements will be made, but the overall conclusion – that improved access to voluntary family planning designed to meet the unmet need for family planning is a highly cost-effective way of reducing greenhouse gas emissions (Table 1) – seems unassailable. In fact, reducing global emissions by 34 gigatonnes using conventional technologies to abate carbon emissions could cost as much as US\$1 trillion, against the US\$220 billion Wire estimates would be required for family planning in the next 40 years.

Nevertheless, the fact that family planning is significantly less expensive than most other ways of reducing CO₂ emissions needs to be interpreted carefully. On the one hand, family planning will always be one ‘wedge’ among the many that are needed. If the crisis of global warming is to be confronted, then emphasis must be placed on a variety of complementary strategies of which family planning is only one. On the other hand, between now and 2050, the reduction by 72 per cent of currently unintended pregnancies implies 11 billion fewer people-years lived, with a significant overall reduction in energy generation needs. This, in turn, means every other ‘wedge’ can be smaller, or, to change the metaphor, technologies in such areas as electricity generation will be able to focus on the less complex, less expensive low-hanging fruit such as wind power.

There are several ways in which Wire’s analysis can be sharpened. First, the empirical evidence is that desired family size is a moving target and therefore by 2050 (the terminal date of the Wire study) it is likely that desired family size in many countries will be lower than today, implying that unmet need may grow in the coming decades and therefore the potential for helping people avert unintended births will be even greater than Wire estimates. Second, Wire uses the United Nations Population Fund (UNFPA) estimate for the cost per CYP at US\$22.70. But, in some developing countries, highly efficient voluntary family planning programmes cost as little as \$2.00 per CYP. Third, the impact of slowing population growth can be decomposed in various ways. Adjusting the projected impact of slowing US population growth to take into account population aging would magnify the impact of carbon reduction, because as the size of the retired population increases relative to the working population, then the economy slows and carbon emissions also fall. Conversely, adjusting for increased rates of urbanization in India, as further population growth takes place in that country, increases the estimate of growth in carbon emissions by 30 per cent to 60 per cent.

In 1992 Nancy Birdsall at the World Bank explored the relationship between population and global warming using a different methodology. Like most economists at that time, she accepted the traditional demographic theory that improved education and greater wealth were prerequisites for fewer children. Therefore her calculations include ‘the cost of attaining lower population growth [...] in terms of the costs of educating women (given the evidence that educated women have fewer births) and the costs of family planning programmes’. She uses a 1992 estimate by Summers that ‘one additional year of female school reduces fertility by between 5 and 10 percent’. Birdsall calculated the cost of averting a birth (family planning costs plus educating women) at US\$240 (1987 dollars).

Table 1

Cost-effectiveness of selected carbon-reducing strategies.

After Wire, 2009.

Strategy	Cost of abating CO ₂ US\$ per tonne
Family planning	7
Wind	24
Solar	51
Coal (new power station)	57
Coal (retrofitted power station)	83
Electric vehicles	131



OK Kashyap/UNEP

As set out above, we posit that education reduces family size because more educated women are better able to surmount the many barriers separating them from the information and technologies they need to manage their childbearing. When these barriers are removed, then differences in TFR between illiterate and educated women largely disappear. The interesting thing, however, is that even with the artificially high costs assumed in Birdsall's pioneer analysis, she was able to conclude that 'cost analysis suggests that it makes sense for developed countries *in their own interest* to spend money to reduce rates of population growth in developing countries as part of any optimal carbon reduction strategy' (italics in original).

The answer to the question whether family planning and global warming can be linked in voluntary ways is a resounding 'yes'. But Birdsall's analysis also opens the door to a much larger opportunity. The World Bank estimates that the carbon market reached US\$11 billion in 2005, US\$30 billion in 2006, and US\$64 billion in 2007. The market grew further to US\$118 billion in 2008 and it could reach US\$150 billion in 2009. The budget estimate for all the aspects (staff, training, commodities, and infrastructure, etc) of international family planning is approximately US\$15 billion per annum. Carbon credits could – and we suggest should – be transferred not only to family planning as a valid contribution to slowing global warming, but also as an achievable way to reduce poverty and improve gender equity by investing in female education, not because it is a prerequisite for fertility decline but because it is the right thing to do.

A human rights framework

In 2009 a *Lancet* editorial titled 'Sexual and reproductive health and climate change' commented: 'It is disappointing to see that there are still tensions between the population and some of the sexual and reproductive health and rights community.' The editorial went on to suggest: 'Perhaps it is time for the sexual and reproductive health community to use the climate change agenda to gain the traction women's health deserves.' If, as we suggest above, carbon credits represent a huge opportunity to improve the status of women in the least developed regions of the world, then the successful implementation of that policy will require those whose initial perspective is the environment and population, or sexual and reproductive health and rights, to agree to work together.

Coming from the sexual and reproductive health community perspective, Petroni (2009) makes two points that should receive universal support: (a) 'we should not overstate the impact that slowing population growth will have on climate change'; (b) 'future population growth in the United States will have a hugely disproportionate impact on greenhouse gas emissions compared to the rest of the world.'

Although Petroni recognizes the unmet need for family planning, she still uses the flawed traditional explanation of the demographic transition and goes on to assume that poor people must be 'asked' to have fewer children.

'Ethically, those of us in the developed world cannot ask the people of these [developing] countries, many of whom struggle to subsist on a dollar or two a day, to slow their economic development for the sake of improving the global

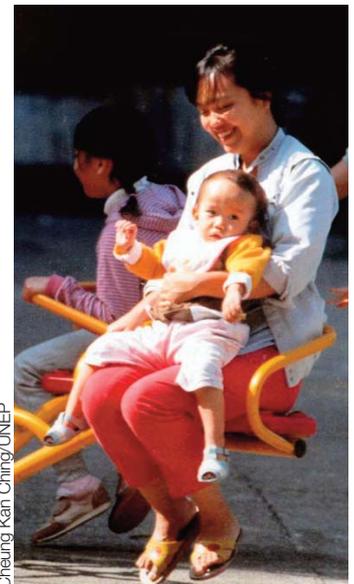
climate. So is it appropriate to ask them to slow their population growth to achieve the same end?’

The answer to Petroni’s rhetorical question is a resounding ‘no’. It would not be appropriate to *ask* people to have fewer children. But if, as is the case, millions of women want fewer children and some percentage of these women all too often risk unsafe abortions to achieve their goal, then Petroni’s question is moot. Further, if, as is also the case, those living on a dollar a day are all too often cut off from the knowledge and means to limit family size, and if linking family planning and global warming, as objective measures suggest, will provide one more useful ‘wedge’ to slow global warming and also bring money to help the poor meet their individual and voluntary fertility goals, then it is indeed a win-win situation.

To move the debate forward, we need to begin with a recognition that arbitrary and often cruel limitations on the freedom of women to decide about their own child-bearing are extremely common. As noted earlier, the ugly, reprehensible coercive episodes that scarred parts of the earlier history of family planning were in part driven by a flawed explanation of the demographic transition. The shadow of coercion is lifted once the theory that socio-economic progress is a prerequisite for fertility decline is replaced by the ‘opportunities model’, built on freedom of choice which asserts family size will fall when women are offered contraception backed up by safe abortion in respectful ways.

It is also important in any debate about population and climate change to retain a sense of scale and recognize that we live in a finite world dependent on fragile ecosystems. Human rights should include our ethical obligation to generations yet to be born. In September 1789, Thomas Jefferson wrote from Paris to James Madison emphasizing: ‘No generation can contract debts greater than may be paid during the course of its own existence.’ This is a prudent vision that the contemporary world needs to adopt. Most scientists agree that human activity has, or will in the near future, exceed the capacity of the biosphere to supply renewable material (whether fish from the ocean or lumber from the forests) or to absorb the pollution produced by human activity. In fact we will run out of atmosphere to absorb CO₂ before we run out of fossil fuels to drive industrial production.

We suggest that empowering individual women and ameliorating global warming can be achieved within an unambiguous human rights framework. At the same time, we recognize that any mention of family planning in the context of global warming will continue to be misunderstood, whether because phrases are ambiguous, or because ideological perspectives trump scientific analysis or even common sense. For example, in some contexts, people could interpret a phrase such as ‘births averted’ as a sort of statistical euthanasia, suggesting somehow that individuals who might have been our neighbours are being deprived of an opportunity to live out constructive lives. An appropriate framework for avoiding this difficulty comes from human biology. Reproduction is characterized by astonishing numbers of sperm and eggs – each genetically unique – and significant wastage of fertilized eggs and early embryos. All human societies have sex tens, hundreds or thousands of times more frequently than is needed to conceive a family. Pre-literate societies (and by inference our Stone Age



Cheung Kan Ching/UNEP

ancestors) had four to six children, half of whom died before they could reproduce. Pregnancies were well spaced by long intervals of lactation, which induces hormonal changes that suppress ovulation. Modern contraception replaces what breastfeeding once did in the natural spacing of pregnancies and further reduces family size, now that infant mortality has been brought to low levels. In this context, family planning is a natural, necessary process that has been practiced throughout history. In a biological setting it makes perfect sense, and is in no way offensive, to speak of averting a birth.

As noted, one of the barriers to family planning is unnecessary medical rules and guidelines. Table 2 summarizes the range of family planning methods that can be made available using a variety of community personnel and health professionals.

Policy responses

Possible policy responses are driven by the explanation adopted to explain the transition from large to small families. If, as we will suggest, fertility declines are influenced more by easy access to modern contraception and safe abortion than by socio-economic factors, then improvements in access to family planning would significantly reduce carbon emissions in the intermediate term. In the West, especially in the USA, the reduction in carbon emissions would be substantial and relatively immediate. Over a longer time frame, investing in international family planning in developing countries would help shift the world to a lower population trajectory with important long-term implications for moving the world to a biologically sustainable economy. However, any transfer of carbon credits for family planning and perhaps education from the polluting North to the populous South would have to be transparent and done in ways that pre-empt any risk of coercive family planning.

There are two sorts of carbon markets. Compliance schemes, such as those regulated by the Kyoto Protocol or the European Union's Emissions Trading Scheme, require setting carbon reduction targets which, at least until a great deal of empirical data is available, could lead to, or be interpreted as leading to, coercive family planning policies. The second voluntary market, where polluters purchase carbon offsets on a voluntary basis, is compatible with an essential human rights framework. For example, the Clean Development Mechanism (CDM) has flexible verification mechanisms and some models take into account co-benefits, such as job creation or protecting biodiversity. In the case of family planning, co-benefits could include reductions in

	Individual choice	Community distribution/shops	Trained community worker	Nurse/midwife/physician's assistant	Physician
Coitus interruptus/ breast feeding	x				
Condoms		x	x		
Oral contraceptives		x	x	x	
IUDs/implants				x	x
Vasectomy				x	x
Female voluntary sterilization				x	x
Medical abortion			x	x	x
Surgical abortion				x	x

Table 2

Delegation of family planning activities.
WHO Medical Eligibility Criteria for Contraceptive
Use, 2003, and peer reviewed literature.

maternal and infant mortality or improvements in the coverage possible for education. In 2007 the CDM market exceeded US\$7 billion. The International Organization for Standardization (ISO) has developed greenhouse gas accounting and verification protocols, although not for births averted. The voluntary market today is expanding at such a rate that delays are occurring in registering and validating projects. The whole of the voluntary carbon market passed the 100 million tonne per year mark in 2007. To give a sense of scale, the Family PACT example of voluntary family planning quoted above – a specialized effort in a single US state – reduces carbon emissions by 156 million tonnes each year.

Several complimentary options exist:

- a: Transfer carbon credits to strengthen government health infrastructure designed to achieve the goal of the 1994 International Conference on Population and Development to achieve universal access to a full range of safe and reliable family planning methods and related reproductive health services by 2015. Given the unmet need for family planning, such improvements would avert a certain number of unintended pregnancies. Plausible estimates of the impact of such a policy could be made when carbon credits were first instituted, and then more exact figures could be calculated by a post hoc analysis. Such a strategy would avoid setting ‘targets’ and any risk of coercion.
- b: Half the population of the developing world is under the age of 25 and 1 billion youth are in the 15-24 age group; the majority living in low-income settings with limited educational and employment opportunities. Anything that would improve access to family planning options, counter misinformation, or raise the age of marriage is likely to reduce unintended pregnancies. As with (a) above, plausible guesses could be made of the possible carbon impact of test projects, permitting more accurate balance sheets to be developed as time passed and as projects grew in size.
- c: In many developing countries, the poorest economic quintiles are not usually reached by government health clinics. However, carbon credits could be used to fund social marketing programmes, which sell oral contraceptives, condoms and injectables at subsidized prices through a variety of retail and other outlets. Carbon credits could also be used to fund output-based assistance (OBA) programmes. In such programmes, individuals, for an appropriately small fee, would purchase a voucher, or coupon, that could be taken to a government clinic, a faith-based clinic, or an accredited private provider. The provider would then provide a long-acting method of contraception the client wants, such as an IUD, voluntary sterilization or implant. The provider cashes in the coupon for an agreed payment for providing such a service. Both social marketing and OBA can be made to work in low-resource settings and as the client is paying for the service – albeit at a subsidized price – the risk of coercion is eliminated.

We suggest that it would be practical to launch test projects based on approximations using the best current estimates of cost and impact. Given the cost-effectiveness of family planning as a wedge in reducing carbon emissions, together with the likely

size of any carbon trading system, it is unlikely that initial approximations would overestimate the impact of a possible scenario, and investors could enjoy a plausible assurance that their investment would be validated by future analyses.

By 2007 over 3,000 projects had been registered in the CDM market. While it would be difficult at this stage for a government or an international organization to launch carbon offsets for family planning, a non-governmental organization with an impeccable record in offering voluntary family planning might develop and test a project for registration and validation by the CDM market or the smaller but more flexible over-the-counter markets (total volume in 2007 US\$0.26 billion).

The Optimum Population Trust in Britain has pioneered a web site where individuals can volunteer to offset their carbon emissions by purchasing oral contraceptives and condoms to donate to developing countries, although they are not seeking carbon credits for averting a birth (<http://www.popoffsets.com>).

Conclusions

Despite the controversy clouding discussions of population and family planning, two observations shine through as broadly true: couples in the most affluent and affluent nations are having two children or fewer, and women with large families in the least developed regions want fewer children than they are currently having. There is a large unmet need for family planning, and a great deal is known about how to meet that unmet need in voluntary ways that respect individual autonomy.

Whether the world has 7.8 billion people (a 28 per cent increase on today's population), 9.2 billion (a 40 per cent increase), or even over 10 billion, will depend to a large extent on the realism of the policies and the seriousness of the investment the international community is willing to make in family planning. Averting an unintended birth ameliorates carbon emissions, and any genuine effort to slow global warming should include family planning as one of the most achievable, scientifically valid and cost-effective wedges. Averting a billion births through purely voluntary family planning, with a life expectation of 60 years and emission of only 2 tonnes per annum would abate 120 billion tonnes of carbon. As noted at the beginning, while most societies seem reluctant to consume less, there is a genuine, large and growing unmet need for family planning.

Generating renewable energy and sequestering carbon are necessary but expensive technologies with a single goal of reducing greenhouse gases. Building carbon capture equipment on a coal fired power station is likely to double the cost. Family planning is a well understood, low-cost endeavour, with multiple benefits. The use of family planning to achieve an optimal spacing of pregnancies significantly reduces infant mortality, and a woman cannot die from a pregnancy she does not have. There is an increasing body of evidence that family size falls, even in poor and illiterate societies, when the numerous barriers to contraception and safe abortion are removed. Policy makers need to understand that birth rates can and should be slowed only by improving access to voluntary family planning. Climate scientists need to understand that preventing unintended pregnancies in both rich and poor countries benefits women, their families and the global environment.



Aye Aye Chit See/UNEP

However, emphasizing family planning, especially in developing countries, in order 'to slow global warming' would be inappropriate and might be seen as blaming the poor for climate problems, when in reality, if blame is to be assigned, it should be the rich who carry the burden of guilt.

It is going to take time, thoughtful advocacy and public education to develop science-based policies. While 37 out of 40 National Adaptation Programmes of Action submitted by the least developed countries to the UN Framework Convention on Climate Change saw a link between population growth and global warming, only six went on to make a specific mention of family planning.

When the right of women to choose if and when to have a child is respected, then a welcome side effect of preventing unintended pregnancies will be a modest but useful contribution to slowing global warming in lesser developed regions of the world and a significant impact in the North, especially in the USA. Family planning presents a highly cost-effective opportunity to slow global warming. We suggest it is possible to use carbon credits to improve the welfare of some of the poorest and most vulnerable groups of women and their families in the world. Now is an appropriate time to begin testing such an opportunity.

Bibliography

- All Party Parliamentary Group on Population, D.A.R.H., 2007. *Return of the Population Growth Factor: Its Impact on the Millennium Development Goals*. London, All Party Parliamentary Group on Population, Development and Reproductive Health
www.appg-popdevrh.org.uk
- Baudouy, J. 2006. *Bringing Population Dynamics and Sexual and Reproductive Health into Development Policy Debates*. Paper presented at DFID-AFD workshop on Demography, Reproductive Health and Sustainable Economic Growth in Africa. Paris, 2-3 March, 2006.
- Bayon, R., Hawn, A. and Hamilton, K., 2007. *Voluntary Carbon Markets; An International Business Guide to How They Work*. London; Earthsacn.
- Birdsall, N., 1992. *Another Look at Population and Global Warming*. Washington, DC, World Bank.
- Burke, M.B., Miguel, E., Satyanath, S., Dykema, J.D. and Lobell, D.B., 2009. Warming increases the risk of civil war in Africa, *Proceedings National Academy of Sciences* **106**:20670-20674.
- Campbell, M.M., Sahin-Hodoglugil, N.N., Prata, N. and Potts, M., 2006. Barriers to fertility regulation: a review of the literature. *Studies in Family Planning* **37**:87-98.
- Center for Reproductive Health Research and Policy, 2002. Family PACT Program Evaluation. *Cost-Benefit Analysis for Calendar Year (CY)*. Family PACT.

- Dyson, T., 2005. On development, demography and climate change: The end of the world as we know it? *Population and Environment* **27**(2): 117-149. ISSN 0199-0039.
- Henshaw, S., 1998. Unintended Pregnancy in the United States. *Family Planning Perspectives*, **30**:74-90.
- Lancet (editorial), 2009. Sexual and reproductive health and climate change. *The Lancet* **374**:949.
- McMichael, A., Friel, S., Nyong, A. and Corvalan, C., 2008. Global Environmental Change and Health: Impacts, Inequalities, and the Health Sector. *British Medical Journal* **336**:191-194.
- Pacala, S., Socolow, R., 2004. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science* **305**:968-972.
- Potts, M. and Campbell, M., 2008. The origins and future of patriarchy: the biological background of gender politics. *Journal of Family Planning and Reproductive Health Care*. **34**:171-174.
- Singh, S., Darroch, J.E., Ashford, L.S., Vlassoff, M., 2009. *Adding It Up; The Costs and Benefits of Investing in Family Planning and Maternal and Newborn Health*. New York: Guttmacher Institute and United Nations Population Fund.
- Short, R.V. and Potts, D. (Eds), 2009. Impact of Population Growth on Tomorrow's World. *Philosophical Transactions of the Royal Society B*. **364**:2969-3124.