DISCUSSANT'S COMMENTS[1]

Adrian C. Hayes, Australian National University

I am sure you will agree with me that this afternoon we have enjoyed three first rate stimulating presentations on population and climate change. The presentations reflect very well the impressive gains – theoretical, methodological and substantive – that a relatively small group of demographers and fellow travelers have made over the last dozen years or so to the interdisciplinary subfield we call "population and climate change."

Population is involved in both the causes and consequences of climate change; and it's not just about population numbers. Human populations are complex entities, and much of that complexity is implicated in the way population operates as cause and consequence of climate change. I want to comment briefly on the way these papers advance that proposition.

One of the fundamental ideas underlying these research efforts is the coupling of human systems and natural systems.

Wolfgang Lutz this afternoon outlined a broad demographic perspective on this. Human populations and natural systems over the last 200 years have increasingly become coupled in ways such that human populations both cause climate change and are subsequently affected by these same changes. These are not simple linear relationships but rather a complex web. Population and climate influence one another by multiple paths.

The big story is that these couplings in aggregate add up to one large vicious circle, and we need to find new ways of coupling human and natural systems which will produce a virtuous circle instead.

[1] A few sentences from the text were omitted from oral presentation in the plenary because of time constraints.

In looking at the big picture, Lutz (by design) focused on how climate change affects population and adaptation, while Leiwen Jiang focused on how population affects climate change.

When the Intergovernmental Panel on Climate Change, IPCC, did their initial work during the early 1990s they focused mainly on anthropogenic effects on climate and the mitigation of those effects. This was considered top priority, and they felt at the time that too much attention on adaptation might cause some policy makers to believe that a massive reduction in emissions was not so important after all because we would be able to adapt to climate change anyway. Unfortunately Kyoto was not widely implemented on schedule and so now we are faced with the urgent necessity of adapting to CC. Even if emissions miraculously stabilized today at current levels global temperature would still continue to rise because of momentum in the system. There is a substantial time-lag between a rise in concentration of greenhouse gases in the atmosphere and the resulting rise in temperature due to the associated increase in radiative forcing.

In other words, adaptation to climate change has become a necessity, and this means, as Lutz argues so well, that there is an urgent need for research on the adaptive capacity of different populations, and for demographers to contribute to this research effort.

Lutz and his collaborators have, over the last several years, given us a lot of ideas on how we CAN contribute. The physical impacts of climate change will not be distributed evenly across the globe, but even within a specific geographical area some population groups will be better resourced to adapt to climate change than others: Other things being equal, we can expect the rich to adapt better than the poor, adults better than children or the elderly, and the educated better than those with little education. Farmers will be affected in different ways than fishermen, urban populations will be affected differently than those living in rural areas; and so on.

As nations begin to assess the human impacts of climate change we need to look at national populations in these terms; and explore news ways to identify and analyze those dimensions of population composition most relevant to adaptation.

I am sure Lutz is right in identifying human capital as one of the most relevant dimensions, but obviously there are also many other candidates that need to be studied carefully, including social capital, and access to infrastructure and social services. I like the way Lutz displays his data; that is, in a way that highlights cohort effects and the persistence of some characteristics along cohort lines through time, such as educational attainment. In fact, we could probably take this one step further. Since we know the time frame in which national adaptation strategies need to be employed we can use this time frame in our research design to link the expected experience of specific birth cohorts through time (on the one hand) to climate impacts as predicted by the latest scenarios of climate change (on the other); and we can then inventory the resources each cohort will have for adaptation at different ages.

As Lutz has argued in another session at this conference, the demographer's ability to predict a lot about future demographic change is an extremely powerful tool for predicting a lot about future social change and adaptive capability as well. Tying this to the latest research on climate change scenarios is I think a new and very exciting research area.

Developing adaptation strategies for vulnerable populations is an urgent priority for the short- and medium term, but a long-term sustainable solution to anthropogenic climate change HAS to depend on mitigation, in other words, a reduction in greenhouse gas emissions. We have to break the nexus between economic growth and rising emissions.

The research findings reported by Jiang in his presentation are extremely valuable for the way they clarify the role of population dynamics in rising emissions: Population numbers are important, but in the present global context of rapidly rising consumption per capita they are generally not the most important factor; We are already fairly confident that the world's population will peak during this century; and most of the additional 3 billion people we expect by mid-century will be the result of population momentum, not high fertility; Reducing population growth therefore will help reduce emissions, but not nearly enough to solve the emissions problem.

We might add here, incidentally, that rising oil prices and the like due to market forces with demand outstripping supply under most business-as-usual scenarios are, under any reasonable

assumptions, also not nearly enough to solve the emissions problem either. Mitigation on a global scale will have to depend on an internationally-agreed policy response.

But the interesting thing for demographers in Jiang's research is that even if the story regarding population numbers is none too striking, when it comes to population composition there are a host of interesting and challenging issues to research which are important in explaining the continuing rise in emissions, and which will be important therefore in developing effective mitigation strategies.

Urbanization has an effect on emissions; so does population ageing. So does household structure. It will be interesting, and relevant, to study the causal chains here in as much detail as possible.

In a soon-to-be published paper by O'Neill, Jiang and others – using the same PET modeling discussed by Jiang this afternoon – suggest that although changes in both urbanization and aging affect climate change (but in opposite directions), both operate through their influence on labour supply. If this is true it is a very important result but I find it a bit puzzling and I am frankly not sure yet whether this is a really robust finding or an artifact of the model. This is not a criticism; my point is simply these causal links take a lot of study. In the case of urbanization and aging I think it is also interesting to see if any of the effects on emissions are due to differences in energy intensity per unit of consumption, or differences in carbon intensity per unit of energy used.

This research looking at changing population composition will be challenging, partly because when we look at population composition in terms of the usual suspects – aging, household size, urban-rural, and so on – many of the underlying processes are interdependent.
For example the rapid growth of the urban population in many parts of the developing world today, and the corresponding stagnation or decline of the rural population, are associated with a rapid aging of the rural population.

Another challenge with the kind of modeling undertaken by Jiang and others is that as the models get more complex it's often difficult to know how to compare systematically the results from different models. In the early stages of their work the IPCC established a set of possible scenarios for global emissions based on different assumptions about future economic

and population growth. By the time their 4th Assessment was released in 2007 global emissions were already edging higher than even the highest scenario. What they had not anticipated was the exceptionally high rates of economic growth to be achieved by a number of large developing countries – like China, India, Indonesia – during the current decade – at least that is the interpretation offered by my ANU colleague Ross Garnaut, who says we are now living in the what he calls the Platinum Age of Development. I'm not sure yet whether the modeling done by Jiang's group – which divides the world up into major regions – can confirm this interpretation or refute it.

In any event, the national emissions of a number of large developing nations now dwarf those of many developed nations. Of course on a per capita basis most developed nations are still far higher; but even that is changing – in the region I study, SE Asia, Malaysia's per capita emissions, for example, are now higher than those of the UK, Netherlands or France, and are rising steeply. Regardless, negotiations at Copenhagen and elsewhere are – for better or worse – between nations, not between individuals. At Kyoto the agreement was that the developed nations should commit themselves to binding reduction targets first, and developing nations could come on board later. That didn't happen, and now that option is frankly no longer realistic. Any effective global mitigation strategy today will have to involve the larger emitting nations of the developing world.

The development of effective mitigation strategies will depend in part on demographers contributing wisely to the debate. Many policymakers and others who influence public opinion still have a very simple concept of population as just being a matter of population size and growth rate. They tend as a result either to exaggerate the importance of population for emissions or dismiss it as irrelevant, depending usually on which populations they happen to be familiar with.

Jiang's presentation shows the importance of using the demographer's more complex and analytical concept of population. We now have the responsibility of conveying the relevance of these insights to those influencing policy.

Let me turn now to Susana Adamo's paper. One of the stimulating aspects of this set of presentations is the way the research discussed combines insights from earth science and demography. As a demographer I feel pleasantly shaken by Susana's presentation into a new

awareness of the importance of physical geography, although I'm probably not using the right label here.

Migration to demographers is so often a matter of statistics describing streams of people from places of origin to destination and we pay little attention to the physicality of the process. With climate change we can expect environmental factors to play a growing role, both as push and pull factors, and we need to expand our conceptual repertoire accordingly.

With Adamo's paper we return to consequences of climate change and adaptation, more than causes and mitigation. Migration will be a major adaptation strategy, perhaps the most important of all. And people will migrate regardless of policy; so it's going to be very important that official national adaptation strategies take this overwhelming fact of life into account.

Once again, we can see demographic analysis has an important contribution to make, even if we have to upgrade our concepts to take into account new realities. It's clear from Adamo's analysis we will also need new data sets if we are to measure and monitor environmental hazards and social vulnerability across the globe reliably. Perhaps preliminary work lobbying the UN Statistics and Population Divisions for this has already begun, I don't know. I do know the promise of new data enabling analysis of adaptive capacity of regional population to climate change will draw demographers to the topic like bees to a pot of jam.

And we should never forget that humans are not the only species which will use migration as an adaptive strategy to climate change. All species will try to do this, including food plants, microbes, and disease vectors like Anopheles and Aedes Egypti. Some of the larger mammals will find their adaptive paths are blocked because of human dominance of the landscape, unless we help them.

As a demographer I'm left wondering whether we shouldn't take another look at the human ecology tradition associated with Amos Hawley, Otis Dudley Duncan, and others, which at one time was so important to our discipline but which has fallen out of favor in recent decades. For those of us looking to undertake collaborative research on population and climate change the links between demography and ecology and geography are clearly just as important as the links with sociology and economics, and arguably much more so.

To sum up, these papers demonstrate very clearly how demographic analysis can contribute to a scientific understanding of the causes and consequences of climate change; AND to policy issues regarding the urgent need for effective adaptation and mitigation strategies.

On adaptation and mitigation, it will be interesting to discover whether the dimensions of population composition most relevant for adaptation are the same as those most important for mitigation. From a policy point of view the problems are not exactly symmetrical. That is, in the case of adaptation the problems in themselves are not new, it's the location of these problems which is new. Some human populations have long histories of dealing with malaria, dengue, high temperatures, low temperatures, high rainfall, low rainfall, changing coastlines and cyclones, and many populations have learned to deal quite successfully with these environmental hazards. The heightened risk associated with climate change is to a large extent due to the fact these hazards will now impact populations who don't have such a successful history of dealing with them. Just thinking of the enormous investments in public health programs designed to control malaria and other vector-borne diseases in the tropics over the last century illustrates the point: It will be an enormous public health challenge if the expertise for managing say the risk of malaria is in one place while the actual risk has moved to another. Theoretically we know how to handle the problem, but practically speaking the expertise and other resources will no longer be in the right place.

Mitigation, most experts agree, is different in that it will require new knowledge and the development of new technologies, not just a social and spatial redistribution of resources.

In closing I would like to mention briefly one additional role for demography which may be implicit in these papers but which deserves to be made explicit. That is the issue of environmental justice and human rights.

Mitigation is an incredibly complex challenge. No nation can handle it on its own; it requires international agreement.

Mitigation is the classic prisoner's dilemma. Every nation stands to gain the most by allowing all the other nations to contribute the most to mitigation efforts while doing as little as possible themselves. In sharing the cost, equity requires we must try to find a fair balance

between rich and poor countries, between those nations that might be affected the most and those less affected, and between their citizens living today and those of future generations. Once target are set there will be similar issues to negotiate within nations. Mitigation is truly what Garnaut calls a diabolical policy problem. Nations and vested interests groups are going to be clambering for special treatment or exceptions.

The point I want to emphasize is that there is a firm demographic substratum to many of the factors that need to be balanced, like balancing the costs and benefits to the current generation on the one hand and future generations on the other. In fact with population aging, the increase in national debt in many nations due to stimulus packages as national responses to the current global financial crisis, and now climate change, we may be approaching something like the perfect storm regarding intergenerational transfers.

One again I think demographic skills and insights are going to be at a premium. When it comes to climate change, demography has an important role to play in adaptation, mitigation, and environmental justice.

The last century has been called the Demographic Century. The present century may be called the century of Climate Change. Regardless, for population experts we still live in interesting times.