Emerging Population Issues in Eastern Europe and Central Asia

Research Gaps on Demographic Trends, Human Capital and Climate Change

UNFPA

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Acronyms and Abbreviations

AR4	*4th Assessment Report of the Intergovernmental Panel on Climate Change*
CAS	*Intergovernmental Panel on Climate Change geographic region comprised of Central Asia (rectangle framed by 30N, 40E to 50N, 75E latitude/longitude)*
CICRED	*Committee for International Cooperation in National Research in Demography*
EECA	*Eastern Europe and Central Asia*
EJ	*Exajoules ($EJ=10^{18}J$)*
ERA-AGE	*European Research Area in Ageing*
EU	*European Union*
GDP	*Gross Domestic Product*
GtC	*Gigatons Carbon ($GtC=10^{15}g$ Carbon)*
ICPD	*International Conference on Population and Development*
IPCC	*Intergovernmental Panel on Climate Change*
IIASA	*International Institute for Applied Systems Analysis*
IUSSP	*International Union for the Scientific Study of Population*
NEU	*Intergovernmental Panel on Climate Change geographic region comprised of Northern Europe (rectangle framed by 48N, 10W to 75N, 40E latitude/longitude)*
PPP	*Purchasing Power Parity*
PRB	*Population Reference Bureau*
REF	*Second Report on Emissions Scenarios' geographic region comprised of Central and Eastern Europe and the independent states of the former Soviet Union*
SEM	*Intergovernmental Panel on Climate Change geographic region comprised of Southern Europe and Mediterranean (rectangle framed by 30N, 10W to 48N, 40E latitude/longitude)*
SRES	*Second Report on Emissions Scenarios*
TFR	*Total Fertility Rate*
UN	*United Nations*
UNFPA	*United Nations Population Fund*
VID	*Vienna Institute of Demography*

1. Introduction

The countries of Eastern Europe are experiencing a population trend that is unprecedented in human history. To date, populations have never before encountered sustained declines that were not the direct consequence of mortality increases caused by, for example, famines, epidemics and wars, all of which were sometimes also associated with out-migration. The current combination of extremely low birth rates, migration losses and moderate mortality is leading to a combination of rapid population ageing together with population decline in many countries of the region. It is such a new development the international community cannot provide these countries with policy advice or reference to best practices elsewhere, as is the case with many other population-related challenges. The international scientific and policy communities' lack of readily available support and resources is in stark contrast to the high level of concern shared by policy makers and the public at large in the countries in the region. There is a need for urgent attention to these population-related challenges that goes beyond the region itself because:

1. These trends in Eastern Europe are unlikely to be idiosyncratic and short-lived, rather, they point to a development that will likely spread to an increasing number of countries around the world, particularly in East Asia;
2. These sharp changes have a politically and economically destabilizing potential that may go far beyond the region of Eastern Europe and Central Asia (EECA) itself.

It is also important to consider the population trends not in isolation, but in the context of other major social, economic and environmental changes that are expected for the region over the coming decades. This report will focus upon the interactions between the expected climate change for the region and future population trends, including migration, all of which are emerging issues of still unknown dimensions. While each of these issues alone may have far-reaching consequences for the future of the countries in the region, the consequences of climate change may further trigger strong migration flows both within and outside the region.

This report begins with a comprehensive summary of information and current gaps in knowledge regarding likely future trends in population growth and ageing in the region. It will then explore how population-related policies can address these trends and lead to a broader perspective focussed on human capital (population x education x health) rather than only population numbers. Assessments of (a) likely future patterns of climate change and (b) migration in the region, and their possible consequences, will follow. The report concludes with an analysis of the possible interactions of these trends and relevant policy considerations.

2. Demographic Trends

Population projections are often used incorrectly as predictions, i.e. with a high confidence that the actual trend will exactly follow the one projected trajectory that is being presented. But for the countries in Eastern Europe and Central Asia, which in several respects are entering previously uncharted demographic territory, the future trends in fertility, mortality and migration are highly uncertain. We simply do not know, for example, whether fertility rates will recover soon, stay constant or continue to decline.

For countries still in the process of demographic transition, there is the clear expectation that they will continue with this transition at least until reaching replacement level fertility. For countries in the post-transition stage, however, there is no useful theory that would tell us where fertility levels are heading. Previously, the expectation was that all countries would converge to replacement level fertility or a Total Fertility Rate (TFR) of 2.1, implying that countries that were still above replacement would never fall below. The assumption was also reflected in the series of population projections published by the United Nations (UN) Population Division until some years ago, when the point of assumed universal convergence was lowered from 2.1 to 1.85. But currently the great majority of the countries of the EECA region is significantly below this level. In 2006, the six countries with the lowest TFRs in Europe were all in the EECA region (Russia, Belarus, Poland, Slovakia, Moldova and Bosnia and Herzegovina all had a TFR of below 1.3). Except for Central Asia, Turkey and Kosovo, all countries in the region have TFRs below 2.1. Many demographers expect that these very low levels will be a temporary phenomenon and there is likely to be some recovery over the coming years, in part due to the end of the fertility depressing tempo effect and in part due to the positive effect of family related policies in some of the countries. It remains unclear, however, what the longer term fertility levels will be.

There are several ways of communicating this uncertainty about future trends. The traditional way is to present high, medium and low variants that typically are based on alternative fertility assumptions and are said to cover a "plausible range" of future trends. Two of the shortcomings of this traditional approach namely that the user is not told what precisely is meant by "plausible" and that the variants disregard uncertainty in the two other components of change, that is, mortality and migration are overcome by newer methods of probabilistic population projections. The International Institute for Applied Systems Analysis (IIASA) produced such probabilistic projections for major world regions, published in the leading science journal *Nature* in 2008[1]. These projections are based on 1000 independent simulations, which draw

[1] W. Lutz, W. Sanderson, and S. Scherbov (2008). The coming acceleration of global population ageing. Nature 451: 716-719.

the annual fertility, mortality and migration levels from uncertainty distributions defined by expert arguments, and the analysis of past projection errors[2]. Graphs throughout this report show the results of these simulations in terms of fractiles of the uncertainty distribution. The medians (.5 fractile) indicate the levels at which half of the simulated cases are above and half below that level.

Population Size

In the IIASA projections the EECA region is comprised of three sub-regions: "European part of the former Soviet Union," which is dominated by Russia, Ukraine and Belarus but does not include Central Asia; "Eastern Europe" which essentially comprises the formerly Socialist countries of Europe that were not part of the Soviet Union and the region of "Central Asia".

In Eastern Europe and the European part of the former Soviet Union, the overall decline in population size over the coming decades is a near certainty; the only question is how rapidly and by how much the population size will decline. The IIASA projections reveal that the population will shrink steadily throughout the century, although the uncertainty range also increases over time. Figure 1 illustrates how in the European part of the former Soviet Union, the population is expected to essentially fall by half over the course of this century from currently around 230 million to (in terms of the median) to 203 million in 2030, 168 million in 2050, 130 million in 2075 and 108 million in 2100. The 80 per cent uncertainty range is 147-192 million in 2050 and 68-150 million in 2100. Where the future population size will come to lie within these ranges will depend predominantly upon the future level of fertility, but also on those of mortality and migration. Although these future trends of fertility, mortality and migration are assumed to be highly uncertain, much of the future decline is already embedded in the current age structure of the population, a fact that allows population projections to go much further into the future than projections in other areas such as economic development. Only the climate projections that will be discussed further below show a comparable inertia and hence long-term predictability.

[2] W. Lutz and J. Goldstein (Eds.) (2004). How to deal with uncertainty in population forecasting? International Statistical Review [Special Edition] 72(1&2): 157-208. Reprinted as RR-04-009 by the International Institute for Applied Systems Analysis (Laxenburg, Austria).

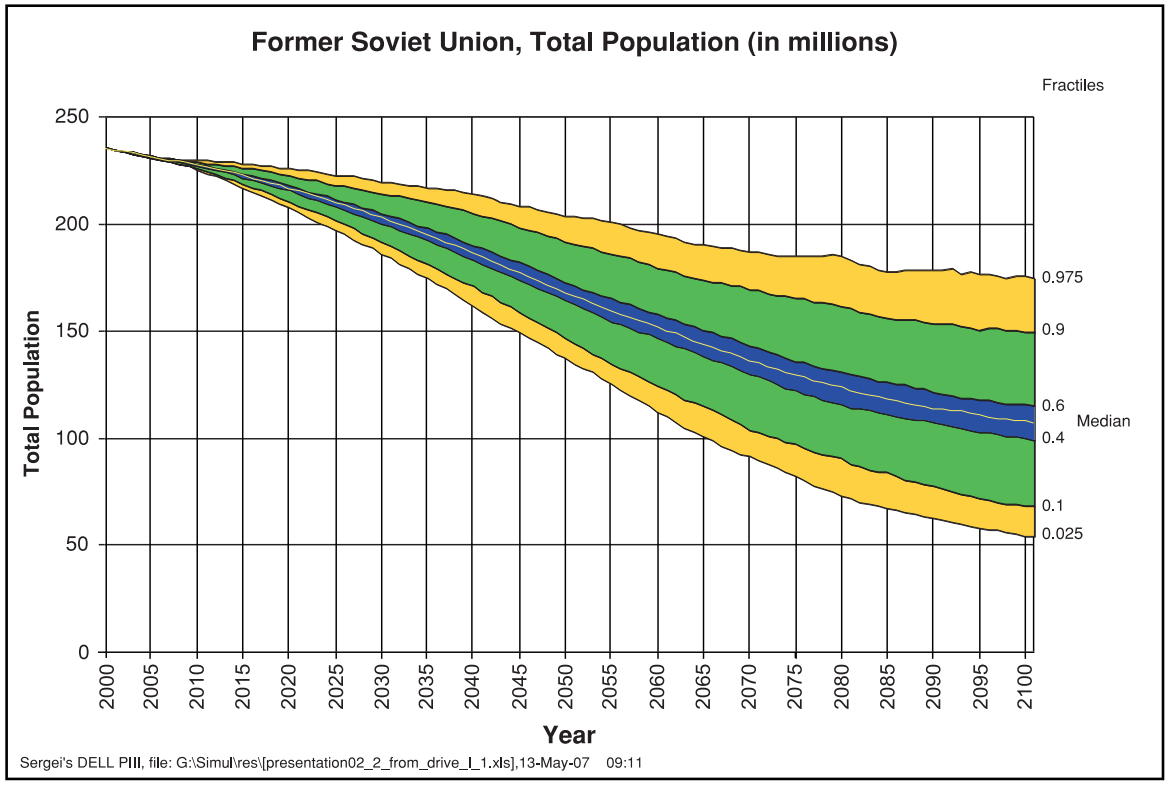

Figure 1: Probabilistic Population Forecasts for the European part of the Former Soviet Union, 2000 to 2100.

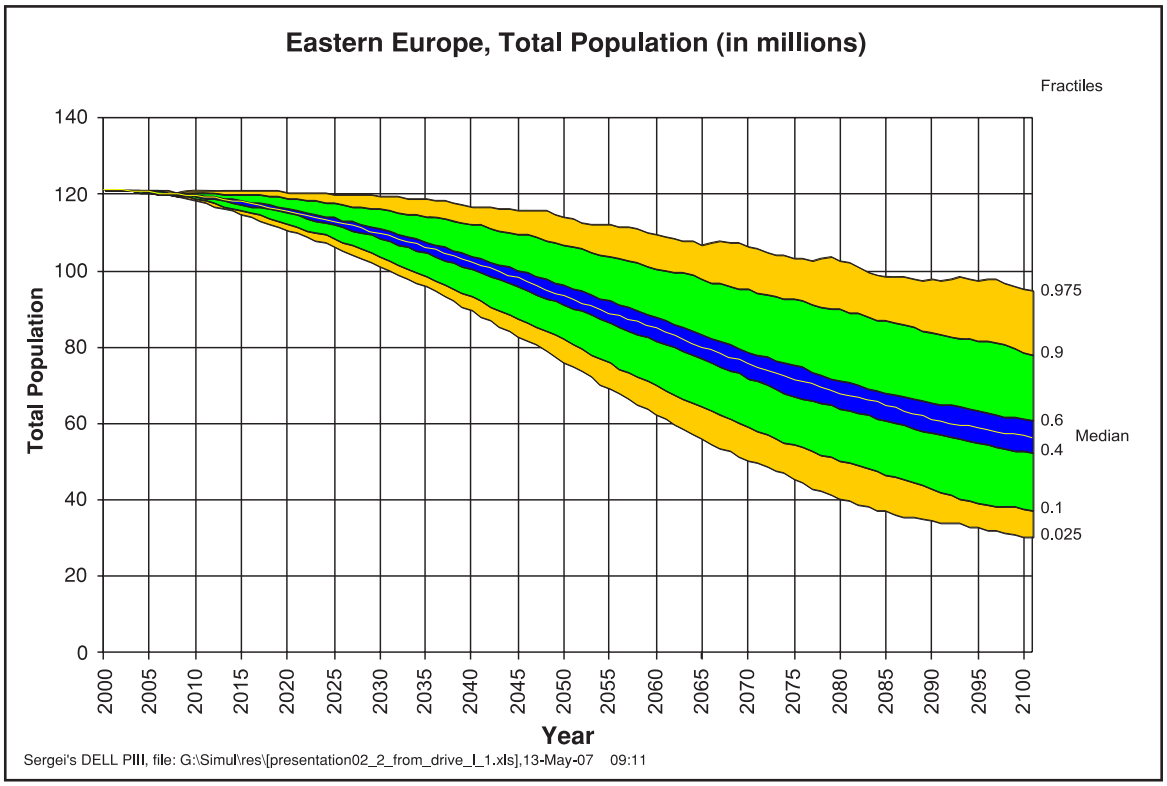

Figure 2: Probabilistic Population Forecasts for Eastern Europe, 2000 to 2100.

Figure 2 shows the probabilistic forecasts for Eastern Europe. Like the case of the former Soviet Union, the population of the region is expected to decline throughout the century. The causes are the same: low fertility, out-migration, and relatively low life expectancies. The median forecast shows the population size of Eastern Europe declining by half over this century, from 120 million today to 94 million in 2050 and 57 million in 2100. The uncertainty range goes roughly from a low population decline of 20 per cent to a high population decline of 80 per cent.

For Central Asia the expected demographic trends are quite different from that of Eastern Europe. This is due to the much younger age structure of the population (a consequence of high fertility in the past) and a currently significantly higher level of fertility. In 2007 the TFR is highest with 3.4 in Tajikistan, followed by 2.9 in Turkmenistan and Kyrgyzstan, 2.7 in Uzbekistan and 2.5 in Kazakhstan[3]. Since these countries are still in the process of demographic transition, fertility is expected to continue to fall, with the open questions being both the speed of decline and the level to which fertility will fall. But, again, a lot of the future population growth is already preprogrammed in the current very young age structure with around a third of the entire population younger than the age of 15. The IIASA projections show for the whole region of Central Asia for the median an increase from currently 63 million to 95 million in 2050, 103 million in 2075 and 101 million in 2100. The population stabilization and small decline at the end of the century is a consequence of the assumption that fertility on average will fall below replacement level. The consideration of a broad range of alternative fertility trends, however, results in a quite significant uncertainty interval with, for example, the 80-per cent range in 2100 translating to population size increase projections between 72 million to 133 million. But there is no doubt that Central Asia's population will continue to grow substantially over the coming decades.

This enormous demographic heterogeneity within the EECA region may also have implications for future migration patterns within the region. If the European part of the region is likely to see its population decline to half and Central Asia will grow by more than 50 per cent, there clearly is a potential for migration pressure, particularly since large segments of the population in Central Asia also speak Russian.

Rapid population decline and all of its possible consequences, ranging from changes in individual health and well-being due to changing socioeconomic structures to changes in the structure of society, regional population redistribution, economic growth and national identity and security, are clearly emerging population issues that require attention and scientific analysis. Since it is such a new phenomenon and so far has only affected a limited number of countries in Eastern Europe, it has not yet received much attention, neither in the international political and intergovernmental community nor in the scientific community. Heads of state from several Eastern European countries and European Commission President Barroso, however, have issued prominent political statements concerning the dangers of this trend including, for example, that population decline is not associated with economic growth.

3 Vienna Institute of Demography and International Institute for Applied Systems Analysis (2008). Asian Population and Human Capital Data Sheet 2008.

While this may have been true empirically in the past, it is also true that fertility has never been voluntarily as low as it is now. Population decline in the past was always a consequence of disasters such as wars, famines or epidemics. In these cases, population decline was also considered a correlate, rather than a cause, of economic decline. The key question in this context now is whether population decline will necessarily lead to declining per capita income, or whether it is possible to experience a happy, healthy and wealthy population decrease which is driven primarily by voluntary long-term below replacement fertility. The recent experience of Eastern Europe, where population decline occurred at the same time as a marked increase in per capita income, requires more attention.

Western Europe has a much longer history of voluntary below replacement fertility. While in many countries in the region this seems to have become a stable phenomenon that has not visibly affected the quality of life of the citizens, in virtually all of these countries net migration gains have more than compensated for the low fertility. Actual population decline has not yet been experienced at the national level. Yet there is already an increasing number of sub-national regions, primarily rural, in Eastern Germany, Italy and Spain where significant population decline has already been experienced. Research on this issue is lagging behind developments, however, as most research on the economic consequences of low fertility focusses on the consequences of population ageing, and not on those of population decline.

New research and science-policy communications initiatives on addressing the consequences of rapid population decline are needed. While Eastern Europe is the first region to massively experience this trend, Japan's population has also started to decline and several other countries in East Asia and Western Europe are expected to follow suit. In the longer run (and sooner if in-migration to Europe significantly diminishes due to the current economic crisis) a large number of countries is expected to follow this trend. In all likelihood an increasing number of governments will view too-low fertility rather than too-high fertility as the main population-related problem of the 21st century. Assessing the likely consequences of population decline, therefore, should be seen not as a specific investment for Eastern Europe but, rather, as an important start for the development of new population policy paradigms.

A new population policy paradigm that integrates population decline should be comprehensive in nature and address the following dimensions: (1) the consequences of decline on economic growth, (2) effects on social cohesion and inter-generational solidarity, (3) the provision of health services, including reproductive health, (4) the potential of compensating for smaller numbers of people through better human capital (see discussion in subsequent section), (5) the role of migration and (6) the implication for national security and national identity.

Population Ageing

Population ageing essentially affects all societies worldwide. Even populations that are still very young on average will experience an acceleration of population ageing in the coming decades. In many countries of Europe this acceleration will be particularly strong due to the ageing of the large cohorts born in the early 1960s (the baby boom generation). While in Eastern Europe this baby boom was less pronounced, the ageing trend is still expected to accelerate.

Very low fertility is the main cause of declines in the populations of Eastern Europe and the former Soviet Union. It seems plausible, therefore, to expect that the proportion of the population that will be below the age of 20 will continue to decline as populations fall. While this is certainly the case for the coming decades, it does not hold true for the longer term future. The median forecast of the proportion of the population below age 20 changes from around 25 per cent to around 15 per cent in 2040 and then stabilizes. The reason for this lies in the fact that fertility is assumed to stabilize at a low level below replacement, and this stable fertility rate will result in a stable age structure even though total population and the absolute number of children below age 20 will decline.

The proportion of the population in Eastern Europe above the age of 60, however, increases rapidly at the beginning of the century and then stabilizes. The stabilization happens in the second half of the century, as can be seen in Figure 3. This, again, is primarily a consequence of the assumption of stabilizing fertility levels together with only moderate long-term increases in life expectancy. Should life expectancy increase more rapidly than assumed in the median trend, then the path would come to lie in upper parts of the uncertainty range and vice versa.

But population ageing and population decline show different temporal dynamics. In the first half of this century, we expect to see rapid changes in both the size and age structures of the population in Eastern Europe and the former Soviet Union and rapid changes in the age structures of those populations. After mid-century, we expect to see continued population decline coupled with a stabilizing age structure. As Figure 3 shows, for Eastern Europe (same regional definition as in section above) the proportion of the population above age 60 has been rather stable at around 18 per cent for the past years, but the median is now expected to increase very rapidly to 29 per cent in 2030 and 42 per cent in 2050. During the second half of the century, the population will be very old but the speed of ageing is expected to be considerably slower. This is due to the assumption that fertility will not decline indefinitely. Depending on how low fertility will fall the region will end up at the lower or higher end of the rather broad uncertainty distribution. If the TFR during the second half of the century is close to 1.0, then the proportion above age 60 will be at the high end (around 60 per cent of the population will be above age 60). If, instead, fertility should recover to a TFR near 2.0, the proportion of the elderly will be significantly lower (around 30 per cent).

But the population proportion of the elderly is also significantly influenced by the future course of old age mortality, which is just as uncertain as future fertility. This is particularly evident for the projected range of the population above the age of 80. For this indicator, the 80 per cent uncertainty

interval for the year 2100 ranges from only 8 per cent of the entire population to an incredible 36 per cent. This huge range is a direct consequence of the scientific controversy about whether we are already close to a maximum life expectancy, or whether life expectancy will continue to increase at the same speed or possibly even accelerate due to new bio-medical technologies. These scientific uncertainties need to be reflected in population projections. The traditional variants approach, where the variants differ only by fertility assumptions and use identical mortality assumptions, cannot appropriately address uncertainties in the future numbers and proportions of the elderly. For this reason, fully probabilistic projections are particularly appropriate for the assessment of future ageing.

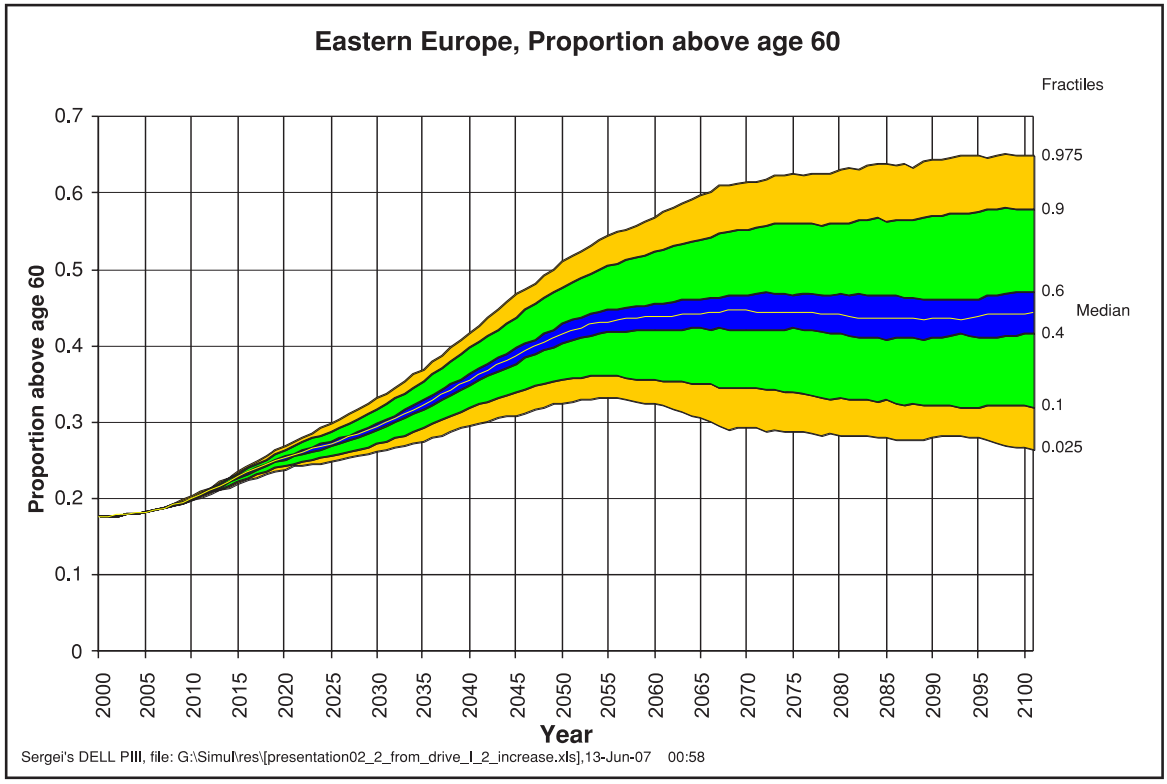

Figure 3: Probabilistic Forecast of the Proportion of the Eastern European Population Age 60 and Above.

For the European part of the former Soviet Union, the picture is very similar to that of Eastern Europe, as described above. The proportion above the age of 60 is currently 18 per cent and expected to increase (in terms of the median) to 40 per cent in 2050, with similar uncertainty intervals as described above for Eastern Europe.

While in terms of population size the trends in Central Asia are diametrically opposed to those in Eastern Europe, population ageing trends run parallel. As Figure 4 indicates, the trend over the coming decades of the proportion of the population above age 60 looks very similar to that of Eastern Europe. But the increase starts at a much lower level. Currently the proportion above 60 in Central Asia is at only 8 per cent. It is expected to increase to around 20 per cent in 2050, i.e. about the same level of Eastern Europe today. Consequently, the process of ageing in Central Asia will continue throughout the second half of the century until the proportion of the population above the age of 60 is expected to reach a level of around one third by the end of the century. Again, the uncertainty trend increases significantly over time.

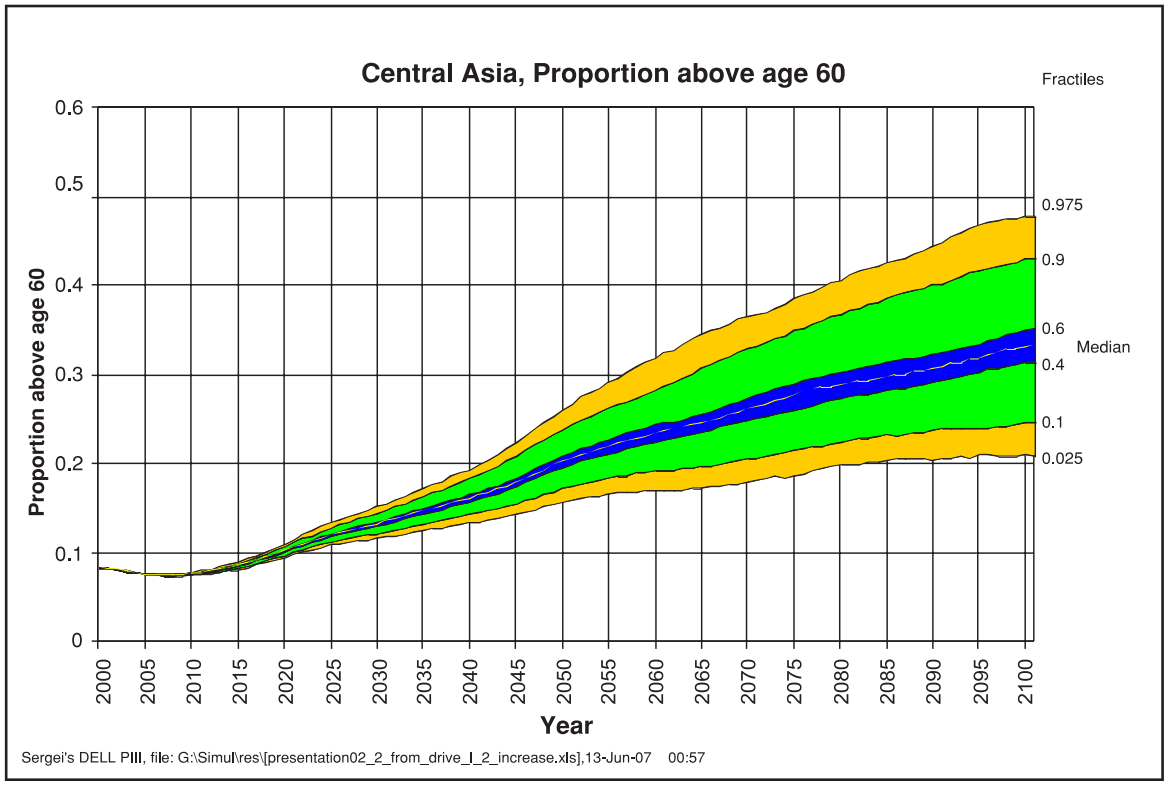

Figure 4: Probabilistic Forecast of the Proportion of the Central Asian Population Age 60 and Above.

Population ageing in the region will be pervasive and is expected to significantly affect many dimensions of society and the economy. In this respect it requires considerable attention in national policy making and all aspects of longer-term planning. But unlike population decline, with respect to ageing, the EECA region is not pioneering the trend but actually lagging behind Western Europe, Japan and North America, a consequence of the rather high level of fertility until the transformation around 1990 and the subsequently still-younger age structure. The map in Figure 5 illustrates this and shows the projected proportion above the age of 65 in 2030 as given by the European Demographic Data Sheet 2006[4].

4 Vienna Institute of Demography and International Institute for Applied Systems Analysis (2006). *European Demographic Data Sheet 2006.*

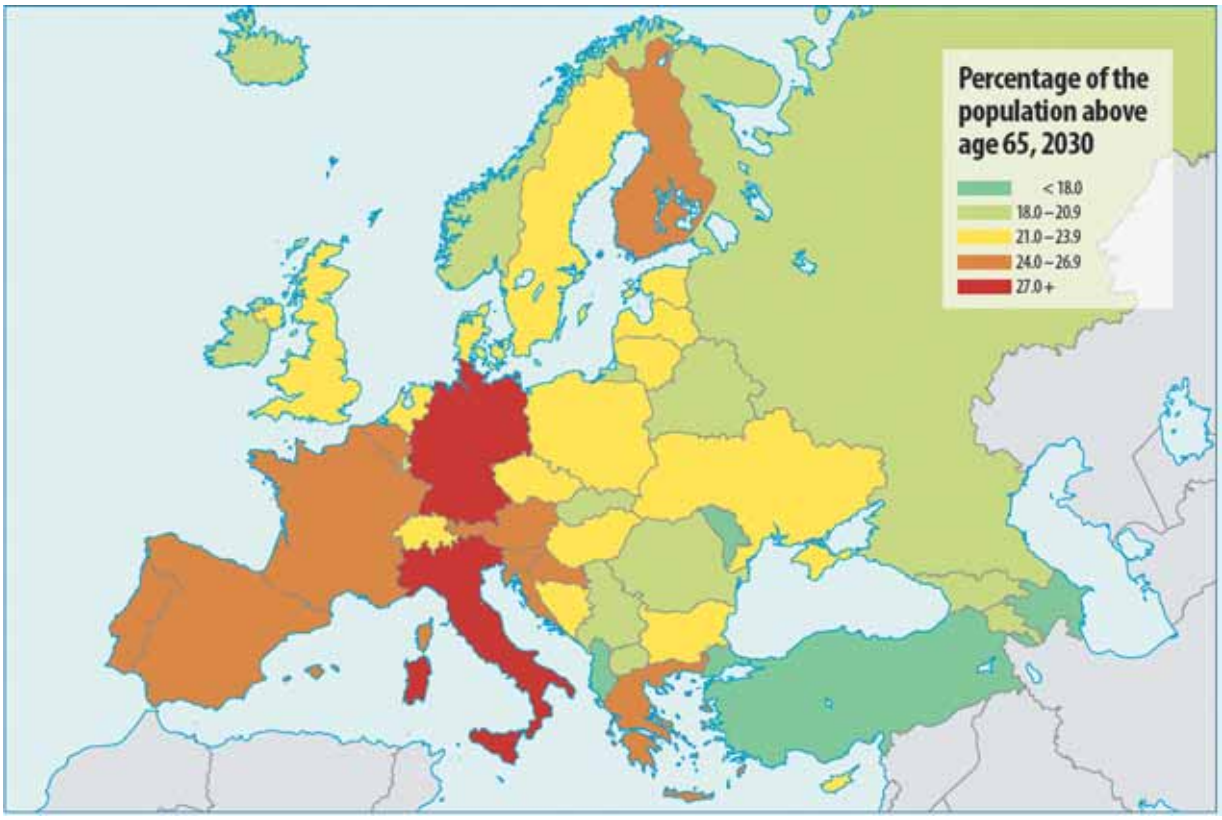

Figure 5: Map of projected proportions of the population above the age of 65 in the countries of Eastern and Western Europe

As a consequence of this delay in the process of ageing as compared to the rest of the industrialized world, policies in the region will be able to benefit from a considerable amount of research on ageing that has already been carried out in the West. This huge body of research ranges from economic consequences of ageing to the broad fields of health, disability and elderly care and questions of intergenerational justice. There are also a lot of ageing-related policies that have been implemented in different countries some time ago that could be tested with respect to their effectiveness under varying conditions. Consequently, a lot has been learned with respect to best practice policies regarding many different aspects of ageing The European Commission has over the past years sponsored several major activities for comparing and assessing different ageing-related research and policies, the most prominent of which is a broad network of activities called the European Research Area in Ageing (ERA-AGE).

With respect to ageing, then, it is advisable to continue the careful study of this existing body of knowledge and experience in the West rather than trying to reinvent the wheel. The main focus of new activities in the region should be on the questions of to what degree the best practices from the West are applicable to the specific national settings, how they need to be adjusted and how. In this respect it is very beneficial to be a late comer. But efforts also need to be made to make the national policy makers aware of the looming challenges associated with accelerating ageing and communicate to them the best solutions found elsewhere.

3. Beyond "Population Stabilization": Human Capital as a Key Dimension in Population Policies

This section will add the dimension of educational attainment and health in the EECA region to demographic change, as the integration of human capital considerations into population policies is an important emerging issue of particular relevance in the context of population decline.

Many governments in Europe report dissatisfaction with the current demographic trends in their countries. The further east one goes, the stronger the publicly expressed concern. While the prime minister of Bulgaria calls his country's "demographic crisis" the number one policy priority, the president of Belarus even speaks of a national "demographic security crisis", implying a requirement for action as drastic as that for a security crisis at the military level.

It is important to try to understand what these policy makers have in mind when they refer to a demographic crisis. The concerns about population decline seems to be very deeply rooted and associated with the fear that the country will lose its population base, and from economic concerns to those of national identity and security. But what should be the goal of government policies in this context? Using terminology analogous to the climate policy discussion, governments will have to choose whether they want to focus on adaptation (taking the demographic trends as given and trying to adjust as well as possible to their inevitable consequences) or a mitigation strategy in which they attempt to influence the demographic trends. In the West, governments refer mostly to adaptation policies, whereas in Eastern Europe mitigation, in particular attempts to directly influence the birth rates, figure prominently.

If fertility is seen as the key policy variable in a mitigation context, what level of fertility should then be seen as the optimal target and goal of such policies? Most demographers might intuitively refer to replacement level fertility (two surviving children per woman) as such a target and, for decades, 'population stabilization' has been the guiding principle and the explicit goal of virtually all population-related policies, both within the UN system and outside. Population stabilization for all countries is likely to please government officials who do not want to see their population either disappearing or exploding in the long run. The problem with this politically attractive concept, however, is that the real world does not seem to follow it: a majority of the world's population already has fertility below replacement level, and in most countries of Eastern Europe the prospect for fertility to increase to replacement level seems unrealistic. In Bulgaria, for example, population stabilization might be interpreted as returning the population to the 9 million mark of the late 1980s, keeping it constant at the current 7.6 million, or stopping it from declining below 7.0 million, although it is projected by Eurostat to decline to around 6 million over the coming decades. None of these seem to be realistic goals, but there is still no obvious appropriate population-related goal for Bulgaria. There is, however, a need for a more useful and more comprehensive new population policy paradigm that in the future might be applicable to a large number of countries including and outside the EECA region, one that, for example, integrates a moderate decline in cohort size with better education of those fewer children as possibly preferable by many criteria that range from per capita welfare to

environmental sustainability. This new paradigm needs to consider people and human wellbeing in a more comprehensive way that includes human capital (education and health) as well as the traditional focus on the number of people by age and sex.

People are the wealth of nations. But it is not only the number of people that counts, it is also the skills, abilities and health status of the people. All these aspects viewed together can be called the human resources base, or human capital in the language of economics. This broadened view of population also implies that political goals should not be defined in terms of population size, but rather, in terms of human capital available for producing the best possible quality of life for all citizens.

This shift in paradigm, from a focus on population size to one that seeks balanced development of the population by age, sex, health, capabilities and skills, is not an easy one because for centuries, population size has been the primary target of national and international population policies. For UNFPA the notion of "population stabilization" is also deeply entrenched in the documents of the series of international population conferences (International Conference on Population and Development) that define the UNFPA's agenda. But two developments since 1994 bear consideration: (1) new scientific studies have demonstrated the overriding importance of education for health and economic growth as well as population size and age structure[5] and (2) an increasing number of countries have experienced significant population decline. While "population stabilization" in its traditional meaning is still a valid goal for higher fertility countries, it requires a further refinement and broadening in order to be meaningful for countries bound to experience further decline. And here Eastern Europe is spearheading the development.

Figures 6 through 9, taken from the new IIASA-Vienna Institute of Demography (VID) global human capital data base, illustrate future trends in human capital. They include back-projections to 1970 and alternative scenarios to 2050 for more than 120 countries[6,7]. So far they only consider the education dimension of human capital, with health status to be added in the future. Figure 6 shows the population pyramid of Ukraine for the year 2000, with age and sex plotted against four categories of educational attainment (no education, some primary, completed junior secondary and completed first level tertiary education). In order to construct this projection, methods of multi-state population dynamics were applied to the empirical data for 2000, taking into account the fact that both fertility and mortality tend to vary greatly with education. Almost without exception, men and women with higher education have higher life expectancies and women with higher education have lower fertility. This new time series of data on human capital by five-year age groups and four educational levels allows researchers to analyze human capital and the returns on investments in education using a new empirical method. Recently, it has been shown that, unlike earlier assessments based on less detailed age-specific information, increases in the educational attainment of the working-age population is a consistently positive and significant determinant of economic growth[5].

5 W. Lutz, J. Crespo Cuaresma and W. Sanderson (2008). The demography of educational attainment and economic growth. Science 319: 1047-1048.

6 W. Lutz, S. KC, H. Khan, S. Scherbov and G. Leeson (2007). *Future Ageing in Southeast Asia: Demographic Trends, Human Capital and Health Status* [IIASA Interim Report IR-07-026].

7 S. KC, B. Barakat, A. Goujon, V. Skirbekk and W. Lutz (2008). *Projections of Populations by Level of Educational Attainment, Age and Sex for 120 Countries for 2005-2050* [IIASA Interim Report IR-08-038].

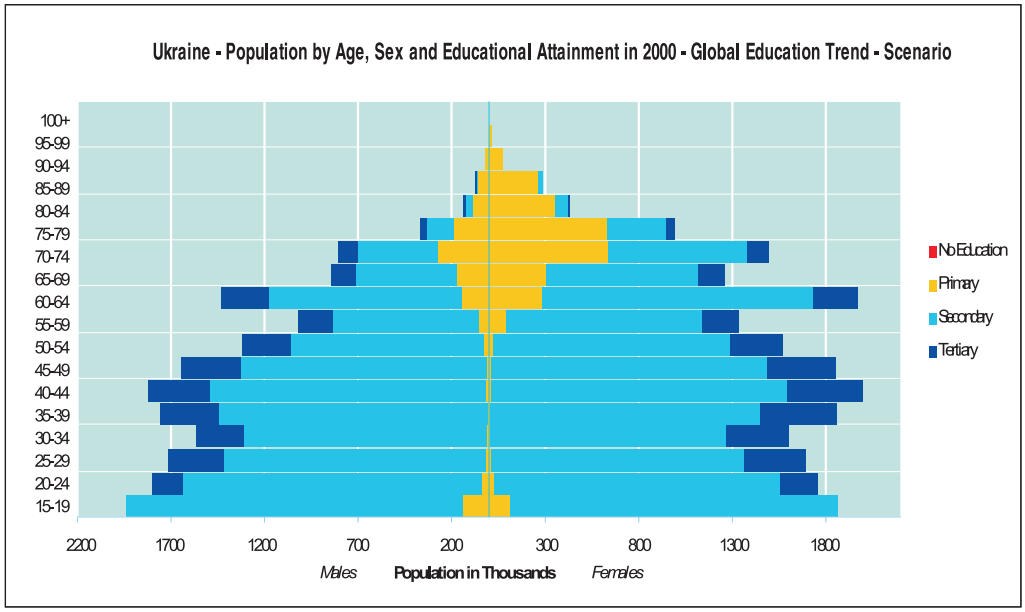

Figure 6. Population Pyramid of Ukraine in 2000 by Level of Education

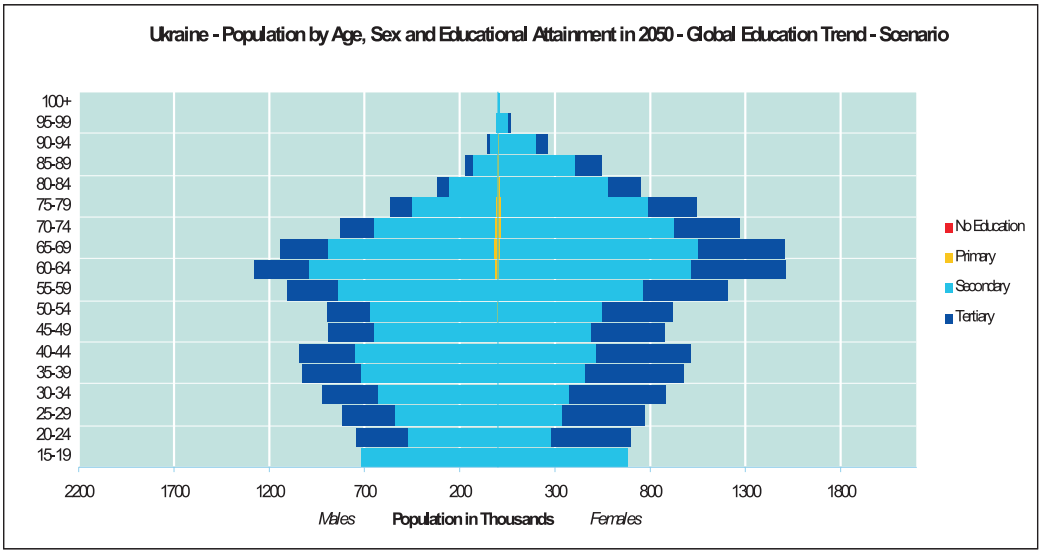

Figure 7. Population Pyramid of Ukraine in 2050 by Level of Education

Figure 7 shows the projections for Ukraine according to the Global Trend Scenario, which can be considered a most likely or medium scenario that uses fertility assumptions similar to those used by Eurostat, i.e,. assuming long term TFRs to be around the level of current tempo-adjusted TFRs, and educational progress rates that follow the average global pattern of recent educational improvements. A comparison of Figures 6 and 7 first shows a significant transformation of the overall population age distribution. In 2000, the age structure still looks somewhat like a pyramid. In 2050, the age distribution is more like an inverted pyramid. In terms of the educational structure, the proportion of the population at each age with tertiary education can be seen to increase between 2000 (Figure 6) and 2050 (Figure 7). The higher levels of education-

al attainment, and the correlate increase in per capita productivity in the population, may potentially compensate for the decreasing size of these cohorts. It is also interesting to note that, according to the current trends, women will be better educated than men in the future. Also, as the better-educated cohorts age, the 2000 levels of low education among the elderly will give way to a much better-educated elderly population by 2050. Since the more educated elderly typically have significantly lower disability rates than less educated ones, this improvement of the educational attainment of the elderly population is also likely to lead to a better future health status of the elderly. This effect even might be able to compensate for the expected increase in public health challenges due to population ageing[8].

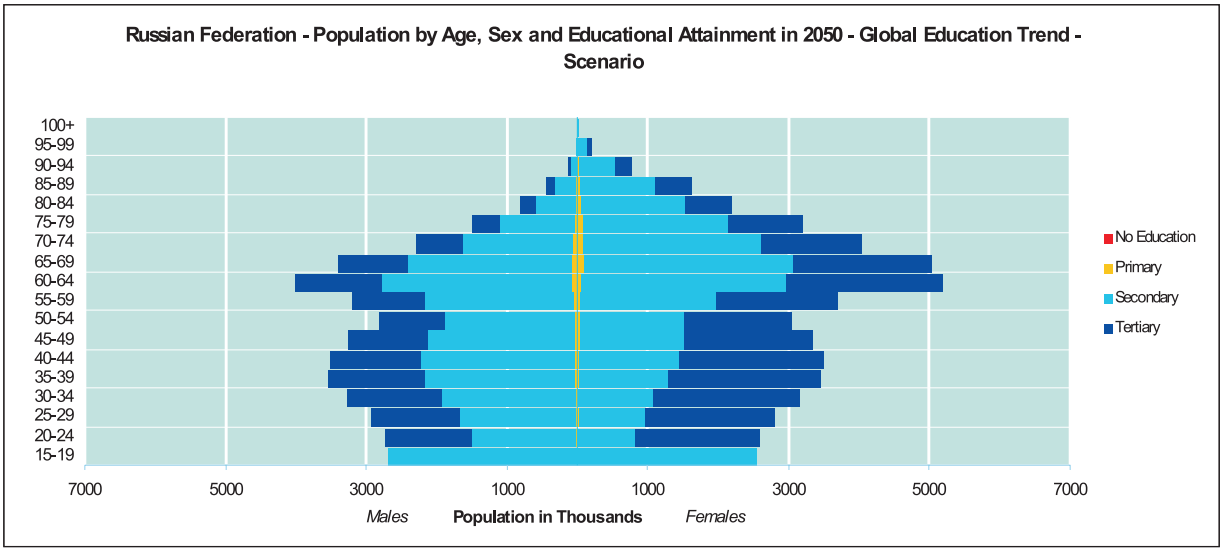

Figure 8. Population Pyramid of Russian Federation in 2050 by Level of Education

For Russia, the pattern is even more extreme because of the higher mortality differentials between men and women (see Figure 8). Projections show that by 2050, 60-64 year old females (those born during the last years of the Soviet Union, when fertility was still fairly high) will be much more numerous than their male counterparts. Partly because of their much higher educational status, these women are also likely to be in better health than women of the same age today. And given the huge size of the projected population above age 60 relative to that below age 60, it is unlikely that these large cohorts will be able to enjoy comfortable retirement benefits because, in terms of labor demand, the rapidly declining size of the younger labor force will also likely result in a situation in which these well-educated elderly women will still be needed in the labor market.

Figure 9 shows the aggregate long-term population projection for Eastern Europe (the European part of the EECA region without current European Union (EU) member countries) from 1970-2050, using the working-age population plotted against different levels of educational attainment. After a peak within the coming years, the absolute size of the labor force is forecasted to decline steadily, though the educational profile will improve. Once again, the

8 W. Lutz, A. Goujon, S. KC and W. Sanderson (2007). Reconstruction of populations by age, sex and level of educational attainment for 120 countries for 1970-2000. *Vienna Yearbook of Population Research 2007:* 193-235.

question for analysts is whether the higher educational attainment of the population will be able to compensate economically speaking for its declining size.

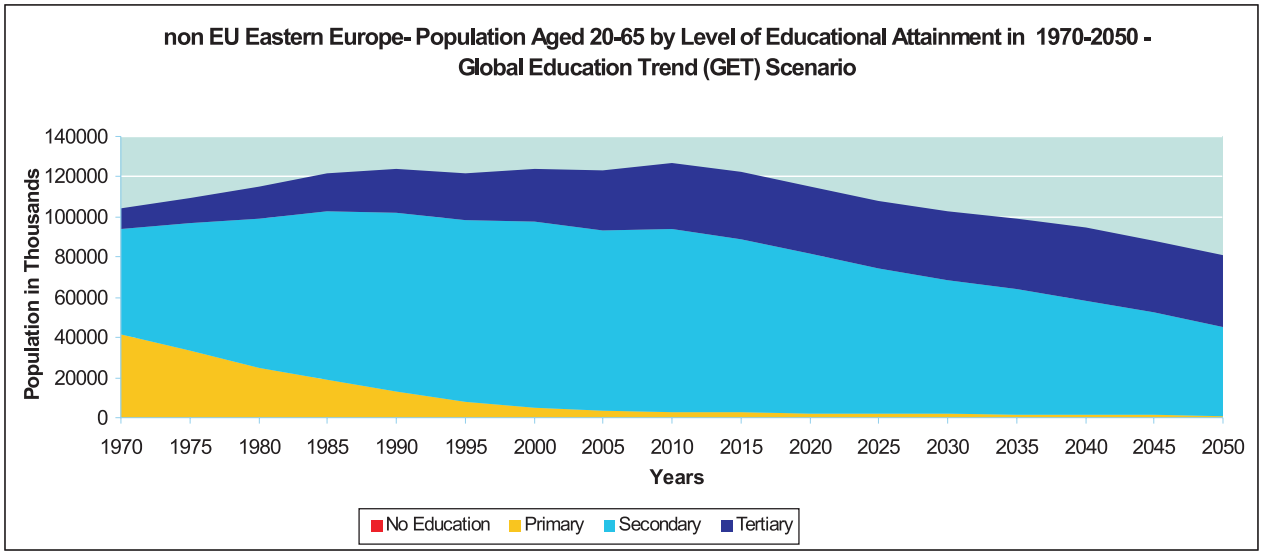

Figure 9: Long-term trend in the size of the working-age population in Eastern Europe by level of educational attainment.

For Central Asia the human capital prospects look quite promising. In Kazakhstan, for example, the IIASA-VID education projections show that the proportion of women aged 15-44 with tertiary education has increased from 5 per cent in 1970 to 20 per cent in 2007 and is expected to continue increasing to 32 per cent in 2030. For Uzbekistan the corresponding percentages are 4 (1970), 13 (2007) and 24 (2030) and for Kyrgyzstan 7 (1970), 19 (2007) and 32 (2030). For Tajikistan, which is less developed in many respects, these percentages are 3 (1979), 7 (2007) and 14 (2030). In all these countries the educational attainment of men is initially higher but continues to increase at a slower rate than that of women. For Kazakhstan this is likely to result in a situation in 2030 in which more women have tertiary education than men, which is a phenomenon increasingly observed among younger adults in developed countries.

In conclusion, the need for new policy paradigms that have a broader objective than just stabilizing the population size is a newly emerging issue and priority in the EECA region. Because the traditional paradigm of "population stabilization" does not apply to societies that are set for further population decrease (partly due to their existing age structure), this new paradigm needs to have a more comprehensive perspective about the objective of population policies and be captured and described in quantitative terms.

4. Population and Climate Change

Of the future challenges that will be facing the EECA region, climate change deserves special attention. So far, concerns associated with population and those associated with climate change have been largely treated in separation. This section will provide a summary of the expected future effects of climate change on the region in terms of changing temperature and precipitation and discuss the interactions with population trends. This analysis leads to consideration of possible effects on long term migration within and into the EECA region, which will be discussed in the following section.

Scenarios for Future Greenhouse Gas Emission in the EECA Region

This section will mostly refer to the summary of current knowledge as provided by the Assessment Reports produced in 2007 by the Intergovernmental Panel on Climate Change (IPCC)[9]. The two most recent such assessments (TAR and AR4) have assumptions about future emissions based upon the Second Report on Emissions Scenarios (SRES)[10]. There are four major SRES scenarios for each world region with several sub-scenarios assuming minor modifications of the main assumptions: the A1 scenario describes a world of very rapid economic growth, moderate population growth and the rapid introduction of more energy efficient technologies; A2 assumes great global heterogeneity combining rapid population growth with only moderate economic growth and technological progress; B1 describes global convergence with the same population trends as A1 but with rapid changes in economic structure toward a service economy; and B2 emphasizes local solutions in an environmentally friendly way, combining low population with intermediate economic growth.

The SRES scenarios combine assumptions to 2100 about future population size and economic growth with specific assumptions about the energy use that would result in certain carbon dioxide emissions, as well as carbon sequestration according to alternative future land use patterns for all major world regions. One such region (called REF) combines the countries of Central and Eastern Europe and the "newly independent states of the former Soviet Union" which largely corresponds to the EECA region.

In short, the population of this REF region is assumed to change from 419 million in 2000 to between 406 million (B2) and 519 million (A2) by 2050. The aggregate level Gross Domestic Product (GDP) in Purchasing Power Parity (PPP) Dollars is assumed to increase for the region from 2.2 trillion in 2000 to between 6.4 trillion (B1) and 12.4 trillion (A1) in 2050. Total energy use is a function of both income and population and of alternative technological developments. Total primary energy consumption in 2050 comes out lowest with 70 Exajoules (EJ = 10^{18} J) under the B1 scenario and highest with 121 EJ under the A1 scenario. Since the total carbon dioxide emissions are not directly a function of total energy use but also depend on the kind of energy used, including the proportion of renewable energy, the picture for total carbon dioxide emissions from the region still looks different under the alternative scenarios. The highest amount of cumulative carbon dioxide emissions since 1990 results from scenario A2 with 71.0 Gigatons

9 International Panel on Climate Change (2007). *Fourth Assessment Report.*

10 N. Nakicenovic and R. Swart (Eds.) (2000). *IPCC Special Report on Emissions Scenarios.* UK: Cambridge University Press.

(GtC = 10^{15} g Carbon) and the lowest from B1 with 50.0 GtC. The corresponding values projected for 2020 are 30.7 and 28.2 GtC respectively. In other words, significant future carbon emissions in the REF region are a near certainty and all four scenarios assume quite sizable annual increases to 2050. It should be stressed, however, that these scenarios all assume the absence of effective climate policies.

Population trends affect these emission scenarios in several ways. The IPCC scenarios as described above consider population only as a scaling factor, i.e. they consider per capita energy consumption. As a consequence, under a given per capita emissions assumption a higher population size implies more total emissions and vice versa. But the SRES scenarios typically combine different population trajectories with different per capita consumption projectors, which are a direct consequence of different assumptions about future rates of economic growth. At the global level, the SRES scenarios aim at consistent storylines in which higher population growth is associated with low income growth and more moderate population growth with higher per capita income growth. While this association makes sense at the global level, its application to the EECA region is more problematic because over recent years population decline tended to be associated with economic decline and vice versa. A new generation of scenarios should directly address the more complex relationship between population growth/decline, population ageing and economic growth in societies that have already completed their demographic transitions.

In addition, recent research has shown that population is not simply a scaling variable. Changes in the population age structure also affect emissions. Household surveys focusing on energy consumption have shown that, indeed, a certain proportion of energy consumption is a fixed and does not depend on the number of people living in the household. The emissions associated with heating, refrigeration or the construction of the housing unit are examples of emissions that vary with the number and size of housing units rather than the number of persons living in them. In ageing societies, the elderly tend to stay in their apartments after the children leave and often continue to do so even after the death of their spouses, consequently, an ageing society that does not grow in size still leads to higher total emissions. O'Neill and colleagues[11] tried to quantify this effect on a global level and assumed that roughly half of emissions depend on the number of households and only the other half is directly proportional to the number of people. More detailed studies that consider energy consumption for travel and other purposes with respect to age have been completed in the US. They show that there is great variability in the extent to which ageing is expected to affect the trend in overall emissions, but that it will generally lead to higher per capita emissions. At the date of publication, no such known studies are available for the EECA region.

Demographic trends also matter with respect to commitments made in international a greements on greenhouse gas emissions such as the Kyoto Protocol, where the total emissions of a country in 1990 are taken as the standard against which progress is measured. In this respect countries with low population growth or even population decline will more easily meet these targets than countries with greater population growth. This may be one of the few positive effects of population decline in some of the EECA countries.

[11] B.C. O'Neill, F.L. MacKellar and W. Lutz (2001). *Population and Climate Change*. US: Cambridge University Press.

Projected Regional Changes in Temperature and Precipitation

The 4th Assessment Report of the IPCC (AR4) also provides a synthesis of the many different climate models included in the review. Despite significant scientific progress since the 3rd Assessment Report, these Global Circulation Models still produce a considerable range of projections, particularly when it comes to specific smaller regions. Generally, the consensus is greatest at the global level and least for small areas, which are very sensitive to all kinds of specific assumptions in the models. The synthesis results presented below are taken from AR4 and present the averages of 21 different models.

Figure 10 below presents the expected changes between 1980-1999 and 2080-2099 for mean annual temperatures and winter and summer temperatures for Europe and Asia. The IPCC did not produce specific maps for the EECA region, however, the combination of the two maps clearly shows that the EECA region will be characterized by an increasing temperature over this century. The warming is projected to continue at a rate somewhat greater than its global mean. For the annual average an increase of between 3 and 4 degrees Centigrade is projected. The maps also show that for the northern parts of the EECA region, temperature increases will be most significant during the winter months, whereas in the southern part they will be more pronounced in summer.

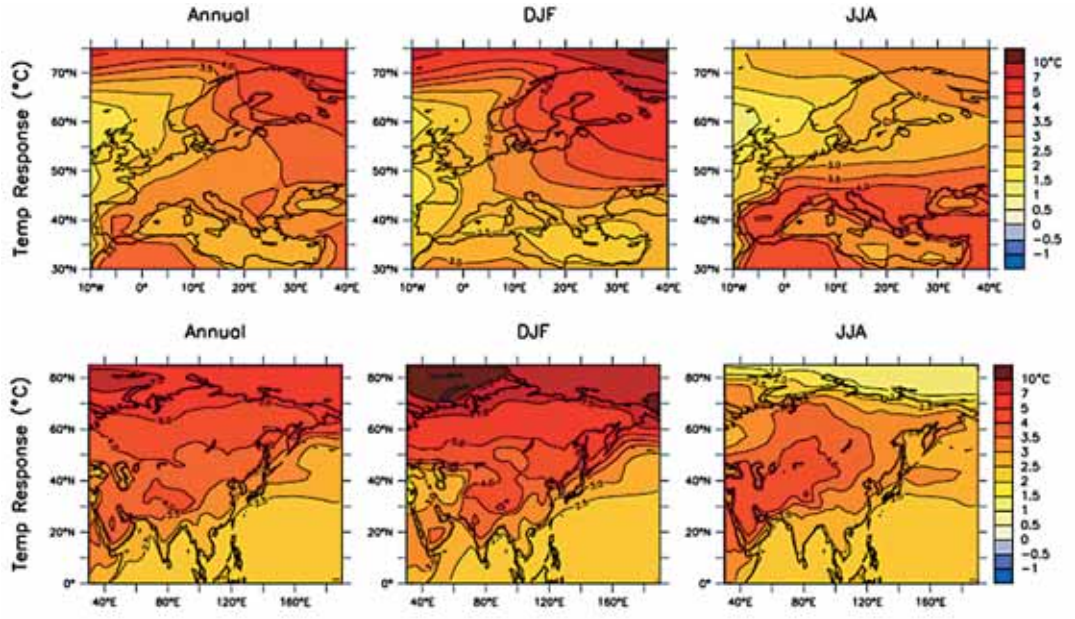

Figure 10: Expected changes between the periods 1980-1999 and 2080-2099 for mean annual temperatures (left), mean temperatures in December to February (centre) and mean temperatures in June to August (right). Source: IPCC 2007.

It is expected that these temperature changes in the EECA region will generally shorten the snow season and will lead to reductions in the land area experiencing permafrost. In Central Asia a strong interaction between precipitation and temperature is expected, as the temperature response is strongly influenced by changes in winter and spring snow cover. Little can be said for the future climate of mountain areas in the region with the exception of a high probability of glacier reduction. Forecasts of future windiness and the probability of temperature extremes are assessed to be of low confidence and therefore not reported here.

Table 1 below provides a probabilistic assessment of the uncertainty ranges associated with these mean projections. It is structured according to the world regions for which the IPCC report presents its results, but the three world regions that matter for the EECA region (shown here) are, in IPPC terminology, Northern Europe, (NEU), Southern Europe and Mediterranean (SEM) and Central Asia (CAS). The table shows not only that the projected mean changes significantly differ by region and season, but also that the ranges of uncertainty show variability along these dimensions.

		Temperature Response (°C)						Precipitation Response (%)						Extreme Seasons (%)		
Region*	Season	Min	25	50	75	Max	T yrs	Min	25	50	75	Max	T yrs	Warm	Wet	Dry
NEU	DJF	2.6	3.6	4.3	5.5	8.2	40	9	13	15	22	25	50	82	43	0
	MAM	2.1	2.4	3.1	4.3	5.3	35	0	8	12	15	21	60	79	28	2
48N,10W	JJA	1.4	1.9	2.7	3.3	5.0	25	-21	-5	2	7	16		88	11	
to	SON	1.9	2.6	2.9	4.2	5.4	30	-5	4	8	11	13	80	87	20	2
75N,40E	Annual	2.3	2.7	3.2	4.5	5.3	25	0	6	9	11	16	45	96	48	2
SEM	DJF	1.7	2.5	2.6	3.3	4.6	25	-16	-10	-6	-1	6	>100	93	3	12
	MAM	2.0	3.0	3.2	3.5	4.5	20	-24	-17	-16	-8	-2	60	98	1	31
30N,10W	JJA	2.7	3.7	4.1	5.0	6.5	15	-53	-35	-24	-14	-3	55	100	1	42
to	SON	2.3	2.8	3.3	4.0	5.2	15	-29	-15	-12	-9	-2	90	100	1	21
48N,40E	Annual	2.2	3.0	3.5	4.0	5.1	15	-27	-16	-12	-9	-4	45	100	0	46
CAS	DJF	2.2	2.6	3.2	3.9	5.2	25	-11	0	4	9	22		84	8	
	MAM	2.3	3.1	3.9	4.5	4.9	20	-26	-14	-9	-4	3	>100	94		16
30N,40E	JJA	2.7	3.7	4.1	4.9	5.7	10	-58	-28	-13	-4	21	>100	100	3	20
to	SON	2.5	3.2	3.8	4.1	4.9	15	-18	-4	3	9	24		99		
50N,75E	Annual	2.6	3.2	3.7	4.4	5.2	10	-18	-6	-3	2	6		100		12

Table 1: Regional averages of temperature and precipitation projections from a set of 21 global models. The mean temperature and precipitation responses are first averaged for each model over all available realisations of the periods 1980 to 1999 and 2080 to 2099 of the A1B scenario. Computing the differences between these two periods, the table shows the minimum, maximum, median (50 per cent), and 25 and 75 per cent quartile values among the 21 models for temperature (°C) and precipitation (%) change. Regions in which the middle half (25–75 per cent) of this distribution indicates decreasing precipitation are coloured light brown, and light blue for increasing precipitation. The frequency (%) of extremely warm, wet and dry seasons, averaged over the models, is shown when at least 14 out of the 21 models agree on an increase (bold) or a decrease in the extremes. A value of 5% indicates no change, as this is the nominal value for the control period by construction. Source: IPCC 2007.

Figure 11 is structured in the same way as Figure 10 and maps expected changes in precipitation between 1980-99 and 2080-99. The blue and green areas show increasing precipitation and the yellow and brown areas show decreasing precipitation. Again, the maps on the left refer to annual averages, the maps in the centre to winter and the maps on the right to summer months. The maps show that throughout the EECA regions winter precipitation is likely to increase significantly, particularly in higher latitudes. In the summer, lower latitudes will likely experience a reduction of rainfall, whereas further north it will still increase. In terms of annual averages most of the EECA region (except for the Balkans) is likely to experience increases in annual precipitation.

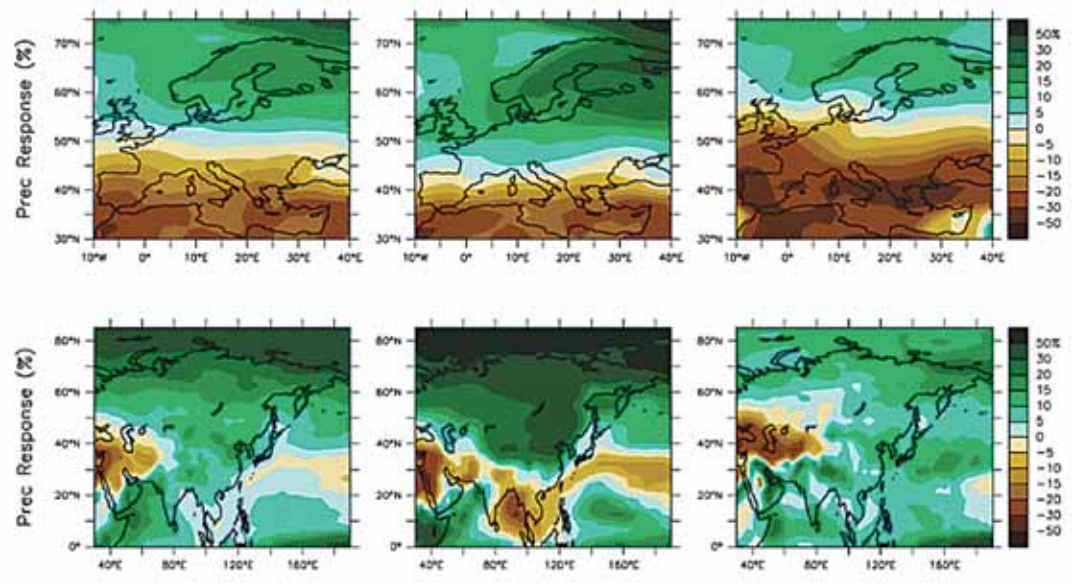

Figure 11: Expected changes between the periods 1980-1999 and 2080-2099 for mean annual precipitation (left), mean temperatures in December to February (centre) and mean temperatures in June to August (right). Source: IPCC 2007.

The implications of these expected changes in climate on the productivity of rain-fed agriculture within the EECA region are likely to vary greatly by latitude. Various estimates of the consequences of climate change on food production have been summarized in the IPCC report and generally mirror the pattern shown for precipitation in Figure 11 above. Areas with increased precipitation and warmer growing seasons are likely to experience increases in agricultural productivity, whereas areas with reduced rainfall in summer will see likely reductions unless irrigation and other adaptations can compensate for the decline in rainfall. The picture is greatly complicated by many additional factors, including the fertilizing effect of increased carbon dioxide levels, expected higher frequency of extreme events (both draughts and floods), erosion stemming from possibly increased windiness and the capacity of agricultural systems to counteract these forces through adaptive measures. The net effect of all these factors for the EECA region is hard to estimate. But what can be said is that the northern parts will certainly be better off than the southern parts of the region and that the region as a whole will be much better off than Western Asia and Northern Africa, two regions that will see significant further increases of their populations combined with a significant decline in rain-fed agricultural productivity. The implications for future migration streams into the EECA region will be discussed below.

Eastern Europe and Central Asia have vast agricultural areas and even larger areas covered by forests which provide important carbon sinks. Changes in the land use patterns induced by population-related changes or by the changing climate itself will likely have significant effects on the global carbon balance. Another important factor for the balance of global greenhouse gases is the likely release of significant amounts of methane from the expected melting of large areas of permafrost in Northern Russia. The consequences of climate change in the EECA region, then, are relevant not only to the region itself but also to the future course of global climate change.

As discussed earlier, in climate policy one usually distinguishes between mitigation and adaptation policies. Until recently the focus has been almost exclusively on mitigation, i.e. factors that reduce the emission of greenhouse gases into the atmosphere through lower consumption of energy or the use of cleaner energy or more advanced technologies. More recently it has been understood that some climate change is inevitable and already on the way and that there is a need to find the best ways to adapt to these conditions, i.e. try to minimize the harm caused by unavoidable climate change. In the context of adaptation policies the climate change discussion further distinguishes between specific adaptive measures and investments that enhance general adaptive capacity.

The adaptive capacity to climate change in the EECA region will also greatly depend on the future size, age structure and, in particular, the level and distribution of human capital in the region. While it is not yet clear how this will play out in detail, it is to be expected that a higher level of human capital will enhance the resilience and adaptive capacity of populations in the region. More research on the impact of population-related factors on future adaptive capacity in the region is clearly needed.

In conclusion, the research indicates that the EECA region is likely to be affected significantly by climate change and that change will more negatively impact the south of the region than the north. The effects on the region as a whole are likely to be less severe than in other world regions further to the south. More detailed social and economic consequences for different parts of the EECA region cannot be assessed at this point due to remaining great uncertainties about the specific future climate trends and trends in adaptive capacity. While climate change certainly qualifies as a highly important emerging issue, the presented analysis does not seem to imply that it should be given higher priority in the EECA region than in other world regions. For national policy making in the region it is certainly important to take whatever is known about likely future climate change into consideration. In this respect all major new infrastructural and other long-term investments should be studied with respect to both their contribution to greenhouse gas emissions and their feasibility under changed climatic conditions. For this "mainstreaming of climate change" new capacity needs to be developed in the region.

5. Future Migration

Internal Migration and Urbanization

The international comparative analysis of urbanization greatly depends on the specific definitions of what is considered an urban and what a rural area. The criteria for such classifications range from purely administrative categories to the consideration of population density and the structure of the labor force by industry, and the significant differences among countries in terms of the definitions applied create more of a problem for cross-country analysis than for studying trends over time, given that national definitions tend to be more stable over time. The UN Population Division, which applies the national definition for each country, lists the Eastern European region as being currently 68.3 per cent urban. This level of urbanization has essentially remained unchanged over the last decade and is somewhat lower than in Western Europe.

It is an interesting phenomenon that as a consequence of general population decline in the region, the population living in urban areas has declined in absolute terms. According to the UN data this decline of the urban population happened at almost exactly the same rate 4 per cent since 1995 as the decline of the rural and total populations. All these categories experienced annual declines of around .4 per cent since 1995. This implies that the assumption that international out-migration from the region mostly originates from urban areas, which in turn benefits from internal rural to urban migration, is not consistent with these data. Although little is known about the specific regions of origin of the out-migrants (and it still cannot be ruled out that it is urban), the data show that in the end urban and rural areas have been losing people at the same rate.

The UN urbanization prospects for Eastern Europe assume that after the current period of stability, the region will experience a rapid increase in urbanization at an accelerating pace over the coming decades. The annual rate of change in the urban percentage of the population is assumed to increase from 0.0 in the period 2000-2005 to a high 0.5 per cent in 2030-35 and result in 80 per cent of the population living in cities in 2050. This expectation, however, seems to simply result from the application of the general logistic urbanization extrapolation to the region (for which the past years were simply a disturbance in an assumed smooth universal trend towards a completely urban society) rather than from substantive reasoning for the region. Yet under recent conditions of fast economic growth in the region, which is typically associated with higher rates of urbanization, no further urbanization was observed. This indicates peculiarities of the internal migration regime in Eastern Europe which deserve closer attention**.** In particular, the vast agricultural land resource in the region and the fact that raw materials important to the economy are found mostly in remote rural areas suggest a future pattern characterized not by strong urbanization but, rather, by a continuation of the currently stable urban proportion of the population.

This issue requires more attention for analysis and policy, because under the new conditions of overall population decline, issues of regional population distribution can have significantly different consequences. It seems plausible to assume that population decline in rural areas has more negative implications than in urban ones. While in cities population decline may be associated with a decrease in housing prices or competition for general amenities and services, in rural communities population decline may mean falling below the critical mass for making it feasible to run schools, hospitals or other important services. It may also imply a labor shortage for agricultural production. For this latter reason, as will be discussed later, it may well be that future streams of international in-migration might be directed to rural areas, thus presenting another force against further urbanization.

In Central Asia the level of urbanization is much lower than in Eastern Europe. The Central Asian percentage of the population characterized as urban currently ranges from 26 per cent in Tajikistan to around 36 per in Uzbekistan and Kyrgyzstan, 47 per cent in Turkmenistan and 57 per cent in Kazakhstan. All these countries, however, have also experienced a stagnation in rates of urbanization or even a decline in the proportion of the population considered urban over the past decades. This decline was most pronounced in Tajikistan where the urban proportion of the population fell by more than 10 percentage points since 1970. This is likely attributable to much higher natural growth in the rural areas although more analysis is needed on "de-urbanization" trends**.** The instant and complete reversal of this trend as assumed by the UN urbanization projections (increasing from currently 26 to 48 per cent in 2050) should not be the only scenario considered in this context.

Climate change, as discussed above may also contribute to internal migration within Eastern Europe as well as within Central Asia and most likely from Central Asia into Russia. This is expected to be driven by worsening agricultural conditions in the southern latitudes and improving conditions in the north. But it is unclear whether this push out of southern rural areas and the pull into northern areas will mostly be rural to rural migration or be associated with movements to cities in the north.

According to the UN estimates exactly one half of the world population lives in urban areas. But there is great heterogeneity around the world. While in sub-Saharan Africa only about 35 per cent of the population lives in urban areas, the proportion is above 80 per cent in Northern America. Most regions, however, experience a strong tendency toward higher urban proportions of the population, which is not always associated with improved living conditions. In the rapidly growing slums of big African cities, for example, health conditions have actually become worse than in the most remote rural places due to high levels of violence in the slums and greater risk of infectious diseases. Increasing urbanization around the world therefore poses formidable challenges for urban management, particularly in the poorest countries. This is also relevant for the EECA region as a possible driving force for international migration.

International Migration

International migration is the most difficult of the demographic components of change to project in the future. This is due to the intrinsic volatility of migration streams that show strong short term fluctuations as a function of hard to predict political and economic changes. For this reason it is impossible to draw a clear picture of what are likely future patterns of international migration in the EECA region. This section will present a few informed theories about possible future migration streams into and out of the region.

Future migration within the region is likely to be determined by future political changes and security problems in certain countries, possibly causing a divergence in the economic growth and the future migratory behavior of ethnic minorities, all factors that are very hard to predict. The more systematic conclusion about internal migration can be drawn from the study of likely climate change. It appears that the agricultural potential in the north will likely improve whereas that further south will deteriorate, likely contributing to internal migration within both Eastern Europe and Central Asia and most likely from Central Asia into Russia. Combined with the fact that the population of Russia is bound to diminish significantly while that of Central Asia will grow substantially, this will ceteris paribus lead to migration pressure from Central Asia into Russia.

What about migration out of the EECA region? As discussed above, Eastern Europe and Central Asia are lagging behind Western Europe in the process of population ageing because the West has experienced very low birth rates for longer periods. But the main demographic difference between Western and Eastern Europe has been that Western Europe has attracted significant numbers of international migrants from both the south and the east, whereas Eastern Europe was losing significant numbers of migrants to the west. This is the reason why most countries in the west continue to see growing population size despite of low fertility while populations in the east are decreasing. There is no doubt that this pattern of international migration is primarily driven by economic differences. Other factors, such as changing demographic structures, have a secondary role because the income differentials between the east and the west after the transformation of 1989 have been simply too big. But currently these differentials seem to be a on a declining trend, at least between the 10 EECA countries that have become members of the EU and the rest of the EU. Even the famous Polish plumbers are starting to return to Poland because salaries there have increased significantly.

This brief characterization of recent east-west migration in Europe raises two key factors in discussing future migration: (1) It is unclear to what extent the migration streams experienced over the past years will be permanent migration or whether significant proportions of out-migrants may ultimately return to their countries of origin as the conditions improve. Other migration streams show that return migration becomes less likely the longer the migrants have been away and the better they and in particular their children have been integrated into the new societies. (2) Economics and especially wage differentials are likely to continue to play a major role in determining future east-west migration in Europe. The prospects for this kind of migration will greatly depend on longer-term economic projections.

Population Structure and Migration

Conventional wisdom predicts that the combination of population decline and population ageing in the EECA and the consequent decline in the labor force will create a huge need for in-migrants in the upcoming decades. However, the analysis above has shown that educational attainment levels can be just as important in determining future migration flows, as they are a crucial determinant of economic growth. It seems to be an open question whether future demographic trends will actually result in the often-mentioned "need for migrants for demographic reasons." If labor input into production keeps diminishing due to technological change, this combination of fewer but better educated workers may just be what the labor market needs.

While a decline in the labor force of Eastern Europe is a near-certainty, it is not yet clear what type of education workers in Eastern Europe will need in the future. Nor is it clear, therefore, what the region's "pull factors" might be, assuming that the region will be able to pay internationally competitive salaries. Some argue that due to population ageing there will be a significant need for unskilled workers in the care sector, yet unskilled workers in Europe today have by far the highest rates of unemployment. It may be more a question of the salaries paid in the care sector and the willingness of people to work in this sector, rather than a question of the supply of unskilled labor. In addition, health care and other personal services increasingly require specialized training. And as mentioned above, industrial production and agriculture are likely to see further increases in labor productivity which also requires more skills. From a labor demand perspective, more detail as to the overall spectrum of skills Eastern Europe will require in the future is needed.

Can immigrants possibly "replace" the "missing" children? This is a much discussed and multifaceted question. Theoretically, it is clear that in principle a young immigrant entering the country has the same effect on population dynamics as a child born in that country. If one looks at the population only by age and sex, then the effects of immigration on the receiving population can be readily described by the tools of population dynamics: generally, the younger the migrants are at the age of arrival and the more children they have, the more they counteract the process of population ageing and decline. It needs to be kept in mind, however, that immigration changes not only the age and sex structure of a population, as migrants typically have educational, cultural, and other characteristics that are different from those of the local population.

Push Factors in the South

Future migration into the EECA region does not depend only on the "pull factors" in the region itself but also on the "push factors" elsewhere. Two prominent push factors are the rapid population growth and consequences of climate change in Western Asia and Africa. As the IIASA population projections show, the population of Northern Africa is likely to increase from currently around 190 million to more than 300 million by 2050. The population of sub-Saharan Africa will likely more than double from around 700 million to more 1.6 billion by the middle of

the century and that of the Middle East is projected to increase from currently 190 million to around 360 by 2050. This will imply rapid increases in the potential labor force and a likely serious shortage of jobs, and so people are likely to look for jobs not only in their own regions but also elsewhere. The intensity of future out-migration pressure from Africa and the Middle East will also depend, aside from political factors that are hard to predict, on two more systemic long term trends: the future course of development and the consequences of climate change.

The future of development in Africa and the Middle East depends upon the future success in expanding basic and secondary education. Only economic growth in this part of the world will enable the economy to absorb the very rapidly growing numbers of young adults. The human capital projections for this part of the world show that in Northern Africa and Western Asia, past improvements in schooling have been sizeable and will result in future improved education of the labor force. Yet education is a necessary, but not always sufficient, precondition for such economic growth[5]. In sub-Saharan Africa, the situation is worse and in a number of countries school enrollment rates have actually been on the decline over the past two decades. Without an educated population, we can expect not only significant increases in humanitarian crises on the continent – coinciding with the expected negative consequences of climate change on African livelihood and health – but also conflict. As the IPCC (2007) reports show, Northern Africa and the Middle East are likely to see significant increases in water stress, a serious problem already for any population not increasing in size. But this combination of increasing environmental stress, insufficient human capital and rapidly increasing human numbers possibly combined with weak governance is an explosive mix that is likely to produce significant numbers of asylum seekers, economic migrants and "environmental refugees". This may pose serious challenges for efforts to develop a planned and orderly migration regime into Europe, both East and West.

This expected difficult situation in the southern neighborhood of the EECA region will evolve at the same time as the depopulation of the vast and highly fertile agricultural lands in the Ukraine and parts of Russia, where climate change may even increase agricultural productivity and allow the expansion of arable land into the north. It seems plausible to assume that this gross imbalance of resources and people in not too distant regions one having fertile land but no people, the other having people but no arable land will lead to some redistribution of people, either in an orderly and planned manner or in an unplanned, chaotic and possibly disruptive fashion. Previous guest worker programmes have shown that well-planned circular migration schemes can have great benefits for all parties, i.e., the receiving countries, the sending countries and the migrants themselves. Consequently, the recent UN Global Commission on International Migration has adopted circular migration schemes as a main recommendation.

6. Research Base and Institutional Capacity in Eastern Europe and Central Asia

Institutional capacity includes: (1) institutional and human capital to conduct research according to the international state of the art, (2) existing knowledge base in terms of comprehensive assessments of past trends, current conditions and likely future trends, and (3) knowledge of these emerging population issues in policy circles and the public at large.

1. Institutional and Human Capital for Research. It is difficult to objectively assess the research and institutional capacity for dealing with the emerging population issues, however, there are some measurable indicators.

1.1. The first indicator chosen is the regional distribution of membership in the International Union for the Scientific Study of Population (IUSSP), the global professional association of demographic experts including both scientists and practitioners. IUSSP membership is awarded through election by the IUSSP Council and, in practice, the Council approves most applications after checking professional credentials. To allow young professionals without the necessary credentials to participate in activities of the IUSSP, however, a separate "student member" category has been created. The membership fee is significantly reduced for residents of most countries in the EECA region so that ability to pay should not introduce a significant bias. Consequently, the regional distribution of full IUSSP members can be interpreted as one indicator of the number of senior experts with international interests and contacts.

In terms of IUSSP members in the countries of the EECA region, Russia has the highest number in the region with 23 resident members, of whom the majority live in Moscow. Romania has 14 members, Ukraine has 7 members and Poland has 6. Of the Central European countries Hungary has 16 members and the Czech Republic has 8, the Baltic States each have 1-3 members, Bulgaria has 2 and the rest of the region has two or fewer per country. In Central Asia the IUSSP membership directory lists one member. In other words, the individual expertise of the EECA region is almost exclusively concentrated in the new member states of the EU and in Moscow and Kiev. East of Moscow the population expertise gets extremely thin.

1.2. Another way of looking at the distribution of population related to capacity is to look at research centers instead of individuals. The database of the Committee for International Cooperation in National Research in Demography (CICRED) provides a possible source of data regarding population research centers. It must be noted, however, that CICRED does not apply quality controls or check whether the listed centers do relevant work in the field of population.

The regional distribution of population research centers derived from the CICRED database of centers is not very different than that of IUSSP members. Russia has 14 centers with 10 of them based in Moscow. Poland has 8, the Czech Republic has 4, Hungary and Romania have 3 each and the Ukraine has 2. Again, the rest of the EECA region has an extremely low density of population research centers.

1.3. One informative source of quantitative data about the quality of the research capacity in the region would be an analysis of citation indices and numbers of refereed publications, to include literature published in several languages, as significant publications exist in Russian, Romanian, Polish, Hungarian and several other languages. If such an assessment is considered important, a special study would have to be commissioned.

2. Existing Knowledge Base. Although a large number of individual articles on specific demographic issues in specific countries of the EECA region has been published in recent years, there has not been a recent comprehensive review of past and future demographic trends and population related challenges. Statistical description with limited analysis has, until recently, been provided by the Council of Europe demographic reports. However, these reports have been discontinued. The UN Population Division provides data on a country-by-country basis.

The 10 EU member countries in the EECA region are routinely included in the demographic monitoring of the European Commission, conducted jointly by Eurostat and the Commission's Directorate-General for Employment, Social Affairs and Equal Opportunities together with a group of population experts. These reports on demographic trends go beyond the publication of demographic indicators and provide some analyses, interpretations and background information. A good example is the recently-issued 2nd European Demographic Report titled "Meeting Social Needs in an Ageing Society"[12]. IIASA also published a book on this topic in 2006 titled "The New Generation of Europeans: Demography and Families in the Enlarged European Union"[13].. The IIASA publication has a special focus on the 10 new EU member countries, but it compares them to the rest of the EU rather than to the rest of the EECA region.

For the countries that previously belonged to the Soviet Union no such recent comprehensive assessment exists. Many references still list the 1994 IIASA book titled "Demographic Trends and Patterns in the Soviet Union before 1991"[14] as the main source. This book, to which 31 international authors contributed, provides a comprehensive analysis of important trends in the Republics of the former Soviet Union with an analysis of challenges arising from the demographic trends. The subsequent historical discontinuities, however, changed many of the trends and issues discussed in the volume fundamentally and hence make it outdated as a reference for today's challenges.

3. The state of knowledge about emerging population issues. Policy makers need to be aware of recent trends, likely future developments and the possible interactions between the domain at which policy is aimed and other relevant domains. In democratic societies the public at large also needs to be informed about the basic facts, why the challenges need to be addressed and how to do so. All this requires comprehensive, timely, efficient and, most of all, understandable and digestible information for policy makers and the public alike.

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12 European Commission Directorate-General for Employment, Social Affairs and Equal Opportunities (2008). *Second European Demographic Report 2008.*

13 W. Lutz, R. Richter and Ch. Wilson (Eds.) (2006). *The New Generation of Europeans: Demography and Families in the Enlarged European Union* [Report of the European Observatory on the Social Situation, Demography and the Family]. IIASA and Earthscan.

14 W. Lutz, S. Scherbov and A. Volkov (Eds.) (1994). Demographic Trends and Patterns in the Soviet Union Before 1991. New York: Routledge.

With the exception of a few countries in Western and Northern Europe that have a long tradition of demographic information services to the public, public knowledge about the key population related trends and challenges within the EU is limited. It is probably still more limited in the EECA region where such information could be even more important, given the interest of many politicians in population decline. Eastern and Western Europe, as well as in Central Asia, need a professional population communication effort that initiates an informed public discussion in the media and provides journalists with background information and policy makers with policy briefs.

There is one institution with a reputable record in this field of population communication. The Population Reference Bureau (PRB) based in Washington DC has for more than 50 years informed the American public about population trends in the US and around the world. The mechanisms of communication include posters, well-written Population Bulletins and Policy Briefs, press briefings about recent and relevant research, new databases and a web site that hosts discussions on pertinent and timely topics.

Similar communication and education strategies would be highly desirable for Europe in general and the EECA region in particular. The task would clearly be more complex than in the US simply because of the multitude of languages involved and the significant national differences in both demographic trends and policy making processes.

7. Summary of Gaps and Recommendations

This report provides a summary of some important emerging issues in the EECA region with a special focus on (a) population growth, ageing and decline, (b) enriching population-related policies through explicitly adding human capital considerations, (c) the possible impacts of climate change and (d) internal and international migration.

Populations of the EECA region are experiencing an historically new development population decline in times of peace and at the moment even economic growth that raises great public concerns and for which no population policies currently exist.

In this context a multi-dimensional research gap has been identified that is not only of interest for the EECA region itself but also has potential importance for all countries of the world, as they may enter similar conditions. This multiple research gap has the following dimensions:

A) Building consensus about the ultimate objectives of population-related policies in the context of population decline.

B) Expanding the focus of population policies from the exclusive considerations of population size and age structure to that of human capital, which includes education and health.

C) Considering the longer-term consequences of population decline on a broad array of issues ranging from social cohesion and economic growth to the implications for national security and identity.

D) Identifying and articulating the options concerning internal and international migration, in terms of both policies addressing in- and out-migration and considering the human capital of the migrants.

These efforts for research and policy development need to be made within the context of two other major global trends climate change and continued rapid population growth in other not so distant world regions which are expected to directly affect population trends in the EECA region through changing agricultural potentials and migration pressures.

While accelerating population ageing will probably be the single most important demographic trend in the EECA region over the coming decades, it is not identified as a research gap because, in this respect, the region is lagging behind others and can benefit from the huge body of knowledge and experience in the West that includes best practices and already-tested policies.

Although research on ageing in the region is not seen as a priority, the communication of what

one knows about ageing as well as about population-related challenges in general to policy makers in the EECA region and to the public at large is a high priority and requires concerted efforts. The EECA region combines extraordinarily high levels of population-related concerns with a very low level of public knowledge about the nature of population processes and the options, as well as limitations, for influencing them.

There appears to be sufficient capacity in the region to carry out such population communication efforts if properly organized and funded. The much more innovative research required to address the consequences of population decline and new policy paradigms for dealing with them, however, requires collaboration with some of the best scholars around the world. This is a worthwhile effort because it relates not only to the EECA region but also to the rest of the world, or at least the half of the world population that already has below replacement fertility. As such, this collaborative research and policy development is highly relevant to the upcoming Cairo Plus 20 World Population Conference in 2014.

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