

Report on the

# IUSSP Seminar on Population Dynamics and the Human Dimensions of Climate Change

Australian Demographic and Social Research Institute,  
College of Arts and Sciences, Australian National University

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International Union for the Scientific Study of Population ■ IUSSP  
Union internationale pour l'étude scientifique de la population ■ UIESP

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## Session 1: Opening Session

Peter McDonald, President of ADSRI and IUSSP, delivered the opening remarks, followed by Adrian Hayes, Chair of the IUSSP Panel on Climate Change.

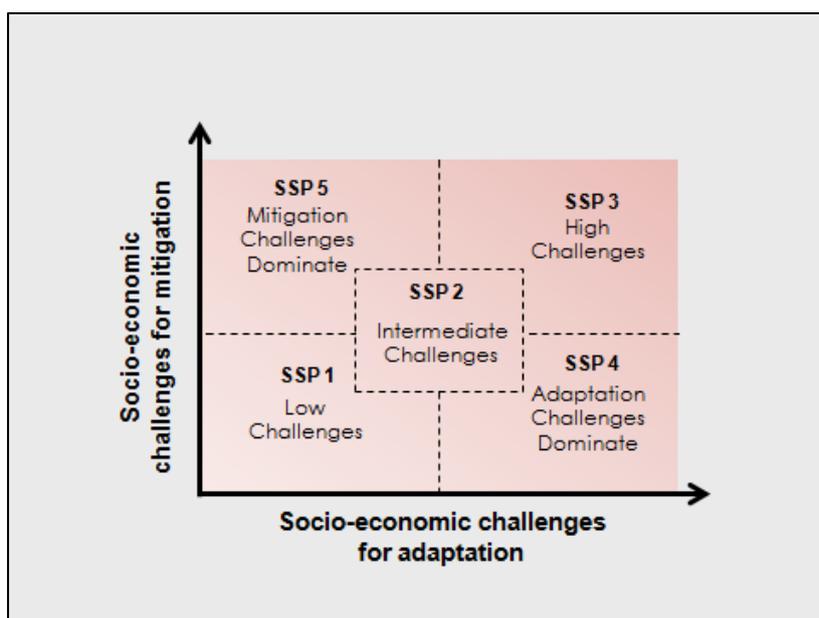
## Session 2: Special Panel Session - Update on the role of population dynamics in the next generation of scenarios for climate change

*Presenter 1:* Brian O’Neill, NCAR, made the first of three presentations on “A New Generation of Scenarios for Climate Change.”

Driven by criticisms of the SRES for failing to incorporate demographic inputs beyond population size, new scenarios are being developed to address population dynamics more comprehensively in climate change projections. O’Neill introduced the process involved in constructing new scenarios. While the SRES scenarios followed a traditional linear process moving from socio-economic variables towards a concentrations profile, the new scenario process begins with concentrations and permits two separate analyses of surface temperature and socio-economic variables to occur simultaneously. The advantages of the new process are efficiency and the production of more open-ended analysis which permits the modification and further exploration of the socio-economic variables without impacting the separate emissions analysis.

As a result of the process, five shared socio-economic pathways (SSP’s) are being developed from two components - a (qualitative) narrative, and quantitative elements flowing from the narrative. These 5 different SSP profiles differ across a two dimensional spectrum of varying levels of climate change mitigation and adaptation challenges.

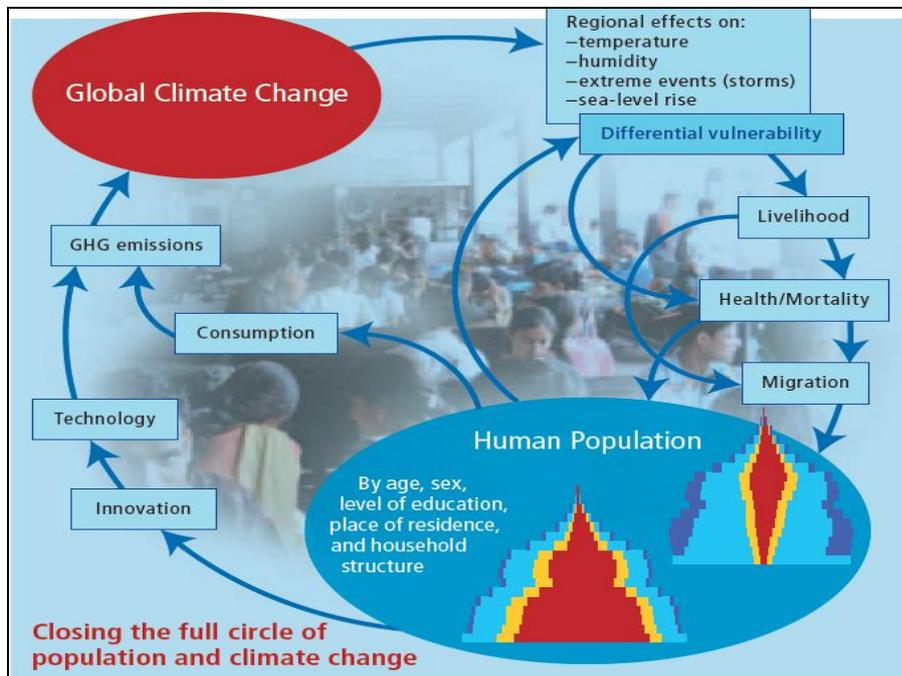
Figure 1: SSP Logic, modified from O’Neill 2012



These SSP's are being developed parallel to RCP's (representative concentration pathways) which will later be combined to produce the full picture of climate change mitigation and adaptation.

*Presenter 2:* Wolfgang Lutz, Wittgenstein Center & International Institute for Applied Systems Analysis, presented on the importance of education in the formulation of the SSP's.

Figure 2 Closing the Circle of Population and Climate change, Lutz 2012



Education - along with age, sex place of residence and household structure - are demographic components included in the new scenarios that were ignored by the SRES. In the SSP's, education is given a prominent role based on its implications for under-five mortality, total fertility, and economic growth.

*Presenter 3:* Leiwan Jiang, NCAR, spoke of the urbanization element of the SSP's. Citing the limitations of existing urbanization projections, he described the efforts to extend the SSP urbanization projections for a longer range of time (to 2100) and account for uncertainty.

Using UN historical urbanization data, the process involves taking the mean of all countries that achieved the subject country's current rate of urbanization over a span of 60 years and creating a fitted line to project urbanization rates forward.

While there is only one central scenario for countries that are already 80%+ urbanized (thus with little uncertainty), countries such as those of Eastern Africa may follow a slow scenario leading to continued rural growth or follow the fast scenario to become as urbanized as the most urbanized region.

The next step was to integrate the urbanization projections into the SSP's to construct a consistent storyline along with the other variables of population, education and GDP. This exercise revealed that SSP1 & 5 generated highest world GDP, but GDP increased under all scenarios given the urbanization projections.

## Session 3: How do population dynamics contribute to the anthropogenic causes of climate change?

*Presenter 1:* Brantley Liddle, Victoria University, presented “Impacts of population, age structure, and urbanization on greenhouse gas emissions/energy consumption: Evidence from macro-level, cross-country analyses.”

This presentation looked at the methodological issues of current studies of population dynamics impacts on emissions/consumption based primarily on the use of aggregate measures that hide significant/meaningful findings. One such example was use of the World Bank data which aggregates age structure data into only three categories which often yields insignificant results. The presentation also addresses some of the ambiguity in using urbanization as an explanatory variable and the mutually causal relationship between energy consumption and urbanization. The presentation advocated for moving away from urbanization to density and to disaggregated age structure and household composition.

*Presenter 2:* Jerzy Banski, Maria Curie-Skłodowska University, presented “Modern day demographic processes in Central Europe and their potential interactions with climate change.”

Citing low fertility and the ageing population structure of Central Europe, Banski predicted a large influx of migration from the regions most affected by climate change (Africa/Asia) would significantly alter the demographic structure of the region.

In Q&A this hypothesis was challenged, citing reports indicating that any climate migrations are likely to be internal and short-term rather than permanent, international mass migrations. This is partially a result of the lack of resources possessed by those most adversely affected by climate change to migrate internationally. Additionally, questions arose about migrations to Central Europe in particular suggesting that any migrations are likely to follow existing patterns to the traditional migrant-receiving countries. Other comments allude to the importance of public perception and policy in shaping future migration patterns in Central Europe.

The presenter also emphasized the increasingly important role Central Europe will play in tackling global food insecurity as warming prolongs the growing season for this area.

## Session 4: How are population dynamics affected by climate change?

*Presenter 1:* Lori Hunter, University of Colorado at Boulder, presented “Migration & Environment: Evidence and Innovation from Rural South Africa”.

The presentation included a brief review of the literature and some preliminary results from a study investigating the association between proximate natural capital and temporary and permanent out-migration. The study, in collaboration with Wits School of Public Health, pertains to 24 villages and 14,000 households in Agincourt, a rural sector in NE South Africa.

Previous studies have shown that environmentally-induced migration tends to be internal while international migration is associated with greater natural capital. The literature has also emphasized the role of social capital and differential vulnerability both across and within households, but little work has been done at the intersection of natural capital, vulnerability and migration in rural livelihoods.

Preliminary results from the study indicate that scale matters when exploring the association between out-migration and proximity to natural capital. Using NDVI to calculate natural resource availability and household data to determine migration trends, the study examined global, village and sub-village trends. On a global scale there was a positive association between proximate natural capital and temporary outmigration; however, further investigation on village and sub-village scale indicated that these global trends masked localized realities where resource scarcity may constrain migration. For instance, negative associations were found for villages near roads linking to more urban areas.

*Presenter 2:* Zhongwei Zhao, ADSRI, presented “Towards a better understanding of daily mortality changes and climate change”.

Many studies have examined longer term mortality patterns, but almost no work outside of epidemiology has examined daily mortality as it relates to environmental factors such as air quality and temperature. Using data from Taiwan, the study demonstrated that daily mortality is highly correlated with temperature, exhibiting a positive relationship in summer and negative relationship in winter. The data, taken over 37 years, also produced nearly 10,000 monotonic runs of mortalities. One interpretation of these findings is the occurrence of a “harvesting effect” whereby deaths of frail individuals are brought forward. The study seeks to produce a better model of predicting daily mortality change.

## **Session 5: How do population dynamics influence the human and ecological impacts of climate change and options for adaptation?**

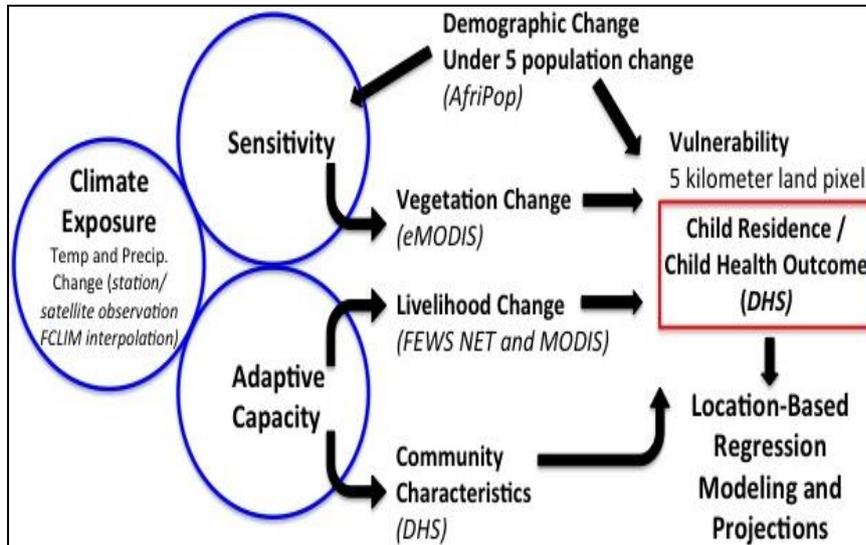
*Presenter 1:* Alisson Barbieri, Universidade Federal de Minas Gerais, presented “Population Transitions and Climate Change: A multidimensional index of population vulnerability in Brazil”.

The presentation relates to an effort to create a macro-level, multidimensional vulnerability index of scenarios for micro-regions in Minas Gerais, Brazil based on the Alkire & Foster methodology, looking at the individual impacts on four key dimensions: economy, demography, health and institutions. The results indicate that health and economic indicators will be the most impacted dimensions given the unfolding demographic, epidemiological and urban transitions in Brazil. Health will be heavily impacted by the surge in dengue and contagious and infectious diseases, which are likely exacerbated by Brazil’s incomplete epidemiological transition. The impact on demographic indicators was found to be relatively less important, but feedbacks between such indicators and climate change remain to be examined.

**Presenter 2:** David Lopez-Carr, University of California at Santa Barbara, presented “Mapping population vulnerability and climate change in Africa”.

The presentation demonstrated the results of a study investigating child health vulnerability to climatic, vegetation, and demographic change in East Africa using the conceptual diagram below.

**Figure 3: Mapping population vulnerability and climate change in Africa, Lopez-Carr et al. 2012**



The process involved mapped areas of significant drying over the last thirty years for the exposure component then examining areas of population density and vegetation changes (via NDVI) as sensitivity. The resulting map shows areas of overlapping drying and population increases stretching across Sub-Saharan as well as south-eastern areas of Africa. The same mapping was then done for increases in the under-five population. Future efforts will involve the integration of DHS surveys (as was done in Mali) to provide more detailed approximations of vulnerable children.

In Q&A there was a discussion of drying’s impacts on health. Results from Mali suggest effects of drying are not all negative; while drying may cause more stunting, it also contributes to drops in anaemia as people are forced to get a higher proportion of their calories from red meat. Another critique pertained to the sensitivity component as it fails to account for other demographic dynamics such as urbanization or education.

Further discussion addressed the lack of a policy implication for vulnerability mapping in general, suggesting “malleability mapping” as a more useful exercise.

**Presenter 3:** Akindeji Falaki, University of Ilorin, presented “Demographic determinants of rural farmers’ perceptions and adaptive capacity to climate change in North Central Nigeria.”

Presenting the results of a study on the demographic factors that influence perceptions of climate change, the study examined how people perceived the changing weather patterns and how these perceptions translated into adaptation. When measuring perceptions, results indicated that people were more likely to attribute the impacts of climate change to evil spirits rather than industrialization. The study found that female-headed households in the subject region of Nigeria

were most able to perceive and adapt to climate change, likely due to the traditional division of labour whereby women's work is most affected by climate variability.

Questions arose on whether perceptions actually translate into adaptive capacity and whether it matters what people believe causes climate change. The presenter argued for the importance of informing people about the causes climate change as an ethical duty given that knowledge may affect their adaptation strategy.

\*Another comment advocated for the distinction to be made between climate change and current climate variability in the discourse. Both are important, but not the same and suggest different strategies given temporal differences.

## **Session 6: Studying adaptive responses - data, concepts and methodological issues**

*Presenter 1* – Subramaniam Chandrasekhar, Indira Gandhi Institute of Development Research, presented “Population at Risk of Climate Change Induced Events and Forced Migration: Policy Disconnect, Data Disconnect and Knowledge Gaps in India.”

This presentation addressed the disconnect between policy and realities in India. The presenter stressed the importance of improved methodology in order to examine how a new policy which seeks to move infrastructure funds away from the areas most affected by climate variability will impact economic and demographic processes. One solution proposed by the presenter was to include “natural calamities” as a response for migration motive in the census. In Q&A, this solution was challenged as the response was, in fact, earlier removed from the census due to too few people reporting it as a motive for migration. Land tenure, kinship and social networks were cited as more probable motives for migration than natural calamities or investment patterns.

The presentation then shifted to results from a nationally-representative survey on differences in migration patterns between rural and urban populations demonstrating slightly more movement in urban populations. The presenter also cautioned that drastic increases in commuter traffic coupled growth of villages and other indicators could signify “exclusionary urbanization”.

*Presenter 2* – Susana Adamo, Columbia University, presented “Conclusions from a session & notes on data issues”.

Presenting conclusions from the ICSU's session on population dynamics and human well-being, Adamo stressed the importance of sharing immigration across disciplines and among the many actors involved in the climate change arena – scientists, policymakers, communicators and practitioners. However, doing so brings about new challenges to integrating data that differ on temporal and spatial scales as well as different levels of analyses. Such challenges have complicated the process of creating universal datasets. Integrating socioeconomic data with environmental data is particularly complex when geo-referencing is involved. There are many standardization issues, particularly for migration data, and the presenter listed recommendations for migration surveys.

Comments in Q&A pointed the presenter to “Geoshare”, which could present a new outlet for integrating demographic data with pre-existing environmental data.

*Presenter 3* – Kim Streatfield, ICDDR, presented on adaptive responses to climate variability in Bangladesh.

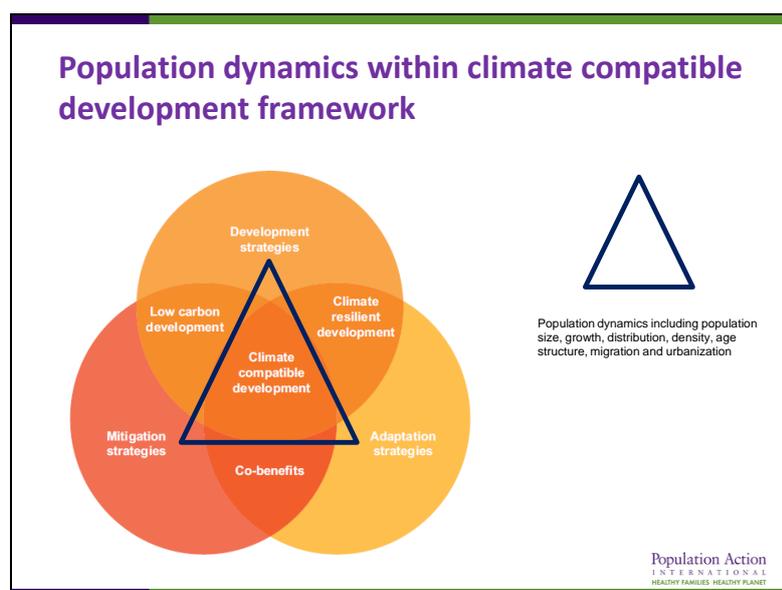
The presentation began with an overview of trends in climate variability in Bangladesh and its unique demographic situation, distinguished by its exceptionally high population density (1,001/sq.km). Trends include shorter, heavier monsoon periods, more frequent flooding, more devastating flood impacts and increased transmission of vector borne diseases. Data quality is also an issue – less than 1% of estimated malaria deaths were reported in an area where 26 million people (and growing) are at risk. Additionally, sea level rise has caused greater variability in water levels and caused rising salinity which damages crops and impacts on health. More frequent droughts have also negatively impacted food production but are likely more a result of geopolitical decisions by India and China than climate variability. Political corruption has also contributed to the misuse of funds allocated to mitigation/adaptation strategies.

## Session 7: How should population dynamics be incorporated into public policy responses to climate change across different scales and administrative levels?

*Presenter 1:* Clive Muntunga, Population Action International, presented “Population Dynamics and Climate Compatible Development in Africa.”

Using the framework illustrated below, this presentation advocated for the need to more comprehensively streamline population initiatives (such as family planning and reproductive health) into adaptation strategies.

Figure 4: Population Dynamics within Climate Compatible Development Framework, Mutunga et al. 2012 adapted from Mitchell and Maxwell 2010



Population growth in coastal urban areas susceptible to flooding and storm surges as well as water stress and agricultural production declines in areas with high population growth rates will pose serious challenges for resilience. Though policymakers are aware of the issues, there is limited evidence of attempts to integrate population, climate change and environmental issues at policy and program levels.

*Presenter 2* – Brian O’Neill, NCAR, presented “The effect of education on challenges to climate change mitigation and adaptation.”

This presentation explores the disparate role of education in terms of emissions and adaptive capacity. Education can lower emissions by producing fertility decreases resulting in population decline. However, education affects labour productivity and consumption behaviours that may increase emissions. Given the education-demographic projections conducted by IIASA, education will increase emissions in the medium term but decrease emissions in the long term as the decrease in population growth becomes relatively more important than productivity and consumption impacts.

On the other hand, education is projected to increase adaptive capacity across all temporal scales as measured by the Human Development Index, which the presenter indicated as the least flawed of the aggregate indices available. While the results are largely positive, uncertainty of education’s effect on economic growth and innovation provide more room for investigation.

The Q&A session provoked questions on the strength of the causality between education and consumption behaviours and reiterated that preferences influence consumption but do not necessarily dictate it. The presenter clarified the role of the models as idealised assumptions should everything go right, but assumptions that are grounded in current trends that are projected forward.

*Presenter 3* – Wolfgang Lutz, IIASA, presented “Effects of educational attainment on climate risk vulnerability.”

This presentation focused on education’s effect on disaster preparedness and adaptation through: empowerment and better access to information, enhancement of cognitive skills, improvement of health and physical well-being and higher income. Evidence cited shows decreasing mortalities from natural disasters in Cuba as education levels improved in the 1970s while Haiti and Dominican Republic, which are exposed to the same trajectory of hurricanes, continue to suffer high disaster mortality. These developments are being considered in scenarios which project education-specific disaster vulnerability.

## **Sessions 8 & 9: What are the emerging research priorities for demographers and population experts?**

### *Discussion of future activities for the IUSSP Panel on Climate Change & Wrap-up*

Lori Hunter geared the discussion with ideas developed throughout the seminar.

The discussion focused on the role of the SSP's. There was some misconception about the nature of what they are meant to achieve, but the author's clarified their role as providing just enough information to be valuable and malleable to users. It was determined that future opportunities include extending, evaluating and using the SSP's as an assessment tool. Another application could be using the framework to explain projections from one SSP to another.

The role of demography in climate change was reasserted with Wolfgang's comment that demographer's have a "monopoly on modelling with respect to stable human characteristics". Demography is also critical to understanding differential vulnerability. There was also a call to re-focus efforts on individual agents rather than trends that look at institutions, arguing that the individuals themselves drive these institutions.

### *Moving Forward*

Wolfgang will be arranging the next meeting in Thailand in February and is looking for suggestions of presenters to invite. There was discussion of other relevant groups/conferences that would benefit from the input of demographers and an open call to participate in PERN.

Peter also announced that there will be a panel page for the group on the IUSSP website.

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## Annex 2: Notes from Brainstorming Session