Does Europe need migrants for demographic reasons?

IIASA and the Joint Research Centre (JRC) of the European Commission jointly assess demographic pull and push factors for migration and the potential for integration into European society.

This issue of POPNET highlights selected ongoing research activities of the Centre of Expertise on Population and Migration (CEPAM), which is jointly run by IIASA and JRC. These activities serve as background for the definition of alternative migration scenarios corresponding to possible alternative migration policies, and the assessment of their implications for receiving and sending societies. Going beyond the conventional demographic focus on age and sex, it applies a multi-dimensional approach including educational attainment and labor force participation for assessing the future supply of labor in Europe. Macro-level analysis is complemented by micro-simulation models addressing relevant characteristics that matter for integration, such as language, region of origin, duration of stay, religion, and the education level of mothers.

It is often said that Europe needs migrants for demographic reasons due to its aging population and the resulting decline in the number of conventionally defined working age people. Figure 1 shows that such a decline indeed results from a scenario of constant labor force participation rates and that in the hypothetical case of zero migration, the decline in the labor force is even stronger than in the case of medium migration. But current labor force participation rates—especially of women—differ greatly within the EU being highest in Sweden and lowest in the South and East. If all member states by 2060 approached the participation rates already observed in Sweden today, the future decline in the total labor force would be insignificant in the case of medium migration. But current labor force participation rates—especially of women—differ greatly within the EU being highest in Sweden and lowest in the South and East. If all member states by 2060 approached the participation rates already observed in Sweden today, the future decline in the total labor force would be insignificant in the case of medium migration. Under a combination of the Swedish benchmark with a doubling of the average migration rates observed over the past decades, the total labor force of the EU-28 would actually increase. This illustrates how a multi-dimensional demographic perspective can shed new light on the widely held view that Europe needs migrants to maintain its labor force.

—— Raya Muttarak

Editorial

A dramatic surge in the number of migrants, refugees, and asylum seekers in Europe over the past couple of years, has given rise to public concern about the social and economic impacts of migration. Policy debate has centered on issues such as how to curb the influx of migrants from potential sending countries; how to promote the integration of newly arrived migrants; and how to deal with local-level social and public service impacts. Deriving policy solutions to these questions require an empirical understanding of the drivers of migration, how many and who the migrants are, and what likely future scenarios entail.

Demography is a scientific discipline that makes use of data, models and toolboxes to understand migration and its consequences. This POPNET issue aims to deepen our knowledge of migration in the European context in light of its drivers and the integration of migrants. Demographic forecasts are useful in the analysis of push-pull factors that drive migration from the perspective of both sending and receiving countries. Changing age structure and educational distribution, and their relationship with income growth in European countries, for example, facilitates our understanding of the potential economic and fiscal impacts of population aging. Likewise, the study of environmental migration allows us to forecast how future global environmental changes may influence out-migration from countries susceptible to climate change.

The ability to migrate and respond to environmental change, of course, depends on a population’s adaptive capacity, which is largely determined by demographic characteristics—particularly education. Using multi-state population projection methods, we can forecast what the adaptive capacity of societies will look like under different socioeconomic development scenarios. Methods such as microsimulation can for instance be applied to investigate different dimensions of migrants’ integration patterns including education, employment, and fertility behavior. The results of these exercises allow us to understand how population dynamics interact with socioeconomic and ecological changes in shaping an outlook for the future.

—— Wolfgang Lutz
Estimates of global bilateral migration flows by gender between 1960 and 2015

Global international migration is an ever-changing process. Migrant stock data, commonly used for the analysis of migration patterns, only manages to capture part of the dynamic nature of international migration. The indirect estimation methodology developed and applied in this paper provide migration flow estimates that are demographically consistent with past population totals, births, and deaths, and hence provide a more robust basis for understanding contemporary migration patterns where no comprehensive source of global migration flow data exists.

While estimated global migration flows are shown to generally increase over time, the percentage of the global population that migrates remains fairly steady at 0.65 of the global population over each five year period. This result supports similar findings in the migration literature on the lack of empirical evidence for the acceleration in global international migration, but rather a shift in directions of flows linked to major geopolitical and economic shifts.

The bilateral estimates quantify trends in global international migration flows over the past 55 years for the first time. Traditional migration receiving countries such as Australia, Canada, New Zealand, and the USA, have seen almost continuously increasing numbers of migrants arriving. More recent growth is evident in countries in Northern-, Southern-, and Western Europe. A growing number of migration flows were estimated along migrant corridors between countries in South Asia (such as Bangladesh, India, and Pakistan) to West Asia (such as Qatar, Saudi Arabia, and the United Arab Emirates), and from Asia to North America. Large migrant transitions were also estimated in selected periods within Africa or Eastern Europe during times of armed conflicts or political change.

Guy Abel

Estimated migration flows by gender during 2010-15


[link to the paper]

World population and human capital in the 21st century, 2018 update

As part of the background studies prepared by CEPAM for assessing future demographic trends in all countries of the world, an update of the scenarios presented in the Oxford University Press (OUP) book, which were based on 2010 baseline data, has been performed. This book was produced by the Wittgenstein Centre for Demography and Global Human capital in 2011-13, and published in a 1,000-page book in 2014 (see below). They are the result of merging the well-established methods of multi-dimensional population projections with the largest global expert inquiry about the scientific reasoning involved in defining assumptions on future fertility, mortality, migration, and education in all parts of the world. These expert assessments were blended with statistical extrapolation models to define alternative scenarios for these four components of population change. The scenarios followed the consistent substantive narratives developed in the context of the Shared Socioeconomic Pathways (SSPs), which have been defined by the international research community in integrated assessment analysis and global climate change.

The 2018 update of these population and human capital scenarios uses 2015 instead of 2000 as the jump-off year. This makes it possible to include both the extensive new data sets that were provided by the 2010/11 round of censuses and the updates of recent fertility, mortality, migration, and education trends. This update maintained the long-term assumptions as defined and extensively documented in the OUP book, while adjusting the assumed near-term trends in light of the new empirical information on latest trends.

Since this new volume should serve as a basis for defining a detailed set of 10-15 alternative migration scenarios in terms of demography-based pull and push factors, it only included three “naive” migration scenarios: 1) Constant in- and out-migration rates as observed on average in the period 1960-2015, 2) double those rates, and 3) zero migration. These stylized scenarios can serve as a first basis for quantifying the potential effects of alternative migration trends. As a second step, they will be replaced with more detailed scenarios that correspond to possible alternative migration policies.


The book includes projection results for all countries in the world by age, sex, and level of education and is a comprehensive assessment of the global state of knowledge about future population and human capital trends.

Modelling integration through microsimulation

Immigration alters the population in many ways: demographically, socioeconomically, spatially, and culturally. Hence, projecting the population composition along several dimensions in a coherent and comprehensive manner becomes highly relevant. Furthermore, the integration of immigrants is a complex process driven by a multitude of determinants, such as country of origin, duration of residence, age at immigration, education level, language skills, or even religious affiliation. Such complexity requires new tools to guide policymakers on a wide range of immigration-related issues, including social cohesion, labor market needs and changes, poverty and inequalities, or education and language skill formation. The microsimulation model of the Centre of Expertise on Population and Migration (CEPAM-Mic) is intended to be such a tool. It will be used to study the impact of immigration on the future population of Europe.

The cohort-component model and its multi-state variant commonly used to make population projections are limited by the number of dimensions (or states) that they can efficiently manage. Microsimulation, on the other hand, is a powerful tool that can be used to make population projections when the number of dimensions becomes large, as well as to model complex behaviours in a consistent and flexible way.

This allows CEPAM-Mic to project the population of all EU-28 countries along traditional demographic dimensions, such as age and sex, but also along a number of additional ethnocultural (immigrant status, region of birth, age at immigration, language, etc.) and socioeconomic dimensions (education, labor force participation, and employment).

CEPAM-Mic, developed using the Modgen programming language, is a dynamic, continuous time, time- and event-based microsimulation projection model of the EU-28 population. Its general structure and components are described in a recent IIASA Report (Lutz and Belanger, 2017). The model, which is still in development, allows for the creation of projection scenarios based on assumptions at the general level of each phenomenon and on the characteristic-specific differentials between individuals. Scenarios can then be created to study immigrant integration according to a “what if” approach.


Using microsimulation to evaluate the impact of a better integration of immigrants

Microsimulation provides a flexible and powerful tool that can guide policymakers in their evaluation of immigration and integration policies. For instance, using “what if” scenarios, CEPAM-Mic can be used to measure what the impact of better integration and selection of international immigrants to Europe could be in terms of future total employment rates, in comparison to a simple increase in the number of immigrants. To answer this question, we designed three scenarios where 1) all the parameters are set to follow recently observed trends (reference scenario), 2) the number of immigrants is increased by 50%, and 3) the number of immigrants is not changed, but future immigrants are more educated (selection) and have labor force participation and employment rates equal to the natives (integration).

Due to population aging, the projected European total employment rate is likely to decrease in the future. This is shown in the figure by the green line representing employment evolution over the next 50 years. The other two lines show that a more successful integration of immigrants can be a better answer to this decline than a simple increase in the size of future cohorts of immigrants. In fact, increasing the number of immigrants (blue line) doesn’t change the projected trend much, but a scenario where immigrants are assumed to be better selected and integrated to the labor market (red line), does produce a rapid and significant improvement in employment rates. This is just one of the integration questions that the CEPAM microsimulation projection model will be able to answer.

In terms of total employment rate, increasing immigration has no effect, while selection and integration may improve the situation.


Projected employment rate (15+), EU, 2010-2060, under the assumption of constant labor force participation rates

Fertility among migrant and native-born women in Europe: towards convergence?

Many people in rich, low-fertility countries reckon that migrant women have much higher fertility rates than native women. Are they right? The answer is not straightforward, as fertility among migrant women varies strongly by their country of origin and level of education. On average, the fertility of migrant women in Europe has been declining during the last decades. While migrant women still have somewhat higher fertility than the native women in most countries, the gap between these two groups has been falling and this convergence has mostly accelerated during the recent economic recession.

Figure 1 illustrates this trend with the period total fertility rates (TFR) among migrant and native women in selected European countries with a higher share of migrants. Between 2008 and 2013 the TFR among migrant women fell in each country except Ireland and the fertility decline among migrant women was stronger than among native women in 12 out of 15 analyzed countries. The fall in migrant fertility was especially steep in Southern Europe, which was hit by massive unemployment and economic uncertainty that affected especially the vulnerable groups including migrants. By 2013, fertility rates among migrant and native women in Europe had become almost identical in several countries, including Denmark, Finland, Ireland, and the Netherlands.

In most countries, migrant women still display somewhat higher fertility rates than native women. In France migrant women retained a high TFR of 3.1 births per woman in 2014, which is 70% above the TFR level of native women of 1.8 (Figure 2). The high fertility of migrant women in France contributes considerably to the higher overall fertility level in that country, which, until recently, hovered around 2.0. However, the dominant pattern in Europe has been a shift towards a low fertility among both native and migrant women. With a few exceptions, namely Belgium, France, Slovenia, Sweden, and the UK, period TFR among migrant women in Europe fell to below 2 births per woman.

This long-term shift in migrant fertility has been in part fueled by immigration from lower-fertility countries, especially from Central and Eastern Europe, to the richer parts of Europe. Even more important was a continuous fertility decline among migrants from many middle- and low-income countries such as Bangladesh, India, Morocco, Pakistan, Tunisia, and Turkey (e.g., Dubuc 2012 for the UK). Their fertility decline coincided with the fall in fertility and expanding education in their countries of origin.

After several decades of continuing declines, fertility of migrant women in Europe is much lower than many people imagine. However, that does not mean migrants do not affect population reproduction. The combination of the rising share of women born abroad and their younger age structure means that more than one in five children born in richer parts of Europe are born to immigrant mothers. This share is considerably higher (30% or more) in Austria, Belgium, and Switzerland. Despite their declining fertility, migrants contribute strongly to population renewal in Europe. ■ Tomáš Sobotka

References


Figure 1: Change in the period total fertility rate (TFR) between 2008 (or 2009-2010) and 2013 among migrant and native women in 15 European countries.

Note: Data for the UK pertain to England and Wales only. Data for Greece, Italy, Portugal, and Switzerland are by citizenship of the mother, not her country of birth.

Sources: Own computations based on Eurostat (2017). Data for England and Wales originate from the ONS (2016).

Figure 2: Period total fertility rate among migrant and native women in selected European countries, 2014.

Note: Data for the UK pertain to England and Wales only. Data for Germany, Greece, Italy, Portugal and Switzerland are by citizenship of the mother, not her country of birth.

Sources: Own computations based on Eurostat (2017).
The role of age structure and education in economic growth for Austria, Spain, and Sweden over 200 years

Research conducted in the AGENTA project over the past few years, has assessed the combined effect of a higher level of educational attainment and the change in the age structure of the population on economic growth. This new assessment provides two main novelties to the demographic dividend literature. First, the analysis was done using detailed demographic and economic data for the period 1870-2015 for three European countries (Austria, Spain, and Sweden). Second, given that both the economic and demographic variables have substantially changed over this period, the standard shift-share analysis, which does not consider behavioural responses to changes in wages, interest rates, life expectancies, and household sizes, is insufficient for fully understanding the implications of the change in the population structure on economic growth. Thus, we have developed a model populated by overlapping generations (OLG), in which heterogeneous individuals, who differ in their educational attainment, decide about their consumption of market- and home-produced goods, as well as the labor supply in the market and at home. The model replicates the main macroeconomic indicators of our three European countries from 1870 until 2015 and takes into account the evolution of two main public transfer programs — that is, publicly provided education and pension expenditures.

The left panel in the figure below shows the evolution of per-capita income in Austria, Spain, and Sweden from 1870 until 2015 and its projected evolution from 2015 to 2100. The right panel shows the contribution of changes in the age structure and educational expansion to the observed and projected per-capita income growth depicted in the left panel. The total height of the bars in the right panel shows the total contribution of education and age structure to the rate of growth of per-capita income during the periods 1870-1949, 1950-1979, 1980-2014, and the projected growth from 2015 until 2100. The solid and diagonal bars depict the per-capita income growth associated with changes in the age structure and in the educational attainment of the population, respectively. The sum of the solid and diagonal bars suggests that both factors together (i.e., the changes in the population size and in its educational composition) accounts for between 20 and 50% of the total per-capita income growth before 1950 and during the period 1980-2014, and for less than 10% during the period 1950-1979. The small impact of changes in the age structure and educational composition on per-capita income growth during the period 1950-1979, is explained by a small or negative effect of the change in the age structure of the population on per-capita income. This effect is also projected for the 21st century. Consequently, our simulations suggest that education, rather than the age structure of the population, is the demographic characteristic that will have the biggest influence on economic growth in the future. The future demographic dividend is therefore projected to be an educational dividend. [www.agenta-project.eu/lacomo/upload/publications/agenta-deliverable-5_4.pdf] Alexia Fürnkranz-Prskawetz, Miguel Sánchez-Romero

Evolution and contribution to per-capita income during the period 1870-2100 in Austria, Spain, and Sweden

Notes: The total factor productivity from 2015 to 2100 is assumed to grow at an annual constant rate of 1% in the three countries.

Climate change and migration potential

Scholars of migration research frequently refer to the complexity of understanding the dynamics and drivers of migration. It is even more complex to pinpoint how climate change serves as a push factor driving people out of the areas affected by changing climate conditions. The common narrative of climate change affecting agriculture production, leading to livelihood disruptions and migration as a response to environmental change, does not always hold. In fact, many studies have shown that migration—especially international migration—declines following rainfall or temperature shocks. It is therefore unlikely (or at least, we do not have enough scientific evidence to confirm) that climate change will induce mass migration, for instance, from sub-Saharan Africa, into Europe. This is because migration is a costly process and income and productivity loss due to climatic shocks constrain outmigration rather than promoting it.

Nevertheless, migration is employed as an adaptation response to climatic shocks, although the impact of climate on migration is likely to be indirect. It may go through socioeconomic channels whereby climate affects income or social conditions (e.g., conflict), which then become the push factors driving outmigration. Households whose livelihoods depend on climatic conditions are likely to try different strategies to cope with rainfall and temperature shocks e.g., changing crop types, selling assets, or borrowing, and may eventually opt for migration as a means to diversify their income and livelihoods. This type of migration however, tends to be within a short distance.

The influence of climate change on migration thus depends considerably on whether the areas/households affected rely on climate conditions for their livelihoods, their capacity to adapt, available options for coping, and many other factors. Establishing empirical regularities on climate change as a potential driver of migration is a challenging task given the complex interplays between different drivers of migration and heterogeneities across geographical contexts, population subgroups, and research methodologies. Consequently, estimating and forecasting climate-related migration is still in its infancy. In the context of the CEPAM project, we are conducting a systematic literature review and meta-analysis of empirical literature on climate as driver of migration, aiming to draw common patterns that can be useful for developing narratives for building future migration scenarios. [Raya Mutarar]
Assessing the likely impacts of climate change on future human well-being requires a combination of two kinds of forecasts: how the climate of the future will be different to that of today; and how humans and their societies in the future will differ in terms of numbers, regional distributions, age structures and, most importantly, their capacities to successfully adapt to changing climatic conditions. This includes capacities at multiple levels from individual, to household, community and national level as well as the associated qualities of institutions and levels of economic development. Much work has been carried out in terms of modelling the future climatic conditions[1–3], but very little has been done for modelling the future socioeconomic conditions. Successful adaptation is also dependent on the qualities of institutions and levels of economic development. In this Perspective, we discuss recent progress in the latter field, especially in the demographic metabolism model, and illustrate the potential of multi-dimensional demographic methods for forecasting societies’ adaptive capacities to climate change.

The Working Group II contribution to the IPCC Fifth Assessment Report[4] appropriately summarizes what was the state of the art on this issue: “Most scenario-based assessments super-impose biophysical ‘futures’ onto present-day socioeconomic conditions”. While this statement is based on many studies that in fact did this — for example, the estimation of the likely increase in malaria deaths in Africa by matching the future climate conditions with today’s social conditions[5] — this is a highly unsatisfactory, if not outright misleading, approach. The IPCC report continues saying: “This is useful for assessing how current socioeconomic conditions may need to change in response to biophysical impacts but raises inconsistencies when future socioeconomic states are out of step with biophysical states”. While we agree with the second part of the statement we disagree with the first one because it is known with near certainty that socioeconomic and demographic conditions in the future will be different from today. Thus, we see little value in the purely hypothetical exercise of assessing potential impacts of the future climate on a society that will not exist in the future. This may even result in misleading assessments.

In fact, the IPCC report recognizes this problem by saying “An important challenge, therefore, is to construct impact assessments in which biophysical futures are coupled with socioeconomic futures. A new set of socioeconomic futures, known as Shared Socioeconomic Pathways (SSPs), which are storylines corresponding to the new Representative Concentration Pathways, is being developed to assist this process”. In the following Perspective, we further pursue this approach and discuss the scientific basis for the human core of the SSPs — the demographic model generating the scenarios of changing population size and composition by age, gender, and level of educational attainment. This has been designed to capture key dimensions of future adaptive capacity. We first address the temporal nature of human–climate interactions and describe the toolbox of multi-dimensional population dynamics and the concept of demographic metabolism that translates them into measurable social change. We then provide an example of educational attainment (as one important population characteristic) and its role in enhancing adaptive capacity. We conclude with illustrations of numerical applications of the approach and policy recommendations.

It is important to clarify right at the beginning that in this Perspective we will not address all possible consequences of climate change, but only those that we consider most dangerous to human well-being. These include all threats to human life (death is irreversible), human health (in particular serious and lasting disability) and basic human subsistence (for example, the risk of absolute poverty which causes higher risk of death and disability). Economic losses that affect wealthy people but fall short of pushing them into poverty will not be considered in this analysis since they are caused by different mechanisms. For example, the destruction of expensive houses by storms that rich people built in highly exposed coastal locations is not considered in our approach to studying adaptive capacities. Moreover, there is no consistent measure of total economic losses[6] and the evidence on a negative impact of natural disasters, especially on indirect loss, remains inconclusive[7]. For this reason, our arguments do not relate adaptive capacity to potential economic loss. Instead they relate primarily to loss of life, health and basic livelihood.

In seeking to understand how future societies will be affected by climate change we cannot simply assume they will be identical to those of today, because climate and societies are both dynamic. Here we propose that the concept of demographic metabolism and the associated methods of multi-dimensional population projections provide an effective analytical toolbox to forecast important aspects of societal change that affect adaptive capacity. We present an example of how the changing educational composition of future populations can influence societies’ adaptive capacity. Multi-dimensional population projections form the human core of the Shared Socioeconomic Pathways scenarios, and knowledge and analytical tools from demography have great value in assessing the likely implications of climate change on future human well-being.
Figure 1 suggests that there are multidecadal lags in the system and the humans causing the change through their emissions (at time $t$) are typically of a different generation to those being affected by the consequences (at time $t + x$). Note, however, that these different generations may have different degrees of vulnerability and different capacities and options for adapting to climate change.

Adaptive capacity is not only linked to the capacities of social and economic systems; additionally, there is and will be substantial heterogeneity within populations. Population heterogeneity is captured by observable individual characteristics such as age, gender, education, income, and place of residence, which determine a population’s capacity to adapt$. In other words, similar to the risk of dis-ease, people living in the same community or even within the same household are likely to have differential vulnerability depending on their characteristics. Moreover, the composition of the population with respect to these characteristics is not static but is changing over time.

When addressing societies’ future adaptive capacities, we also need to take account of the complex interactions between human capital (knowledge and skills embodied in individuals) and social capital (institutions, regulations and public policies such as zoning that structure the individual adaptive decisions). While social capital facilitates the formation of human capital, it is enhanced human capital that will produce stronger social capital. Good institutions do not fall from heaven nor can they be imposed by other powers: they have to evolve from an increasingly self-empowered population. There is evidence on how increasing levels of education in a population both at individual and societal levels. Unlike economic forecasts and predictions of human behaviour that are rather volatile and within a few years can move in totally unexpected directions, demographic forecasts are remarkably inert. Population forecasting is reliable over decades because it refers to the slowly changing stocks of people with life expectancies of well above half a century and many characteristics established at a young age (for example, education) that remain unchanged over the life course.

While the tool is demographic in its approach and origin, the applicability goes far beyond what are conventionally thought to be demographic questions. To our knowledge, this is the only existing tool for relevant quantitative social forecasting at a timescale that is applicable for climate change-related analyses.

Demography studies the changing size and composition of populations. As this scientific discipline developed out of what used to be called ‘political arithmetic’, there has been a long tradition of forecasting future population trends for all kinds of government policies ranging from military to health and education systems. Originally,
the approach was to consider the population as homogeneous and projection was simply done by applying an assumed growth rate to a given initial population size. Although birth and death rates vary strongly with age, under conditions of rather stable age structures, this was a useful approximation and it is still widely used, for example, in animal demography. For human populations, however, age structures in Europe became irregular due to fertility declines and the strong fluctuations in births and deaths associated with World War I, the Spanish Flu and the Great Depression. Therefore, since the middle of the twentieth century, most population projections have been based on an age-specific model, called the cohort-component model, which projects populations along cohort lines (for example, the cohort aged 20–24 in 2015 becomes 25–29 in 2020) adjusting for the three principal components of population change: fertility, mortality and migration.

While the model differentiating population by age and gender has been widely used, multi-dimensional population models can actually sub-divide populations by further observable characteristics that are considered relevant and whose distribution can influence population dynamics. In terms of methods, projection is similar done along cohort lines (for example, the proportion of women with high school graduation aged 25–29 in 2015 is a good predictor of women aged 60–64 with high school graduation in 2050 after accounting for mortality and migration). Since in most countries both fertility and mortality tend to vary greatly by level of education, explicitly accounting for educational differences also changes the population forecasts.

This model of population change along cohort lines has also been generalized to a model of social change with predictive power called demographic metabolism21. Building on the earlier work of the sociologist Karl Mannheim22 and the demographer Norman Ryder23, this concept operationalizes the age old view that societies change as a function of new generations, that are different in relevant ways, successively replacing older ones. The notion of demographic metabolism was introduced by Ryder, who saw this replacement through new generations with different perspectives and characteristics as the only mechanism of social change. In his view “a population whose members were immortal would resemble a stagnant pond”24. The generalization by Wolfgang Lutz25 further allows for individuals to change over their life cycle and thus model the combined effects of new and different cohorts moving up the age pyramid as time passes while certain proportions within each cohort change from one sub-population to another — such as from child to secondary to tertiary education. Capturing these movements between different sub-categories of each cohort through a set of age-specific and gender-specific transition probabilities allows for the application of the powerful methods of multi-dimensional mathematical demography mentioned above26,27. Hence, the model of demographic metabolism can describe and forecast under certain assumptions how societies change as a consequence of the changing composition of their members with respect to certain relevant and measureable characteristics.

This social change through successive generational replacement can be illustrated in the form of three-dimensional age pyramids. For the case of the Republic of Korea, Fig. 2 shows in different colours the proportions of men and women in different age groups who have different levels of education. In 1970, the Republic of Korea was still a poor developing country with a very young population structure and only the younger age groups benefitted from then recent education expansions. Virtually all women above the age of 50 had never attended any school. For the pyramid in 1990, we clearly see that the entire education pattern has essentially moved up the age pyramid by 20 years. By then, the better-educated younger cohorts had reached the main working ages which also was a factor driving the rapid economic growth of that time27. By 2010 the education structure had moved up another 20 years and as a consequence of improved female education, birth rates strongly declined. This mechanism of cohorts moving up can be extended into the future as the pyramid for 2030 shows. By then, even the elderly in Korea will have some education and the uneducated population will essentially disappear.

This model does not only hold for the changing educational composition. It can also be applied to other relevant characteristics that tend to be persistent along cohort lines. For instance, the entry of new generations who have grown up being exposed to environmental education and post-materialistic values28,29 can influence environmental attitudes and environmental behaviour at the societal level. The concept of demographic metabolism has already been applied to modelling and forecasting the changing prevalence of attitudes towards gender roles28,29, Homosexuality30 and European identity31, where younger and older birth cohorts differ mainly because they were socialized in different social environments.

There are also relevant cohort effects with respect to health. Owing to social and economic development over the second half of the twentieth century, there is strong evidence showing that younger cohorts, especially those born after 1960, are healthier than the older ones at any given age. This pattern is particularly discernible in old age both for physical capability and cognitive function32–34. Although the elderly are particularly vulnerable to certain weather extremes such as heat waves, and population ageing is expected to amplify the risks associated with heatwaves35, the process of demographic metabolism suggests that older people in the future will not only be better educated but will likely be healthier and have better cognitive function than those of today. This implies that the healthier and better informed subsequent cohorts will be able to cope better with the health challenges associated with climate change. The central role of the changing composition of human populations in socioeconomic development thus has significant implications for the ability to cope with the changing climate.

In fact, adaptation practices have been categorized along different dimensions such as by spatial scale, sector, type of action, climatic zone, baseline development level and actor36. Furthermore, adaptations involve anticipatory and reactive actions and include adaptation to short-term weather variability and extreme events and to longer-term climate change including sea-level rise. While heterogeneity in the populations’ characteristics of today determine coping responses to current weather variability, anticipating the future population composition through the process of demographic metabolism allows for forecasting societies’ capacity to adapt to climate change in the longer term. For instance, changing educational composition in the population is highly relevant to societies’ adaptive capacity as explained below.

**Education changes behaviour and reduces vulnerability**

Regarding how precisely education contributes to vulnerability reduction, we build the argument upon a well-established causal link between education and health37–41. Education influences our cognitive function, attitudes, and behaviours and equips us with better social and economic opportunities. Schooling directly enhances cognitive development through increasing the synaptic density in relevant parts of the brain. Not only experimental and observational studies have provided confirmation of a robust effect of education on executive functioning and cognitive abilities42–45; neurocognitive and neuroimaging studies have also shown strong associations between adaptive changes in the brain and learning experience in classrooms46,47. Abstract cognitive skills such as categorization and logical deduction acquired through schooling enhance the way educated individuals reason, solve problems, assess risks, and make decisions48,49 — those skills and qualities that are highly relevant for adapting to climate change. Similarly, since education improves knowledge, understanding of complex information, efficiency in allocation of resources, and capacity to plan for the future50–52, this can help in making better choices on adaptation options, such as what insurance to take out or how to reinforce building structure.
Further, education indirectly reduces vulnerability through mediating factors such as improved socioeconomic status and social capital. The increased income, for instance, allows people with higher levels of education to make not only the right but also costly strategic investments to reduce vulnerability. With greater social capital and larger social networks, the more educated also have better access to information and social support which facilitate coping responses and undertaking of adaptation measures. Through these direct and indirect mechanisms, there is sufficient ground to assume that education plays a role in reducing vulnerability and enhancing adaptive capacity.

A cautionary note is required on the interplay of the effects of education and income on vulnerability. There is a widespread view that income or GDP per capita is the most important aspect of socioeconomic development and also that it is directly related to vulnerability and adaptive capacity. Many empirical studies indeed find an association between the two\textsuperscript{55–57}. The alternative hypothesis, however, is that the cognitive enhancement associated with education is the common cause of higher income and economic growth\textsuperscript{55,58}, the more educated also have better access to information and vulnerability thus is spurious. Testing these contradictory hypotheses is beyond the scope of this Perspective. There is however evidence based on a study of disaster-related mortality in 167 countries over the period 1970–2010 confirming that female education is the most significant factor resulting in fewer deaths from climate-related disasters after controlling for the effect of income\textsuperscript{59}. Most extant studies on human loss from climate hazards nevertheless commonly consider either only GDP\textsuperscript{55–57} or a composite indicator such as Human Development Index\textsuperscript{55}. In fact, when the latter is decomposed into its three elements (income, education and health)\textsuperscript{50}, the results show that countries with higher average levels of education did experience lower disaster mortality, while income did not play a significant role\textsuperscript{60}.

In this context, it is also enlightening to look at the rich body of literature studying child mortality as an aspect of vulnerability. Multivariate (controlling for many relevant factors) and multi-level (stratified by household, community, and national level) studies have clearly come to the conclusion that for child survival, mothers’ education matters more than household wealth as measured by various indicators\textsuperscript{61,64}. Another series of studies has tried to explicitly test the importance of education with respect to disaster vulnerability after controlling for income and vice versa, asking what matters more, income or education? Generally, the result was that for vulnerability, mind matters more than money\textsuperscript{62,65–68}.

With all this evidence at the micro level, it is not surprising that the vulnerability-reducing role of education also dominates at the macro level. Recent empirical studies have demonstrated consistent evidence showing that countries and communities with higher average levels of education experience lower vulnerability to natural disasters\textsuperscript{69}. This applies to both developed and less developed countries as well as different dimensions of vulnerability including preparedness and responses to disasters, mortality, morbidity, coping strategies, recovery from disasters and other relevant outcomes. With respect to disaster preparedness (measures taken to prepare for and reduce the impacts of disaster such as having a family evacuation plan, emergency supply kit, and disaster insurance), direct experience of a disaster is undoubtedly one key driver of disaster risk reduction efforts. However, in the absence of disaster experience, it has been reported that the highly educated exhibit higher levels of disaster preparedness- ness thanks to their better abstraction skills in anticipating the consequences of disasters — that is, thinking about the counterfactual that has not yet been experienced\textsuperscript{69,70}. Indeed, better disaster preparedness among more educated communities can provide protective effects when a disaster strikes. Not only were educated individuals more likely to survive and had a lower risk of injuries for example, from the 2004 Indian ocean tsunami\textsuperscript{71,72}, communities and countries with higher average levels of education also experienced much lower losses in human lives from climate-related disasters\textsuperscript{60,62,65,73}. The protective role of education further extends to morbidity associated with natural hazards, especially mental health, with more highly educated individuals showing a lower prevalence of distress, depression and post-traumatic stress disorder following a disaster\textsuperscript{71,74–76}.

Likewise, since education facilitates decision-making related to disaster risk reduction measures such as construction practices and location decisions, damages to residential property and economic losses are found to be lower in communities and countries with higher mean years of schooling or higher literacy rate\textsuperscript{65,77,78}. Furthermore, with better access to loans and credits, as well as larger assets and social networks which provide a wider portfolio for coping strategies, households or communities with higher average levels of education are better able to maintain their welfare and level of consumption after being affected by disaster shocks\textsuperscript{79–81}.

With respect to adaptation to the changing climate, education is indeed highly relevant since individuals with higher levels of education are also more likely to have better awareness of climate risk\textsuperscript{82}. Given that climate change is a relatively new form of risk and a rather sophisticated scientific subject, education facilitates

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Figure 2 | Age and education pyramids for the Republic of Korea 1970–2030 in 20-year intervals. Colours indicate highest level of educational attainment. Children aged 0–14 are marked in gray. The blue line links the identical birth cohorts at different points in time when they are of different ages but maintain their highest education attainment level as it is typically established before age 30.
the understanding of new ideas and concepts related to climate variability. Accordingly, a wide range of studies reported a higher likelihood of carrying out adaptation actions such as changing crop varieties, planting and harvesting dates, methods of farming and using improved type of seed among better educated households.\textsuperscript{85–87} Education also increases options to diversify livelihood and sources of income when facing climate pressure.\textsuperscript{88} For instance, migration as an adaptation strategy to cope with livelihood disruptions due to environmental change often involves more educated members.\textsuperscript{89} With the focus of this Perspective on ‘dangerous’ climate change, given the consistent evidence on the protective role of education in reducing disaster vulnerability\textsuperscript{90} we can conclude that better educated societies are more resilient and hold greater adaptive capacity to climate change. This insight is relevant when deciding what qualities and characteristics of populations should be forecasted when assessing future adaptive capacities in the context of global socioeconomic scenarios used in the analysis of climate change. Because these qualities go far beyond the mere consideration of population size — as has been done in earlier work based on the Special Report on Emissions Scenarios\textsuperscript{90} — the new SSPs approach has the populations fully stratified by age, gender and level of education.

**Scenarios of future adaptive capacity**

The qualitative narratives of the SSPs describe alternative future worlds with respect to socioeconomic development that matters for both mitigation and adaptation challenges. These narratives have been translated into consistent quantitative scenarios covering future trends in areas ranging from population and education\textsuperscript{91} to GDP growth\textsuperscript{92}, urbanization\textsuperscript{93}, energy and land use. Here we will only focus on what has been termed “the human core of the SSPs”\textsuperscript{94,95} because it directly addresses the future of human beings, including their changing numbers and regional distributions as well as their health and empowerment through education.

The calibration of the SSPs was carried out in tandem with a major new effort to summarize the international state of the art with respect to the drivers of future fertility, mortality, migration, and education trends. Over 550 international population experts participated in an attempt to assess alternative substantive arguments that pertain to future demographic trends. The results were subsequently translated into alternative demographic assumptions for all countries of the world until 2100.\textsuperscript{95} The specifications of these demographic scenarios followed the general narratives of the SSPs. More specifically, the medium scenario of these new expert argument-based projections — which is considered the most likely in terms of future fertility, mortality, migration, and education trends — was set to be identical with SSP2 which reflects a ‘middle of the road’ scenario.

Figure 3 shows the global population and education trajectories for the three SSPs. The scenario story lines in SSP1 envisage a rapidly developing world with more education, lower mortality, and a more rapid fertility decline in countries with high fertility. For today’s rich OECD countries this scenario, based on economic prosperity, assumes medium fertility as couples are likely to be better able to realize their childbearing aspirations. SSP3, in contrast, assumes increasing global inequality in the context of social and economic stagnation leading to stagnant school enrolment rates and delayed demographic transition. For the rich OECD countries the picture is different, with adverse economic conditions assumed to result in low fertility. As Fig. 3 illustrates, by 2050 SSP1 and SSP3 already differ greatly in terms of resulting population size and educational structures. Total population size will differ by as much as 1.5 billion over the coming four decades (8.5 billion for SSP1 and 10.0 billion for SSP3 in 2050). Given the very different educational compositions of the world population, it is indeed plausible to assume that these scenarios refer to very different future levels of human well-being. By the end of the century, SSP1 depicts a world of less than 7 billion people with a relatively well-educated and therefore healthy and wealthy population, who will be better able to cope with the consequences of already unavoidable climate change. In contrast, SSP3 shows a world of almost 13 billion people who are less educated, less healthy and less wealthy making them more likely to be much more vulnerable to environmental change.

These differences in total population size are mainly due to a different educational composition for women of reproductive age because fertility rates differ by level of education with more educated women in developing countries wanting and having better means to actually have fewer births. Lutz and KC\textsuperscript{20} recently showed that by 2050, different education scenarios alone result in a difference of about one billion. The SSPs also alter the levels of education-specific fertility and thus produce an even larger inter-scenario difference. As can be expected, the middle-of-the-road SSP2 scenario which essentially assumes a continuation of current trends (as they look most likely from today’s perspective) results in an intermediate picture, with the world population reaching a peak of around 9.4 billion during the second half of this century, followed by a slight decline to 9 billion by the end of the century.

A recent study of disaster fatalities translated estimated determinants of disaster vulnerability — including education — to the SSP1 and SSP3 scenarios for the rest of the century.\textsuperscript{20} It was shown that due to the educational expansion under the rapid social development path in SSP1, disaster mortality will be much lower — even in the case of increasing climate-related hazard — than in the SSP3 scenario, where underinvestment in education leads to high population growth and heightened vulnerability.

**Discussion and policy implications**

Despite the theoretical argument and solid empirical evidence showing that ensuring universal education can potentially be a powerful measure for reducing dangerous impacts of climate change

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*Figure 3 | World population scenarios by level of educational attainment to 2100 on the basis of Shared Socioeconomic Pathways (SSP1, SSP2, SSP3). Data from ref. 95 for base year and ref. 91 for the scenarios.*
on human life, health and basic subsistence, in practice public and internationally driven adaptation efforts have been concentrating on hard structural adaptation measures\(^{96,97}\). Hard adaptation such as reinforcing buildings or constructing dykes and seawalls are often capital-intensive, large, complex, and inflexible technology and infrastructure. On the contrary, a soft adaptation path involves behavioural changes or planning and policy adaptions, empowering of local communities, simple and modular technologies owned by local people as well as natural infrastructure such as ecosystems and forests\(^{98}\). Soft adaptation measures hence are less expensive and are relatively more flexible to respond to alterations in climate change projections. While it has been argued that optimal adaptation paths require synergies between hard measures and non-technological adaptation options\(^{99,100}\), being more tangible and visible, hard structures remain prominent in planning measures. Subsequently, analysis of adaptation costs or estimation of adaptive capacity typically only considers economic capacity to install hard structural measures since this is easier to quantify\(^{101,102}\). Instead, empowerment through education in order to enable flexible and informed adaptive decisions in the future should be made a priority in this field.

Given that investing in human capital not only has a large number of social, economic and health benefits but also is an efficient adaptation strategy, knowing the educational distribution also implies understanding adaptive capacity of a society to a certain extent. Indeed, we have shown that multi-dimensional population projections have a forecasting property which can be incorporated into climate change modelling. Stratification by age, gender and level of education is necessary not only because these characteristics matter for population dynamics (that is, fertility, mortality and migration) but they are also relevant to vulnerability and adaptive capacity. Besides differential vulnerability by education, mortality from extreme climate events and natural disasters also differs substantially by age and gender. For example, with lower capacity to adapt coupled with limited ability to thermoregulate body temperatures, the majority of 70,000 deaths in 12 European countries during the heat wave in summer 2003 comprised older persons aged >65 years\(^{103}\). Likewise, in certain hazard events such as tsunami where physiology plays a key role in survivorship, women, children aged <5, and older persons aged >70 years had a clear mortality disadvantage\(^{104}\). Mortality risk from flood events, on the other hand, is higher for males than for females\(^{105,106}\). Such demographic differential vulnerability needs to be taken into account in projections of climate change vulnerability and adaptive capacity. The above described SSPs offer a valid way for explicitly incorporating these aspects into assessments of future adaptive capacity.

In conclusion, this Perspective shows that the model of demographic metabolism can be used to meaningfully produce forecasts of human and associated socio-economic capabilities for several decades into the future. This long time horizon is very different from economic or technological forecasts which have much higher uncertainty, even in the shorter term. The reason for the longer time horizon of the demographic metabolism model lies in the fact that the human life span is now seven to eight decades in most countries. Given that many relevant characteristics of people (such as educational attainment and basic attitudes) are formed at young ages and tend to be stable over the rest of the life course, we are able to predict adaptive capacities associated with these characteristics for many decades ahead. Taking aggregate future human capital projected in this way as a proxy for future socio-economic and institutional capacity, the demographic metabolism model thus offers a meaningful way to quantitatively forecast societies’ future adaptive capacity to climate change. This offers the possibility for analyses that actually match future climate conditions with future socio-economic conditions, thus avoiding the misleading assumption that the climate of the future will meet the societies of today. This is an essential prerequisite for trying to assess how dangerous climate change will be for future human well-being.

References available at [www.nature.com/articles/nclimate3222](http://www.nature.com/articles/nclimate3222).

Acknowledgements
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Education and health are priorities for sustainable development

In his Inaugural Article published in *Proceedings of the National Academy of Sciences (PNAS)*, Wolfgang Lutz argues that a successful global transition to sustainability will require an urgent emphasis on two core priorities that underlie and facilitate the achievement of all other goals: *sola schola et sanitate* – only education and health. With *sola schola et sanitate*, Lutz draws on Martin Luther’s sola principles – only scripture, only faith, and only grace – which describe the essence of the Reformation, which started exactly five hundred years ago.

Research has shown that basic education and basic health are essential prerequisites for ending poverty and hunger, for improving institutions and social participation, for voluntary fertility declines and ending world population growth, for changing behavior and adoption of new and clean technologies, and for enhancing adaptive capacity to ineluctable climate change.

In another *PNAS* issue, Lutz was invited to write a commentary on how population growth relates to climate change. Lutz W (2017). Global Sustainable Development priorities 500 y after Luther: *Sola schola et sanitate*. *PNAS* 114 (27): 6904–6913. [pure.iiasa.ac.at/14674]


Education First! From Martin Luther to Sustainable Development

In this new book by Wolfgang Lutz and Reiner Klingholz, the authors argue that education is a key prerequisite for modern social and economic development, as well as for the successful achievement of the Sustainable Development Goals (SDGs). It makes the case for a global alliance on education as a strategy for future wellbeing on the planet.

“This scholarly yet highly accessible volume by two renowned experts shows why education is under threat, and what should be done to counter this. The authors mobilize a fascinating array of compelling historical and current evidence, which demonstrates the centrality of education to the creation of flourishing societies and show the dire consequences of its neglect. Anyone interested in education and development should read this book.” — Professor Ian Goldin, University of Oxford

“This book shows convincingly that education has been a key driver of human development in all parts of the world. Quality education for all — especially for all girls — will be absolutely essential for achieving the Sustainable Development Goals.” — Ban Ki-Moon, the 8th Secretary-General of the United Nations.


Demographic Data Sheets

Russian Demographic Data Sheet 2016

The first Russian Demographic Data Sheet provides a comprehensive look at key demographic indicators and main population trends for all subjects of the Russian Federation, including population projections for 2035.

The dataset combines data for the national level, all regions and districts, and features maps, population pyramids, rankings, graphs, and a glossary. It pays special attention to the importance of alternative indicators of population aging for current and future population changes across Russia. It covers assumptions about fertility, mortality, migration, and population structure, including population aging and changes.

The new projections show huge regional differences among demographic indicators across the vast country, particularly in terms of life expectancy. The data also shows that Russia’s population will decline slightly in the next 20 years, even with the assumption that in-migration will exceed out-migration by around 250,000 people per year. Without this migration, the population would have declined by more than 5 million people by 2035.

The project is a collaboration between IIASA, the Russian Presidential Academy of National Economy and Public Administration (RANEPA), and the Russian Federal State Statistics Service (Rosstat), led by Sergei Scherbov.

The data sheet is freely available online in English and Russian (www.iiasa.ac.at/pop/Datasheets).

Aging Demographic Data Sheet 2018

The first Aging Demographic Data Sheet comprehensively presents new measures of aging, developed at IIASA, for all countries in the world and world regions, including projections for 2050.

The Aging Demographic Data Sheet 2018 shows population aging trends and projections until 2050 with a focus on traditional and alternative indicators of population aging for current and future population changes across the world.

The new measures recognize that groups of people in different countries and in different years may have aged at different rates. They do this by taking differences in remaining life expectancy and other changing characteristics of people into account. Conventional measures of population aging provide a biased picture of the extent of population aging in the future, because they ignore these important differences.

The dataset shows the magnitude of this bias by comparing estimates and forecasts of population aging that adjust for differences in relevant characteristics of people, with analogous measures that do not.

The dataset presents adjusted and unadjusted data for all countries of the world and all continents. It features ranking and graphs, and contains a detailed glossary. It is based on the UN World Population Prospects 2017 revision.

The data sheet is freely available online (www.iiasa.ac.at/pop/Datasheets).
**Aging research**

**Population aging is likely to end before 2100 in China, Germany, and the USA**

New measures of aging, combined with UN population projections, show that population aging could peak by 2040 in Germany and by 2070 in China, according to a new study published in the journal PLOS ONE. In the USA, the study shows very little population aging at all in the coming century. Iran, which had an extremely rapid fall in fertility rate in the last 20 years, has an unstable age distribution and the results for the country were highly uncertain. In the last decade, Sergei Scherbov and Warren Sanderson have published a large body of research showing that the very boundary of “old age” should shift with changes in life expectancy, and have introduced new measures of aging that are based on population characteristics, giving a more comprehensive view of population aging.

**Wittgenstein Centre measures of aging included in UN report**

New measures of aging developed by Sergei Scherbov and Warren Sanderson are incorporated in the new World Population aging 2017 report highlights published by the United Nations Population Division. This milestone reflects a growing recognition that traditional measures no longer reflect the changing face of aging around the world. The new UN report incorporates the IIASA approach to define a dynamic old age threshold based on changes in life expectancy—rather than a fixed chronological age.

**Vienna Yearbook of Population Research**

The latest Vienna Yearbook of Population Research looks into new measures of aging, building on research by Warren Sanderson and Sergei Scherbov developed at the Wittgenstein Centre.

In the last decade or so, new approaches to thinking about and measuring population aging have been developed. These approaches share the view that aging should be defined more by how people are living than by how long they have been alive. At each age, there are many aspects of people’s lives that are relevant to the study of population aging, including how long they expect to live, how healthy they are, what activity limitations they have, how well they function physically and cognitively, and whether they receive a state-funded pension. These dimensions of people’s lives differ across generations, across countries, and across subgroups of the population. The new 60 is not the old 60 when aging is viewed from a more holistic perspective. In recognition of this insight, the Wittgenstein Centre brought experts on aging together in November 2014 to discuss new ways of thinking about and measuring population aging. This volume is the result of that conference.

Guest editors of this special issue were POP scientists Warren Sanderson and Sergei Scherbov. Together they have developed new methods of the analysis of aging that take characteristic of people into account. Their research has been published in major scientific journals, including Nature and Science. Scherbov is also a winner of a prestigious Advanced Grant from the European Research Council (ERC) to study, among other things, the extent to which advanced societies are actually aging in multiple dimensions, including health, cognitive abilities, and longevity.


**New age- and gender-specific data on income, transfers, consumption and saving**

National Transfer Accounts (NTA) aim to improve our understanding of the economic consequences of demographic changes by introducing demographic information into the System of National Accounts. The European NTA 2010 data provide comprehensive and detailed age- and gender-specific economic data on income, transfers, consumption, and saving in the year 2010 for 25 EU countries. These data are predestined to study the relationship between age, economic activity, and the organization of intergenerational transfers. The data is provided in the framework of the European Research Council (ERC) funded AGENTA project at the Wittgenstein Centre.

Explore and download European NTA with the NTA 2010 data explorer. [www.wittgensteincentre.org/ntadata](http://www.wittgensteincentre.org/ntadata).
The Role of Education in Enabling the Sustainable Development Agenda

This book explores the relationship between education and other key sectors of development in the context of the new global Sustainable Development Goals (SDG) agenda. While it is widely understood that there is a positive relationship between education and other dimensions of development, and populations around the world show a clear desire for more and better education, education remains an under-financed and under-prioritised sector within development. When education does make it onto the agenda, investment is usually diverted towards increasing access to formal schooling, without focusing on the intrinsic value of education as a tool for development within the international development community more broadly. Bengtsson S, Barakat B, & Muttarak R (2018). The Role of Education in Enabling the Sustainable Development Agenda. Routledge. [pure.iiasa.ac.at/id/eprint/15144/]

Awards 2017

Guy Abel received the China National 1000 Youth Talent Award 2017. Caroline Berghammer received the Austrian Science Fund’s Elise Richter grant to study trends in the education gap in family behavior across Europe. Isabella Buber-Ensser, Eva Beaujouan, and Zuzanna Brzozowska received the Best Poster Award at the Generations and Gender Programme 4th User Conference for their Poster “Running against the clock: Postponement and recuperation of childbearing unions”.

Mengni Chen has received the Tang Kwong Leung Social Work Thesis Prize 2016-17 from the Faculty of Social Science, The University of Hong Kong, honoring her dissertation on fertility trends in high-income Asian societies. Ivan Frankovic and Daniela Weber were invited as Austrian delegates to the prestigious 6th Lindau Nobel Laureate Meeting on Economic Sciences. Bernhard Hammer, Lili Varga, and Tanja Istenic received the Demografie-Preis 2016/17 from the Stiftung für die Rechte zukünftiger Generationen (SRzG) for their work on the Dissolution of the Generational Contract in Europe.

Roman Hoffmann received the 2017 Bank Austria research award for his dissertation on the impact and utilization of integrated community health programs in developing countries based on evidence from the Philippines. Anna Matysiak’s article “Country-Specific Conditions for Work and Family Reconciliation: An Attempt at Quantification”, co-authored with D. Weziak-Bialowolska, published in European Journal of Population 32(4): 475-510 was included in the “Change the World” selection of articles created by Springer Nature.

Tomáš Sobotka received the Allianz Young Talent Prize from Deutsche Gesellschaft für Demographie (DGD), the third award honoring her dissertation on the international perspective on aging and cognitive decline.

Reconstructing educational attainment of populations in the 20th century

The EDU20C project reconstructs the changes in the educational composition of populations by age and sex during the 20th century for a large number of countries using the methodology of back-projections. EDU20C is a project of the Human Capital Data Lab at the Wittgenstein Centre lead by Anne Goujon, and is funded by the Anniversary Fund of the City of Vienna for the Austrian Academy of Sciences. The reconstructed data is now available and can be accessed at: www.edu20c.org

7th and 8th European Research Council (ERC) grants to the Wittgenstein Centre

Consolidator Grant for Marc Luy: Levels and Trends of Health Expectancy - Understanding its Measurement and Estimation Sensitivity

The aim of the project is to better understand the methodological features of Health Expectancy (HE). The general understanding is that this indicator simply extends the average life expectancy by one dimension. Technically, this is correct because the total number of life years is divided into two quality dimensions: life years spent in good health and those spent in poor health. However, incorporating this additional dimension to the life table makes the indicator extremely sensitive to certain measurement and estimation issues. This is an important issue because HE is not only increasingly being used in health research, but it is also a major structural indicator in health policy. The project team will assess the sensitivities of HE by direct empirical application to the most important research questions. These include the expansion-versus-compression-of-morbidity-debate, as well as differences between socioeconomic status groups, women and men, and European populations.

Advanced Grant for Wolfgang Lutz: The Demography of Sustainable Human Wellbeing

The project aims to develop new indicators for long-term human wellbeing that include feedback from environmental and other changes. The new research project will detail a new holistic indicator, labelled Empowered Life Years (ELY), and explore its viability and acceptability as an ultimate end measure for sustainable development. The ELY indicator is based on the often forgotten fact that being alive is a fundamental prerequisite for enjoying any quality of life. Since mere survival however, does not say much about quality of life, this project proposes to combine life expectancy with empowerment indicators such as health, literacy, freedom from poverty, and happiness. As a criterion for sustainable development, the new indicator should not decline over time even if feedback from socioeconomic and environmental changes, including climate change, are factored into the model.
Various updates from WIC

Wittgenstein Centre Progress Report
The Wittgenstein Centre Progress Report will cover the achievements of the Wittgenstein Centre in the years 2011-2017 during which the funding of Wolfgang Lutz’ Wittgenstein Award (Austrian Science Fund (FWF) Z171-G11) was active. The report is scheduled to be published in April 2018.

Meeting highlights

WIC celebrations
The Wittgenstein Centre celebrated anniversaries of three distinguished colleagues this year.

In honor of Wittgenstein Centre Founding Director, Wolfgang Lutz’ 60th birthday, the Wittgenstein Centre and its three pillars, IIASA, the VID at the Austrian Academy of Sciences, and the Vienna University of Economics and Business, hosted a scientific surprise conference under the title “Variations of the themes of Wolfgang Lutz” from 5 to 7 December 2016.

Sergei Scherbov was honored with a collection of annotated reprints of key publications for his 65th birthday that was presented to him during a jour fixe in August 2017.

A small surprise symposium was organized for Dimiter Philipov on the occasion of his 70th birthday in October 2017.

Training course Bangkok
Between 20 November and 1 December 2017, Sergei Scherbov gave a hands-on training course on “Demographic Analysis with Applications to Aging Societies”. Designed for PhD students, researchers and lecturers working in fields related to population studies, this workshop strengthens basic analytical skills and advanced techniques for demographic analysis with a special emphasis on new ways to measure aging. As in previous years, this course was organized together with Chulalongkorn University in Bangkok—this year in the framework of the European Research Council (ERC) funded Reaging project. For the 2018 dates and application, please follow the announcements at www.iiasa.ac.at/POH.
Demography, Human Capital, and Economic Growth

From 19-23 June 2017, the Wittgenstein Centre, in collaboration with the Asian Demographic Research Institute hosted the first Asian Summer School at Shanghai University. A total of 20 junior and mid-career scientist from around the world were acquainted with how demographic trends and improving educational attainment impact economic growth around the Asia region.

This also included discussions about the so-called first and second demographic dividends, and on the role of human capital as a determinant of economic development. Leading international scholars from Asia and Europe gave lectures providing overviews of the state of knowledge in these fields.

Call for papers

Wittgenstein Centre Conference 2018 - 3rd Human Fertility Database Symposium
"Fertility across time and space: Data and Research advances",
5-7 December 2018,
Vienna, Austria.

Hosted by the Vienna Institute of Demography/Austrian Academy of Sciences together with the Max Planck Institute for Demographic Research

Deadline for submission: 1 June 2018

More information
www.oeaw.ac.at/vid/events/calendar/conferences/fertility-across-time-and-space

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AGENTA final conference

Under the theme "Economic consequences of population aging and intergenerational equity", this final conference of the European Research Council (ERC) funded AGENTA project, took place from 20 to 22 November 2017 at the Wittgenstein Centre. The participants discussed the past and future of taxes, public transfers, and services in light of demographic change in the European Union. The conference also included a one-day National (Time) Transfer Accounts Workshop. The AGENTA project was lead by Alexia Fünfkranz-Prskawetz. The presentations are available at www.oeaw.ac.at/en/vid/events/calendar/conferences/agenta-final-conference/

AGENTA project final conference participants

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Calls and conferences

AGENTA project final conference participants

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