Population Dynamics and Climate Change



INTRODUCTION

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In collaboration with Population Action International

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Introduction

Population matters to climate change. In an effort to elucidate the ways in which population dynamics (growth, composition and distribution) interact with climate change and impact the well-being of people and the planet, in 2009 the United Nations Population Fund (UNFPA) brought together leading analysts to centralize some initial thinking and practical approaches to addressing these dynamics. The resultant compilation, *Population Dynamics and Climate Change*, examines these relationships and vulnerabilities from the perspective of climate change mitigation and adaptation in various key elements. These elements include: why and how population and climate change interact; the specificity of impacts in urban settings; vulnerabilities for different populations such as children, women, the elderly and the poor; and programmatic interventions including research, policies, programs, and advocacy.

These analyses have led to several key conclusions. First, population size and growth matter for emissions projections over the long term, though the magnitude of the effect is at times difficult to estimate. Recent modeling efforts have incorporated population size, composition and distribution together with variations in consumption and production and affirm that slowing population growth will lead to a decline in long-term emissions.¹ This decline will ultimately depend not on just the total of number of people, but also on age structure, household composition and spatial distribution.

Furthermore, pursuing a rights-based approach to reproductive health and decreasing fertility helps increase adaptation. Family planning programs may also mitigate climate change in the long run, but it is important that governments not be given financial incentives to achieve reductions in their countries' population growth, given the risk of a return to the oppressive population targets and controls that several countries adopted in the past. Therefore, funding mechanisms for reproductive health should not be coupled directly to emissions targets, though coupling them to adaptation is both appropriate and essential.

Finally, there are many components of the link between population dynamics and climate change beyond population size and growth. Health and well-being, gender inequality, migration and displacement and urbanization all link population dynamics with climate change and need to be incorporated in planning and implementing global and country-level responses. These issues are particularly relevant in the development of adaptation plans, including in assessing the costs of adaptation. Yet they also impact mitigation, from how households use energy to efficiencies from urban versus rural living. This manual, the result of a collaboration between UNFPA and Population Action International, builds on UNFPA's continuing work in this arena, and provides a comprehensive introduction to these topics in the form of training materials. The target audiences are policymakers, practitioners and advocates who are seeking a practical, hands-on understanding of the ways that population and climate change interact so that they can apply that understanding to their work in meaningful ways.

The information will be presented across a series of training modules, and guidelines for trainers, and cross referenced and supported by the United Nations' training platform, UN CC:Learn.

This manual serves as an introduction to the key concepts and background material required for an understanding of how population and climate change interact. It includes three parts.

Part 1 introduces training participants to **climate change and development connections** by examining the causes of climate change, the impacts of climate change, and the policy frameworks to address climate change,

Part 2 examines how population dynamics relate to overall development efforts. It

introduces key population concepts and trends such as fertility, population projections, urbanization, migration and age structure. It examines the development of population policies and frameworks including reproductive health rights, voluntary family planning, the United Nations Conference on Environment and Development, the International Conference on Population and Development and the Millennium Development Goals.

Part 3 links **population and climate change** in the context of how growth, urbanization, population aging and household size affect the growth of greenhouse gases emissions. Population and climate change adaptation is examined through various demographic lenses, including population growth, urbanization and disaster risk, migration, aging, fertility and reproductive health.

Part 4 encourages readers to consider the ways in which the interactions of **population dynamics and climate change can be better integrated** in international and national policy dialogues. It also highlights opportunities to strengthen climate change and development planning and programs through the inclusion of population data and analysis of populationclimate relationships.

Climate Change and Development

"Climate change" means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

- United Nations Framework Convention on Climate Change²

The planet is warming: over the course of the 20th century, the average surface temperature of the Earth increased 0.74 degrees Celsius.³ While this change may seem small, even this modest increase in temperature has affected weather patterns in ways that have dramatic consequences for society. With the potential for temperatures to rise as much as 6.4 degrees Celsius by 2100, these consequences could grow significantly.

Causes of Climate Change

As determined by the Intergovernmental Panel on Climate Change, an international body of scientists, the observed increase in temperature is most likely due to human activities that have increased the concentration of carbon dioxide and other gases in the upper atmosphere, contributing to a strengthened "greenhouse effect" that prevents heat from radiating into space. Carbon dioxide (CO_2) , the most abundant greenhouse gas, comes from the burning of coal, oil, and other fossil fuels, as well as the destruction of forests. Methane, a by-product of raising livestock and growing rice, is also a greenhouse gas (see Table 1).

Future climate change will depend in large part on how quickly greenhouse gases

Greenhouse gas	Generated by
Carbon dioxide	Fossil-fuel combustion, land-clearing for agriculture, cement production
Methane	Livestock production, extraction of fossil fuels, rice cultivation, landfills, sewage
Nitrous oxide	Industrial processes, fertilizer use
Fluorinated gases • Hydrofluorocarbons • Perfluorocarbons • Sulphur hexafluoride	Leakage from refrigerators, aerosols, air conditioners Aluminum production, semiconductor industry Electrical insulation, magnesium smelting

Table 1.1: Greenhouse Gases

Source: State of World Population 2009, UNFPA



Source: Solomon, S et. al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK and New York, NY: Cambridge University Press. Page 115.

continue to accumulate in the atmosphere. This accumulation will be determined by how much is emitted, as well as on how much is absorbed by carbon "sinks" such as the oceans and forests.

Impacts of Climate Change

As the atmosphere warms, weather patterns shift in ways that affect human health and safety. Heat waves, drought, severe storms, floods, glacial melt, changing ecosystems, and sea level rise are among the impacts that are already being observed in many parts of the world. These changes affect agricultural productivity, economic activity, human health, and livelihood strategies, and contribute to people's decisions to migrate from one place to another. Examples of climate change impacts for each region of the world are outlined in Table 1.2. People's vulnerability and capacity to adapt to these changes differs widely between and within populations, and is linked to economic, political, geographic, cultural, and other factors. The impacts of climate change are already being felt by vulnerable populations around the world, and have the potential to erode the recent development gains and threaten progress toward the Millennium Development Goals.⁴

Policy Frameworks to Address Climate Change

194 countries are Parties to the United Nations Framework Convention in Climate Change (UNFCCC), an international agreement that seeks to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. Each

Table 1.2: Projected climate change impacts for different regions				
Africa	 By 2020, between 75 and 250 million of people are projected to be exposed to increased water stress due to climate change. 			
	 By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50%. Agricultural production, including access to food, in many African countries is projected to be severely compromised. This would further adversely affect food security and exacerbate malnutrition. 			
	 Towards the end of the 21st century, projected sea level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5 to 10% of Gross Domestic Product (GDP). 			
	 By 2080, an increase of 5 to 8% of arid and semi-arid land in Africa is projected under a range of climate scenarios (TS). 			
Asia	• By the 2050s, freshwater availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease.			
	 Coastal areas, especially heavily populated megadelta regions in South, East and South-East Asia, will be at greatest risk due to increased flooding from the sea and, in some megadeltas, flooding from the rivers. 			
	 Climate change is projected to compound the pressures on natural resources and the environment associated with rapid urbanisation, industrialisation and economic development. 			
	 Endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts are expected to rise in East, South and South-East Asia due to projected changes in the hydrological cycle. 			
Australia and New Zealand	 By 2020, significant loss of biodiversity is projected to occur in some ecologically rich sites, including the Great Barrier Reef and Queensland Wet Tropics. 			
	 By 2030, water security problems are projected to intensify in southern and eastern Australia and, in New Zealand, in Northland and some eastern regions. 			
	 By 2030, production from agriculture and forestry is projected to decline over much of southern and eastern Australia, and over parts of eastern New Zealand, due to increased drought and fire. However, in New Zealand, initial benefits are projected in some other regions. 			
	 By 2050, ongoing coastal development and population growth in some areas of Australia and New Zealand are projected to exacerbate risks from sea level rise and increases in the severity and frequency of storms and coastal flooding. 			
Europe	 Climate change is expected to magnify regional differences in Europe's natural resources and assets. Negative impacts will include increased risk of inland flash floods and more frequent coastal flooding and increased erosion (due to storminess and sea level rise). 			
	 Mountainous areas will face glacier retreat, reduced snow cover and winter tourism, and extensive species losses (in some areas up to 60% under high emissions scenarios by 2080). 			
	 In southern Europe, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability, and to reduce water availability, hydropower potential, summer tourism and, in general, crop productivity. 			
	 Climate change is also projected to increase the health risks due to heat waves and the frequency of wildfires. 			

Note: Unless stated explicitly, all entries are from Working Group II SPM text, and are either very high confidence or high confidence statements, reflecting different sectors (agriculture, ecosystems, water, coasts, health, industry and settlements). The Working Group II SPM refers to the source of the statements, timelines and temperatures. The magnitude and timing of impacts that will ultimately be realised will vary with the amount and rate of climate change, emissions scenarios, development pathways and adaptation.

Table 1.2: P	rojected climate change impacts for different regions (continued)
Latin America	 By mid-century, increases in temperature and associated decreases in soil water are projected to lead to gradual replacement of tropical forest by savanna in eastern Amazonia. Semi-arid vegetation will tend to be replaced by arid-land vegetation.
	 There is a risk of significant biodiversity loss through species extinction in many areas of tropical Latin America.
	 Productivity of some important crops is projected to decrease and livestock productivity to decline, with adverse consequences for food security. In temperate zones, soybean yields are projected to increase. Overall, the number of people at risk of hunger is projected to increase (TS; medium confidence).
	 Changes in precipitation patterns and the disappearance of glaciers are projected to significantly affect water availability for human consumption, agriculture and energy generation.
North America	 Warming in western mountains is projected to cause decreased snowpack, more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources.
	 In the early decades of the century, moderate climate change is projected to increase aggregate yields of rain-fed agriculture by 5 to 20%, but with important variability among regions. Major challenges are projected for crops that are near the warm end of their suitable range or which depend on highly utilised water resources.
	 Cities that currently experience heat waves are expected to be further challenged by an increased number, intensity and duration of heat waves during the course of the century, with potential for adverse health impacts.
	 Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution.
Polar Regions	 The main projected biophysical effects are reductions in thickness and extent of glaciers, ice sheets and sea ice, and changes in natural ecosystems with detrimental effects on many organisms including migratory birds, mammals and higher predators.
	 For human communities in the Arctic, impacts, particularly those resulting from changing snow and ice conditions, are projected to be mixed.
	 Detrimental impacts would include those on infrastructure and traditional indigenous ways of life.
	 In both polar regions, specific ecosystems and habitats are projected to be vulnerable, as climatic barriers to species invasions are lowered.
Small Islands	 Sea level rise is expected to exacerbate inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities.
	 Deterioration in coastal conditions, for example through erosion of beaches and coral bleaching, is expected to affect local resources.
	 By mid-century, climate change is expected to reduce water resources in many small islands, e.g. in the Caribbean and Pacific, to the point where they become insufficient to meet demand during low-rainfall periods.
	 With higher temperatures, increased invasion by non-native species is expected to occur, particularly on mid- and high-latitude islands.

Source: IPCC's Fourth Assessment Report, Summary for Policymakers, p 11-12: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

year, governments gather for a Conference of the Parties (COP) to further negotiate the details of the Convention and its Kyoto Protocol, a legally binding international agreement that came into force in 2004 and sets targets for greenhouse gas emissions reduction targets for industrialized countries. Recent negotiations have been focused on crafting a new global agreement focused around goals and commitments for mitigation, adaptation, forest protection, climate change finance, capacity building, and technology development and transfer.

Under the Convention, all Parties are required to implement national programs and measures to control greenhouse gas emissions and to adapt to the impacts of climate change. In 2009, Parties agreed to a Green Climate Fund, established to assist in the allocation of climate change finance to developing countries, which industrialized countries pledged in the amount of \$100 billion by 2020.

The Convention also requires all Parties to promote the development and use of climatefriendly technologies; education and public awareness of climate change and its impacts; sustainable management of forests and other ecosystems that can remove greenhouse gas from the atmosphere, and to cooperate with other Parties in these matters.

Because forests play an important role in absorbing and storing carbon dioxide, efforts to restore, protect, and effectively manage forests have become an important part of national and international policy discussions on climate change. Reducing Emissions from Deforestation and Forest Degradation (REDD) is a mechanism through which developing countries receive financial and technical support for forest protection and management; increasingly, these initiatives are expanding to include broader conservation and sustainable forestry efforts.

Most Least Developed Countries (LDCs) and Small Island Developing States have developed and submitted to the UNFCCC National Adaptation Programmes of Action (NAPAs), action plans that identify a country's most urgent and immediate climate change adaptation needs. NAPAs outline priorities for international funding of adaptation through mechanisms such as the Least Developed Countries Fund of the Global Environment Facility.

With the completion of NAPAs, LDCs and other interested developing countries are now moving toward the development of National Adaptation Plans (NAPs) to address medium and long-term adaptation needs. Many developing countries have also submitted to the UNFCCC plans to limit the growth of their emissions, officially known as Nationally Appropriate Mitigation Actions (NAMAs).

Outside of the Convention context, many governments are in the process of setting national goals and plans for low carbon/low emissions development, a green economy, and climate change adaptation. These plans may be in conjunction with national development and/or poverty reduction strategies and plans, but are often separate processes.

Resources

Intergovernmental Panel on Climate Change, Fourth Assessment Report

http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml The Intergovernmental Panel on Climate Change (IPCC) is an intergovernmental body of scientists established in 1989 with a mandate to prepare regular, comprehensive reviews of 1) the state of the science of climate change, 2) the social and economic impacts of climate change, and 3) possible response strategies. The Fourth Assessment Report was published in 2007 and is available in several lengthy segments on the IPCC's website. The report of Working Group I is "The Physical Science Basis," Working Group II's report is on "Impacts, Adaptation, and Vulnerability," and Working Group III's report is on "Mitigation of Climate Change." A "Synthesis Report," along with a "Summary for Policymakers," is also available on the website. The IPCC's Fifth Assessment Report is scheduled for release in 2014.

Text of the UN Framework Convention on Climate Change and Kyoto Protocol

http://unfccc.int/essential_background/items/2877.php

The text of the original climate change convention, which was signed by 194 countries, establishes the framework for national responsibilities and international cooperation on climate change. The Kyoto Protocol (ratified by 192 countries) further elaborates the convention, and outlines legally binding commitments for industrialized countries to reduce greenhouse gas emissions.

Cooperation and Support through the UN Framework Convention in Climate Change

http://unfccc.int/cooperation_and_support/items/2664.php

In addition to the details of the convention and its Kyoto Protocol, the UNFCCC website hosts a range of information about the convention's finance mechanisms (including the Least Developed Country Fund and the Green Climate Fund), technology provisions, education and outreach initiatives, capacity-building, and more.

National Adaptation Programmes of Action (NAPAs)

http://unfccc.int/cooperation_support/least_developed_countries_portal/submitted_napas/items/4585.php As of September 2011, 46 Least Developed Countries and Small Island Developing States had submitted NAPAs to the UNFCCC. While each country's NAPA differs in format, detail, and length, most provide a summary of current and projected climate change impacts and vulnerabilities, as well as a sector-by-sector review and identification of needs. All NAPAs are available in PDF format on the UNFCCC's website.

UN-REDD Programme

http://www.un-redd.org/

This website, maintained by the UN Environment Programme, the UN Development Programme, and the Food and Agriculture Organization, contains background information, resources, and latest developments on the UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries.

Population and Development

The Millennium Development Goals, particularly the eradication of extreme poverty and hunger, cannot be achieved if questions of population and reproductive health are not squarely addressed. And that means stronger efforts to promote women's rights, and greater investment in education and health, including reproductive health and family planning.

- Kofi Annan, Statement to the Fifth Asian and Pacific Population Conference, December $_{\rm 2002^5}$

Population dynamics, including growth rates, age structure, fertility and mortality, and migration, influence every aspect of human, social and economic development. As is recognized in the 1994 Programme of Action of the International Conference on Population and Development, "Efforts to slow population growth, reduce poverty, achieve economic progress, improve environmental protection and reduce unsustainable consumption and production patterns are mutually reinforcing."⁶ Similarly, UN Secretary Generals Kofi Annan and Ban Ki-Moon have affirmed that fertility reductions are an inherent part of development strategies, helping improve countries' overall wellbeing and the well-being of families and individuals.⁷ Overall, development initiatives that consider population dynamics have a better chance of success.

Population Growth

Population change reflects the interplay of fertility, mortality, and migration. In less developed regions, where fertility levels are high, fertility has the greatest effect on future population size. Future population size is often estimated by population projections (see Box 2.1). Projections are modeled under a variety of different scenarios for fertility (low, medium, high and constant) as well as a couple of mortality and migration scenarios.

In the medium fertility scenario developed by the United Nations Population Division, demographers assume that over time, every country's fertility rate will stabilize close to 2.1 children per woman. The high and low fertility variants are simply 0.5 children per woman above and below, respectively, the medium fertility variant. For many high fertility countries, the assumptions built into these projections would require increases in the use of family planning.

Such projections allow planners and policymakers to approximate changes in population and associated impacts for development planning, including determining infrastructure, schooling, health, workforce, and social security needs.



Population Projections

To project population size at a future date, demographers make assumptions about levels of fertility and mortality and about how many people will move into or out of an area. The net population increase or decrease over the period is added to the "baseline" (beginning) population to project future population. Every two years, the United Nations Population Division releases updated estimates and projections of population for each country and for the world as a whole. Population projections are revised to take into account new information, primarily from country censuses.

Country projections can be viewed at the United Nations Population Division's website at http://esa.un.org/ unpd/wpp/unpp/panel_population.htm

Urbanization

Urbanization has important considerations for development. More than half of the world's population now lives in areas that are considered urban, and most population growth of the next several decades is expected to be concentrated in the cities and towns of the less developed regions.⁸ Urbanization serves as an engine for economic growth and development. As a general rule, cities offer greater opportunities to resolve social and environmental problems than rural areas. Cities generate jobs and income. When effectively managed, cities may deliver education, health care and other services



more efficiently than less densely settled areas simply because of their advantages of scale and proximity. Cities may also present opportunities for social mobilization and women's empowerment. And the density of urban life can relieve pressure on natural habitats and areas of biodiversity. Ultimately, the key determining factor to urbanization's contributions to sustainable development are the ways in which that urban growth is planned and managed.

Spatial Distribution and Migration

Migration is a key component of a country's population makeup. It includes international migration and migration within a country, especially from rural to urban areas. While reliable global and even regional figures are not available for either the current or future population flows triggered by environmental factors, climate change, demographic trends and globalization, all point to increased migration. Such migration will most probably be the result of increased drought that undermines agricultural livelihoods

and reduced food security; rising sea levels that affect coastal deltas and especially low lying island countries which may reduce habitability of these areas; intensification of acute natural hazards such as cyclones and hurricanes which threaten the physical safety of affected populations; and competition over scarce natural resources that may lead to conflict especially where other mediating factors are at play in the same region, including social tensions, extreme poverty, week governance and pre-existing fault lines. Migration trends are likely to have growing significance for policymakers and program managers engaged in disaster risk reduction strategies as well as broader sustainable development initiatives.

Age Structure

One of the key ways that policymakers are able to assess population needs and productivity over time is through the examination of age structure via population pyramids. Population pyramids (see Box 2.2) are the graphic representation of age and gender distribution of a population. Years of high fertility produce a young population age structure, which generates momentum for future growth as these youth begin having their own families. This population momentum assures that the population will continue growing, and carries implications for development over time. Overall, the relative size of the working-age population is the result of a rapid decrease in fertility to produce a high ratio of workers to children and the elderly, and help generate the conditions for a potential demographic dividend. A rapid expansion of the workingage population, which many less developed

countries are experiencing today, often drives economic expansion, migration to new areas, and construction of new homes and supporting infrastructure. In addition, an older population is more vulnerable to health threats brought by environmental changes, including respiratory diseases associated with air pollution and the spread of infectious diseases associated with climate change, deforestation, and water pollution.

Fertility, Reproductive Health and Development

Fertility, the number live births women have, carries important considerations for health. education and income. When women feel assured that they can safely have children, that their children will survive, and that they will be provided for as they get older, they desire fewer children. Fertility declines are also associated with increases in girls' education, expansion of economic opportunities for women, and access to reproductive health and family planning services. Giving women access to family planning can enhance women's educational and employment opportunities and increase their financial contribution to their families and communities.⁹ It would also contribute substantially to women's empowerment, achievement of universal primary schooling, and long-term environmental sustainability.¹⁰ Investing in girls' education and the education of women is one of the most cost effective development interventions.¹¹

More than half of the world's people live in countries with fertility rates above replacement level of about 2 children per couple, ensuring sustained population growth for the long term. Nearly 1 billion

BOX Thailand's Changing Age Structure

The population pyramids below demonstrate how Thailand's age structure has changed over time. As fertility declined, the proportion of the population in older age groups is growing, with implications for housing, education, health care infrastructure, and other social and economic sectors.



Source: United Nations, Department of Economics and Social Affairs, Population Division. 2011. World Population Prospects: The 2010 Revision. New York: United Nations. people, including most of the population of sub-Saharan Africa, live in countries where women have an average of four or more children. High rates of population growth are concentrated in the least developed countries, which also have the least capacity to respond to growing demographic pressures.

Demographers have undertaken various cross-national and program-specific studies to evaluate the impact of voluntary family planning and reproductive health programs and assess the value of further investments. Nearly half of fertility declines achieved across the developing world between 1960 and 1990 can be attributed to family planning programs.¹²

Unmet demand for family planning directly affects fertility and therefore, demographic trends. Around the world, the average number of children born to each woman will make the greatest impact on how populations grow, shrink or stabilize over time. Currently, 215 million women in developing countries would like to prevent or delay future pregnancy, but are not using an effective contraceptive method. Meeting this demand would reduce the number of maternal deaths and unsafe abortions by at least 70 percent, and newborn deaths would decline by nearly half.¹³

Policy Frameworks for Population and Development

The early 1990s marked a dramatic departure from conventional ideas about how governments should try to influence the size and well-being of the societies they govern, and brought an unparalleled consensus on population policy with a strong focus on reproductive rights. This new perspective shifted the emphasis of population policies away from a focus on reducing population numbers to improving human well-being, particularly women. This new perspective forms the basis for the population work being carried out my many international development agencies (see Box 2.4).

In 1992, the **United Nations Conference on Environment and Development** (UNCED) in Rio de Janeiro was an unprecedented global agreement on the need to rethink the concept of economic development in favor of a broader, more holistic approach to development called sustainable development. Sustainable development focuses on the processes by which people satisfy their needs and improve their quality of life in the present, while safeguarding the ability of future generations to meet their own needs. UNCED produced a program of action called Agenda 21 and other global accords on forests, climate change and biodiversity. Principle



вох 2.3

Using Demographic and Health Survey Data

In many developing countries, Demographic and Health Surveys (DHS) are carried out every four to six years, and results are easily accessible on the DHS website. "Ouickstats" (shown below) can provide a snapshot of national averages of fertility, contraceptive use, and unmet need for family planning, among other factors. Summary country reports, also available on the website, will provide further breakdown of this data into regions or districts, rural and urban residence. wealth quartiles, and educational attainment levels.



8 of Agenda 21 recognized the centrality of population to development. It notes that, "To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies."

The real turning point in international discussions on population, however, was the 1994 **International Conference on Population and Development** (ICPD), held in Cairo. ICPD's 20-year Programme of Action, adopted by 179 countries, argues that if needs for family planning and reproductive health care are met, along with other basic health and education services, then population stabilization will occur naturally, not as a matter of coercion or control. Underlying this new emphasis was a belief that enhancing individual health and rights would ultimately lower fertility and slow population growth.

The Millennium Development Goals

(MDGs) were adopted by world leaders in 2000, and provide benchmarks for tackling extreme poverty in its many dimensions. The overall objectives include a range of development goals such as eradicating hunger; improving education; promoting gender equality; reducing child mortality; improving maternal health; combating HIV/AIDS, malaria and other diseases; ensuring environmental sustainability; and implementing policies to ensure global partnerships for equitable development. Each of the objectives has demographic components or implications, particularly around women freely determining the size and spacing of their families, gender equality, and access to voluntary family planning.

BOXInternational Development2.4Agencies and UNFPA

International development agencies, such as the United Nations Development Programme (which oversees the MDGs), have adopted frameworks for approaching development goals. One agency, the United Nations Population Fund (UNFPA), has a particular focus on population. UNFPA promotes the right of every woman, man and child to enjoy a life of health and equal opportunity. It supports countries in using population data for policies and programs to reduce poverty and to ensure that every pregnancy is wanted, every birth is safe, every young person is free of HIV, and every girl and woman is treated with dignity and respect.

UNFPA works on three core areas: reproductive health, gender equality, and population and development strategies. Starting in 2007, UNFPA decentralized its operations to become a more field-centered, efficient and strategic partner to the countries it serves. Toward this end, it established five regional and six sub-regional offices in the field that help coordinate work in about 150 countries, areas and territories through a network of 129 country offices.

More information can be found on UNFPA's website at: http://www.unfpa. org/public/home/about/pid/4628

Resources

Census Data

Links to National Statistical Offices: http://unstats.un.org/unsd/methods/inter-natlinks/sd_natstat.asp UNFPA's Census Portal: http://www.unfpa.org/public/home/sitemap/pid/6734# National censuses typically provide population and housing data at regional, province, district, or county level. Useful indicators include household size, dwelling type, socioeconomic status, and migration/

level. Useful indicators include household size, dwelling type, socioeconomic status, and migration/ emigration. Many National Statistical Offices (NSOs) now feature data online, and users can search by country at the above websites.

World Population Prospects, 2010 Revision

http://esa.un.org/unpd/wpp/index.htm

Country-level population projections and other data are published in *World Population Prospects*, issued by the United Nations Population Division every two years. Data are freely available online or on CD-ROM by request. Official population estimates and projections are provided for the world, 6 major areas, 21 regions and 228 countries, as well as for more developed regions, less developed regions, least developed regions and sub-Saharan Africa. Indicators include total population, fertility, migration and population age structure.

World Urbanization Prospects, 2009 Revision

http://esa.un.org/unpd/wup/index.htm

Every two years the United Nations Population Division releases estimates and projections on the urban and rural populations of all countries in the world and of their major urban agglomerations. A report on trends and a user-friendly data-base is available online.

Demographic Yearbook

http://unstats.un.org/unsd/demographic/products/dyb/dyb2.htm

International demographic data are collected and published by a number of groups or agencies. The *Demographic Yearbook* of the United Nations Statistics Division, produced annually since 1948, provides a wealth of information on population, birth and death rates, life expectancy, city populations, and a variety of census tabulations. The *Demographic Yearbook* also contains valuable technical notes that give definitions and indicators of data quality.

World Population Datasheet

http://www.prb.org/

The annual *World Population Data Sheet*, published by the Population Reference Bureau, contains latest population estimates, projections, and other key indicators for 200 countries.

Millennium Development Goals Progress

http://www.undp.org/mdg/basics.shtml#

The United Nations Development Programme tracks global and country progress towards the 21 quantifiable targets and 60 indicators that are contained within the Millennium Development Goals.



Linking Population and Climate Change

Population matters for climate change. Incorporating population dynamics into research, policymaking and advocacy around climate change is critical for understanding the trajectory of global greenhouse gas emissions and developing and implementing adaptation plans, and thus to global and national efforts to curtail this threat.

- Introduction to Population Dynamics and Climate Change¹⁴

Understanding the ways in which population dynamics intersect with the causes and consequences of climate change is critical for designing policies and programs that improve human well-being and address climate change challenges.

Population dynamics and greenhouse gases

Population growth is one of the factors, along with changes in production and consumption patterns, that has driven the growth of greenhouse gases in the atmosphere. The Intergovernmental Panel on Climate Change's Fourth Assessment Report states that "gross domestic product per capita and population growth were the main drivers of the increase in global emissions during the last three decades of the 20th century."¹⁵

However, simplistic assessments of population size and growth cannot provide the full picture in determining how population dynamics relate to the growth of greenhouse gases. It is important to note that climate change has largely been driven by production and consumption patterns of affluent, industrialized countries. Regions with large populations and current high rates of population growth have, in general, low per capita greenhouse gas emissions (see Figure 3.1), so ongoing population growth in those regions contributes relatively little to the growth of greenhouse gas emissions. However, as development proceeds in these regions, per capita energy use will increase. This underlines the importance of swift action for the development and transfer of clean energy technologies so that developing countries can avoid the polluting development pathways that gave rise to the current climate crisis.

In observing the energy use differences between industrialized and developing countries, it becomes clear that where people live and how they live is critical in understanding their access to and use of energy and other resources that contribute to greenhouse gas emissions.

For example, **urbanization** is a trend that is associated with climate change, with cities contributing up to 80% of greenhouse emissions worldwide.¹⁶ In countries that are rapidly urbanizing, the growth of urban



Figure 3.1: Per Capita Greenhouse Gas Emissions and Cumulative Population of Regions

Source: State of World Population 2009, UNFPA

populations could accompany shifts in the labor force toward greater industrial activity, leading to increased greenhouse gas emissions.¹⁷ The shifts in occupational and income trends that accompany urbanization. rather than the process of urbanization itself, are largely responsible for the accompanying growth in greenhouse gas emissions. At the same time, the compactness of cities can be beneficial for mitigation efforts, as higher density can reduce per capita energy use, create economies of scale, contribute to more efficient distribution and use of natural resources. foster more effective access to services, and minimize pressure on surrounding land and ecosystems.¹⁸ Proper and sustainable urban planning that includes attention to land use, form, size and density can serve as an important tool for mitigating greenhouse gas emissions.

Population aging and **household size** are two additional trends that can affect the growth of greenhouse gases. Youth bulges that expand the industrial labor force may contribute to a growth of greenhouse gases; and over time, as a greater proportion of the population retires from the labor force, emissions growth may decrease.¹⁹ And since households are often the basic unit of energy consumption – a household of seven may use roughly the same amount of energy in heating and cooling as a household of two, for example – the changes in household size that accompany aging or other demographic trends are important to watch.

Population and climate change adaptation

The continually changing nature of population dynamics also has important implications for adaptation planning and programming. Rapid urbanization, shifting migration patterns, increasing numbers of youth or elderly persons, high fertility, growing needs for reproductive health



services, and other population-related characteristics can affect the degree of vulnerability experienced by individuals and groups of people, and can help to pinpoint the underlying causes of such vulnerability.

Yet, in many of the current frameworks used for assessing people's vulnerability to climate change, population dynamics are not fully taken into consideration. This gap results in a fundamental misunderstanding of the continuously changing nature of vulnerability, and thus, of the ways to effectively reduce it.²⁰ Incorporating a broad range of population dynamics into climate change policy and adaptation planning also allows for proactive action rather than reactive responses.²¹

POPULATION GROWTH

Much of the conversation about the links between population and climate change vulnerability has focused on population growth. As world population reaches an unprecedented 7 billion now and an expected 9 billion by 2050,²² population size does indeed matter: the scale of consequences and adverse impacts of climate change will ultimately be determined by the numbers of people affected. In addition, rapid population growth also increases pressure on natural resources that are, or will be, affected by climate change. Some parts of the world are already experiencing water shortages and decreasing agricultural output due to the combined pressure of population growth and a changing climate. As demand grows for limited supplies, large numbers of people will experience greater challenges in meeting their basic needs.

But growth itself tells only part of the story. A closer look at the dynamics of population to identify where populations are growing, how people are spatially distributed, in what contexts people are living, and who is most exposed to climate hazards allows for a much deeper understanding of who is most vulnerable to the effects of climate change and why.

URBANIZATION AND DISASTER RISK

Urban growth is one of the most significant demographic trends today. Around the world, more and more people are moving to urban centers: more than half of the world's population currently lives in cities, and nearly all future population growth will be concentrated in urban areas,²³ with the vast majority of this growth in developing countries.²⁴

Depending on issues relating to density, geography, exposure, infrastructure and governance, large urban populations may be particularly vulnerable to climate change impacts. Where rapid and unplanned urban and population growth are happening together, disaster risk is amplified. Particularly in urban areas located in low elevation coastal



Source: State of World Population 2007, UNFPA

zones (LECZs), large numbers of people are highly exposed to potential climate impacts and hazards, increasing challenges for adaptation and disaster risk reduction efforts.

MIGRATION TRENDS AND MOBILITY

The adverse effect of climate change will undoubtedly push many people to migrate. Much of the discussion around climateinduced migration, however, tends to be overly and negatively reactive, inciting anxiety and fear of massive movements of people worldwide. In reality, migration is a dynamic process, one that is influenced by many factors and that can take a variety of patterns, such as short-term, short-distance and circular. Additionally, migration has long been used as a tool of adaptation by people seeking better access to resources, more livelihood opportunities and improved living conditions, all of which are key aspects of reducing vulnerability.²⁵

AGE STRUCTURE

The age structure of any given population directly affects both current and future vulnerabilities and adaptive capacities. Issues often related to an individual's age, such as dependency, health, mobility and socioeconomic status, are also indicators of climate vulnerability, exposure and risk. Many developing countries have disproportionately high numbers of young people; in the world's least developed countries, for instance, young people 14 years old and younger comprise 40% of the total population.²⁶ Population aging is another important demographic trend happening in many nations worldwide, especially in more developed regions, where the percentage of the population 65 years and older is projected to grow from 16% to 26% between 2010 and 2050.27 Both young and elderly people are likely to face increased vulnerability to the adverse effects of climate change due to health and well-being sensitivities as well as to structural changes in welfare systems and social safety nets.²⁸



FERTILITY, REPRODUCTIVE HEALTH AND ADAPTIVE CAPACITY

Beyond the demographic implications, however, the high fertility rates and lack of access to reproductive health care that frequently underlie rapid population growth also hold implications for people's ability to cope with and adapt to climate change.

In many parts of the world, women are disproportionately affected by climate change and face social and cultural disadvantages in surviving and adapting to climate stresses.²⁹ Among the many gender constructions that increase women's vulnerability are their traditional roles as child bearers and family caregivers. **Fertility**, or the average number of children a woman has over her lifetime, remains high in many developing countries and among populations most vulnerable to climate change. High fertility can have negative effects on women's and children's health, reduce prospects for income generation and savings, and limit educational opportunities—all factors that relate to a household's ability to cope with shocks and stresses associated with climate change.

As outlined in Part 2, fertility outcomes are closely associated with girls' education, economic opportunities for women, and access to and use of **reproductive health** care and family planning services. Family planning access and use continues to vary widely between and within populations. Worldwide, 215 million women have an unmet need for family planning, meaning they are sexually active and don't want to become pregnant but are not using any form of contraception. Unmet need for family planning is particularly high in Africa, where one in five married women of childbearing age have an unmet need.³⁰ Ongoing unmet need for family planning results in early childbearing, high fertility and short birth intervals. Such outcomes are directly connected to development outcomes that are critical for adaptive capacity.

Resources

CensusInfo

http://www.censusinfo.net/

A database of population and housing census results, available via CD-ROM or the internet. Provides national and sub-national data, which can be converted into maps, tables and graphs. Time series data can be displayed in animated maps.

Demographic and Health Surveys

http://www.measuredhs.com/

In many developing countries, Demographic and Health Surveys (DHS) are carried out every four to six years, and results are easily accessible on the DHS website. An online database and country reports provide national and subnational data on fertility, contraceptive use, and unmet need for family planning, among other factors.

Eldis Community

http://www.eldis.org/

A knowledge-sharing platform for development policy makers and practitioners. Features resources by topics, including aging populations, gender, disaster risk reduction, migration and poverty, as well as:

Climate Change Adaptation

http://www.eldis.org/go/topics/dossiers/climate-change-adaptation Resources include summaries of current adaptation issues, a database of organizations working on adaption efforts, links to relevant literature, and regional-specific resources.

Climate Change Resource Guide

http://www.eldis.org/go/topics/resource-guides/climate-change Provides resources by sector, including gender, health, and poverty and vulnerability. Also features country-specific climate profiles.

Center for International Earth Science Information Network

http://ciesin.org/

An information and data resource focused on links between people and environment. Features access to extensive data and information collections as well as geospatial mapping tools and applications.

Population Dynamics and Climate Change

http://www.unfpa.org/public/home/publications/pid/4500

And edited volume compiled by UNFPA and the International Institute for Environment and Development in 2009, the papers in this volume provide a substantive and methodological guide to the current state of knowledge on issues such as population growth and size and emissions; population vulnerability and adaptation linked to health, gender disparities and children; migration and urbanization; and the data and analytical needs for the next stages of policy-relevant research.

Opportunities for Integration

It is clear that population dynamics matter for climate change. And yet, population dynamics are not always effectively integrated into climate change policy, planning and programs. The section provides examples of entry points for population dynamics in climate change responses, and tips for strengthening integration.

International and National Policy Dialogues

While population dynamics are not at the forefront of climate change policy discussions within the United Nations Framework Convention on Climate Change (UNFCCC), it is clear that issues of growth, spatial distribution, migration, urbanization, fertility, and reproductive health are central to the mitigation and adaptation goals of the convention. Ongoing debates within the UNFCCC about the goals, strategies, and financial and technical support mechanisms for initiatives such as Nationally Appropriate Mitigations Actions (NAMAs) and National Adaptation Plans (NAPs) can be informed and strengthened through greater incorporation of population dynamics, particularly as these initiatives move toward national policy implementation.

There are many key points of entry for the integration of population dynamics within the Cancun Adaptation Framework (resulting from the December 2010 UNFCCC negotiations in Cancun, Mexico), particularly in the areas of enhanced action on adaptation at the national and sub-national levels. Specifically, the assessments of climate change vulnerability and impacts that are called for within the Cancun Adaptation Framework are directly influenced by such dynamics as population distribution and density, mobility, and age structure; such population links must be taken into account in order for adaptation to be more effectively targeted.

Additionally, because shifts in population dynamics affect climate vulnerability and, thus, adaptation needs, utilizing population data and projections allows for more accurate medium- and long-term adaptation cost assessments and analysis, as called for in National Adaptation Plans. Population is also inherently linked to climate-related migration and displacement; the collection and use of data on population movement is integral to understanding who is likely to move and where, allowing for better coordination and cooperation on national, regional and international climate migration issues. Finally, census and Demographic and Health Survey (DHS) outputs are valuable resources that help strengthen the data, information and knowledge systems necessary for successful adaptation policy. Such information can also contribute to effective planning and programs.

Planning and Programs

If climate change responses are to be effective, successful and sustainable, population dynamics must play a key role in assessment and planning process. As national governments assess future energy needs and sources in the context of low-emissions development strategies and green economic development, the analysis and utilization of demographic data and trends is critical.

Census data provides demographic information that can help to inform **analysis needed for low-emissions development**.

Data on characteristics of the population (age, sex, household composition, etc.) can inform the pattern and level of emissions; and opportunities exist to integrate climate- and energy-use-related questions into census questionnaires. In Latin America, for example, many countries have integrated questions into their latest census rounds on sources of energy for cooking and lighting, waste disposal, access to water and sanitation,³¹ all of which have implications for sustainable development in the context of climate change.

Information about population dynamics can also contribute to **more robust vulnerability** assessments. For example, a comprehensive understanding of where and how people are living in relation to potential climate hazards is essential in targeting and building the adaptive capacities of at-risk populations. Newly developing urban areas, for example, present the opportunity to mainstream adaptation directly into development, thereby proactively planning for the potential effects of climate change and reducing likelihood of exposure and risk. This is especially important in regards to low-income city dwellers, who will need to have access to adequate and appropriately sited land on which to reside.

Vulnerability assessment and adaptation planning should also assess needs and opportunities associated with migration and aging. While it is clear that communities sending and receiving migrants will face many challenges, proactively preparing, planning for and even fostering climate-induced population movements is likely to be much more effective than reactive responses in reducing potential conflict and protecting the wellbeing of all involved. Likewise, locating elderly populations through the use of demographic data will be very important for outreach efforts aimed at building adaptive capacities and resilience of the elderly.

Finally, population dynamics are central to improving and targeting climate-related disaster risk reduction efforts, which share many commonalities with climate change adaptation. Climate risk assessments, which often focus heavily on geographic and other physical elements of risk, are more fully informed when population dynamics and other social aspects are taken into account. Climate risk is a function of vulnerability, exposure and adaptive capacity, assessments of which require incorporating population dynamics and data in order to better understand how and where people live and work in relation to potential climate hazards. Taking into account population forecasts also allows for more proactive and longer-term risk reduction planning and programming. For instance, inclusion of urbanization rates and migration patterns helps to better anticipate changes in population size and structure in areas that are considered high risk, thereby providing a clearer picture of exactly who is likely to be most affected and why, both now and into the future.

Table 4.1: Selected Indicators of Sustainable Development that can be Obtained Using Census Data and/or a Combination of Census Data and Other Sources

Issue covered	Indicator	Census data that can be used to calculate this indicator	Relevance (extracted from the source document)
Sanitation	% of population using an improved sanitation facility	Type of sanitation facilities	Assess sustainable development, especially human health.Accessibility to adequate excreta disposal facilities is fundamental to decreasing the faecal risk and the frequency of associated diseases.
Drinking water	% of population using an improved water source	Access to drinking water	Access to improved water sources is of fundamental signifi cance to lowering the faecal risk and frequency of associated diseases.
Access to energy	Share of households without electricity or other modern energy services. Additional: % of population using solid fuels for cooking	Type of energy for cooking and lighting	Lack of access to modern energy services contributes to poverty and deprivation and limits economic development. Adequate, affordable and reliable energy services are necessary to guarantee sustainable economic and human development. The use of solid fuels in households is a proxy for indoor air pollution, which is associated with increased mortality from pneumonia and other acute lower respiratory diseases among children, as well as to increased mortality from chronic obstructive pulmonary disease and lung cancer (where coal is used) among adults.
Living conditions	% of urban population living in slums	Data on population and type of materials used for roofs, walls and ceilings combined with other sources	This indicator measures the proportion of urban- dwellers living in inadequate housing conditions. It is a key indicator for measuring the adequacy of dwellings for the basic human need for shelter. An increase in this indicator is a sign of deteriorating living conditions in urban areas.
Vulnerability to natural hazards	% of total population living in coastal areas	Data on population combined with other sources, such as elevation maps, etc.	Measures the level of vulnerability in a given country, thus encouraging long-term, sustainable risk reduction programmes to prevent disasters, which are a major threat to national development.
Coastal zone	% of total population living in coastal areas	Data on population combined with other sources, such as elevation maps, etc.	Quantifi es an important driver of coastal ecosystem pressure, and it also quantifi es an important component of vulnerability to sea level rise and other coastal hazards.

Source: Population Dynamics and Climate Change , UNFPA and IIED, 2009

Resources

The United Nations Framework Convention on Climate Change

http://unfece.int/

A wealth of information on past and upcoming negotiations; text of agreements including the original Convention, the Cancun Agreements, guidelines for National Adaptation Plans and Nationally Appropriate Mitigation Actions; and essential background information on climate change science and policy.

State of World Population 2009, Facing a Changing World: Women, Population and Climate

http://www.unfpa.org/swp/2009/

In 2009 UNFPA's annual State of World Population report focused on summarizing evidence on gender, population and climate change relationships, and identifying recommendations for more comprehensive climate change responses. Includes a supplement on youth and climate change.

Adaptation Learning Mechanism

http://www.adaptationlearning.net/

This global, collaborative knowledge sharing platform provides a wealth of information and tools for policymakers and practitioners interested in developing effective adaptation plans and programs. Organized by the Global Environment Facility, UN Development Programme, World Bank, UNFCCC, UN Environment Programme, and the Food and Agriculture Organization.

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