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Working paper

Updated demographic SSP4 and SSP5 scenarios complementing the SSP1-3 scenarios published in 2018

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Abstract

The set of Shared Socioeconomic Pathways (SSPs) contains as its "human core" a set of five demographic scenarios giving population projections by age, sex and level of education based on assumptions that are consistent with the SSP narratives. The first set of these demographic scenarios was produced in 2013 and published in 2014 with the assumptions based on a broad global expert solicitation exercise. In 2018 the projections were updated using new 2015 baseline data – instead of 2010 in the earlier version – and adjusting near-term assumptions while largely maintaining the long term assumptions. This 2018 update was only published for SSP1, SSP2 and SSP3, which are the ones mostly used in the demographic community. This paper adds the updated projections for the SSP4 and SSP5 scenarios to make the set of the updated SSPs complete.

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Background and introduction: Adding SSP4 and SSP5

The Shared Socioeconomic Pathways (SSPs) are a set of scenarios that have been produced by a consortium of international global environmental change research groups to quantitatively describe alternative possible future pathways in terms of mitigative and adaptive capacity to climate change until the end of this century (O'Neill et al. 2017). While the SSPs cover many aspects of society and the economy ranging from energy and technology to poverty and governance, the also include a demographic module – which has been labeled "the human core of the SSPs" – presenting alternative scenarios by age, sex and level of educational attainment that are consistent with the general SSP narratives (KC and Lutz 2014).

The first set of SSPs population scenarios by age, sex and level of education for 201 countries in the world and educational attainment scenarios by age and sex for the period 2010-2100 were published in the SSP-database Version 1.0 on March 2013 along with a peer-reviewed publication. (KC and Lutz 2014) This is the official SSP version used by the research community globally. The current SSP-database has been updated to Version 2.0 (see weblink[1]). IIASA and WIC published the SSP's population dataset with minor updates in 2014 on their website. (WIC 2015; Lutz, Butz, and KC 2014) More recently, the second update in 2018 of the SSP population scenarios has been published as a result of a joint research project between JRC and IIASA. (WIC 2019; KC et al. 2018; Lutz et al. 2018). In this context, only SSP1-2-3 were published following the research plan of this joint project, which primarily focussed on migration and development. In the present report, we complement this 2018 report by adding SSP4 and SSP5 and present the full data set all five SSPs to the SSP research community as the "2018 update".

The population scenarios as defined in the original 2013 assessment (Lutz, Butz and KC 2014) are the result of merging the well- established, but still infrequently used methods of multidimensional population projections with the largest ever global expert inquiry into the scientific reasoning involved in setting assumptions on future fertility, mortality, migration and education for all parts of the world. These expert assessments were then blended with statistical extrapolation models to develop alternative scenarios for these four components of population change. These scenarios followed the substantive narratives developed in the context of the SSPs (Shared Socioeconomic Pathways), defined by the international research community in integrated assessment analysis and global climate change (KC and Lutz 2014; O'Neill et al. 2017) as will be described below. The toolbox for technical demographers contains powerful methods of multidimensional (multi-state) population dynamics, which were developed around 1980 in and around the Population Program of the International Institute for Applied Systems Analysis (IIASA). They represent a generalisation of the widely used cohort-component method of projecting by age and sex and are tailor-made for the task of integrating the processes of human capital formation with education-specific fertility, mortality and migration. They provide a comprehensive, analytically consistent, and directly applicable model for projecting these interdependent processes.

The new set of global population projections presented in 2018 for SSP1-3 and complemented by adding SSP4-5 in this paper updates and extends the scenarios presented in the 2014 volume. While those projections were based on 2010 baseline data, which did not yet include the results of the 2010 round of censuses for most countries, the new projections have a 2015 baseline which mostly includes this census information, as well as more recent information from population registers, vital registration and demographic surveys compiled and estimated by the UN population division. (UN 2017) A further change has been made

[1] https://tntcat.iiasa.ac.at/SspDb

for the 60 richer countries: The highest education category has been split into three more detailed categories (from general post-secondary to some post-secondary, completed BA and completed Master or higher) to account for the fact that a rapidly increasing proportion of younger cohorts in developed countries do get some sort of post-secondary education. In this paper, we only briefly summarize the general approach taken to derive assumptions about future fertility, mortality, migration and education trends for all countries. Next, we discuss specific adjustments made to the near-term assumptions as a consequence of a new 2015 baseline, while maintaining the longer-term assumptions as extensively justified in the 2014 volume. Finally, we introduce the general Shared Socioeconomic Pathways (SSP) narratives used to define the specific scenarios described in the current 2018 update.

Defining assumptions for population and human capital projections[2]

The population projections by age, sex and level of education presented here are based on a multidimensional generalisation of the so-called cohort-component projection model, which projects populations by cohorts and requires assumptions about future fertility, mortality, migration, and education trends. An important prerequisite for suggesting educational attainment, as a third demographic dimension in addition to age and sex, is the assumption that the relationship between education and demographic outcomes is not spurious, rather real and causal. (Lutz and Goujon 2001) In the projections presented here, functional causality was established (as strong causality in the sense of universal validity is almost impossible to establish in social sciences) through assessing three criteria: (a) a strong empirically observed associations between the two factors studied; (b) a plausible narrative about the mechanisms through which one force influences the other; and (c) the exclusion of alternative explanations of the observed associations. Lutz and Skirbekk (2014) demonstrate that these three criteria are being met in education effects on health, mortality, and fertility through a broad review of the literature that also includes several 'natural experiments.' The effects of education on human behaviour derive their foundations from modern brain research: neurological studies have confirmed beyond doubt that brain volumes, cortical thickness, and neurological structures can be affected by increased education which has direct consequences for health and fertility-related behaviour. (Lutz 2017)

The mid- to long-term assumptions used in this set of population projections are the same as those used in Lutz et al. (2014). For the definition and substantive reasoning of the specific assumptions made, the reader is referred to the chapters of this 2014 volume which provide comprehensive reviews of the scientific literature on the drivers of future fertility, mortality, migration, and education trends and the results of the largest ever expert survey for assessing the validity of alternative arguments drawing from over 550 international experts who either participated in a series of five substantive meetings or took part in an extensive online survey.

In a nutshell, for the Medium (SSP2) scenario, these assumptions imply that fertility gradually converges for all countries to a long term level somewhat below replacement level and that morality continues to improve with life expectancy increasing by about two years per decade until the end of the century with some of the high mortality countries catching up more rapidly. For migration, it was concluded that there is no good

[2] The following text draws heavily on the description of the approach as given in Lutz et al. 2018

migration theory to guide specific migration assumptions and that the best one can do is to assume constant in- and outmigration rates at an observed level for the Medium (SSP2) scenario. In terms of education, a continuation of the global education expansion trends for each level was taken as the Medium (SSP2) scenario. These mid- to long-term assumptions are essentially identical in this new assessment and the 2014 book. But the change of the baseline from 2010 to 2015 requires some short-term adjustments to the assumptions that will be specified in the following section.

Adjustment of assumptions due to the new 2015 baseline

With the long-term assumptions remaining essentially unchanged from the 2014 book, the only issues addressed here are the modifications in assumptions that resulted from changing the starting year (baseline) from 2010 to 2015. The new population data by age and sex for 2015 (for population size and structures) and 2010-2015 (for fertility, mortality and migration) has essentially been taken from the UN 2017 assessment. (United Nations 2017).

Baseline data: Populations by age, sex and educational attainment

The starting point for updating educational attainment by age and sex was the previous dataset that included information for 171 countries (Bauer et al. 2012). As previously, we have not relied on the data collected and published by the UNESCO or other agencies and instead focused on collecting the 2010 census round data directly from the national statistical offices. For countries without census data, we have collected new waves of surveys such as the Demographic and Health Survey (DHS) or Multiple Indicator Cluster Survey (MICS) when available. Compared to the previous dataset that included educational attainment by age and sex for 171 countries, we have increased the coverage to 185 countries (92 % of the countries comprising 99 % of the world's population). Educational compositions of the 16 countries with missing data on educational attainment were imputed using proxy countries from the region. For details, we refer to our publication, Chapter 2, in Lutz et al. (2018).

Overview of the projection assumptions and modifications to these in the 2017 update

As discussed above, the TFR values defined for 2030-2035 and beyond in the 2014 assessment (Lutz et al., 2014) were maintained as assumptions for this new assessment. Only in the near-term, it was assured that there was a smooth transition from whatever TFR level the new baseline sets to the assumed 2030-2035 level. As for the educational differentials in fertility rates, we have updated the estimates described in KC and Potančoková (2013) for the high-fertility countries with the new waves of the DHS data and recalibrated the simple regressions that help us estimate region-specific differentials for the countries with missing data. For low fertility countries, additional information from the Cohort Fertility and Education database (Zeman et al. 2017) has been utilised, and a region-specific approach is applied to capture the diversity in the gap between the low and highly educated in various settings. Over time, the educational differentials are assumed to converge to ratios of TFRs of 1.42 for women with up to primary education, 1.35 for women with lower secondary, 1.14 for women with upper secondary and 1 for post-secondary educated. Educational differentials for women with bachelor vs master or other degrees are not considered in the 60 countries where we have information of detailed post-secondary population compositions.

In terms of mortality, the new baseline data give for some countries, particularly in sub-Saharan Africa, lower infant and adult mortality than was assumed by most forecasting agencies (including WIC) for the 2010-2015 period. The reason is the rather unexpected decline of AIDS mortality in the countries with the highest HIV prevalence, due to widespread use of anti-retroviral treatment at no or low cost and due to the stunning success of concerted global health efforts (including the global fund for AIDS, tuberculosis and malaria) in fighting child mortality. In the context of some countries having life expectancy at birth already higher than originally assumed for 2030-2035, it was decided only to maintain the very long-term life expectancy levels assumed for the end of the century and linearly interpolate for every country between the new baseline and old assumptions for the end of the century.

As discussed above, migration is the most difficult of the demographic components to forecast because there is no broadly accepted guiding theory and migration rates tend to fluctuate strongly even at an annual level. We also wanted to maintain the scientifically well-justified approach to making migration assumptions in terms of both in- and outmigration rates, rather than just assuming net-migration as is done by most forecasting agencies. The data source for this global matrix of bilateral migration flows has been the reconstruction of Abel and Sander (2014) based on empirically given migration stock data. These estimates were recently updated by Abel to include the 2010-2015 period. (Abel 2018)

Confirming the above-mentioned volatility of migration trends, the migration pattern in 2010-2015 was quite different from previous years. Considering the high likelihood of continued volatility in the future and the experience that periods of exceptionally high immigration rates to some countries tend to cause political reactions aimed at curtailing migration, it seemed advisable to use the long term average (1960-2015) of in- and outmigration rates for each country and keep them constant in the Medium (SSP2) migration scenario over the entire projection period. Again, in the next stage of this project, we will replace this rather naïve assumption of constant rates by a larger set of different migration scenarios in terms of direction, volume and composition of migrants.

For coming up with educational transition rates, essentially, the same method was used as before, o estimating future transition rates based on national time series for all countries (Barakat and Durham 2014). The only difference is that now the time series has been extended to include the empirical data points for 2015 and that for a sub-sample of countries, the transitions to the new highest education categories (BA and Master or higher) have also been included, which are now applied to 60 richer countries as discussed above. Future trends in education progression rates that have been estimated in this way constitute the Global Education Trend (GET) scenario, which will be combined with other scenarios described below.

Alternative scenario definitions

Compared to the previous generation of IPCC scenarios, which only included total population size and GDP as socioeconomic variables, the new SSPs provide a much richer picture of demographic and social trends. The alternative scenarios by age, sex, and level of education are being defined, presented, and discussed in this volume form the 'human core' of the broader SSPs that also include many other dimensions such as energy and economic variables. (Riahi et al. 2017). The Middle-of-the-Road/Continuation SSP2 scenario is identical with the Medium (SSP2) scenario, which combines medium fertility, mortality, and migration assumptions with the Global Education Trend (GET) scenario. There is also SSP1 (Sustainability/ Rapid Social Development), which combines rapid education expansion (SDG education scenario) with rapid fertility and mortality decline, and SSP3 (Fragmentation/Stalled Development), which combines stalled school enrolment rates (CER education scenario) with slow fertility and mortality decline. Also, there is SSP5 (Conventional Development), which is similar to SSP1 except with high migration, and SSP4 (Inequality) with polarized education distribution in each country and high and low levels of fertility and mortality conditions in a different group of countries. In terms of total world population size by 2100, these scenarios span from 7 to almost 13 billion people.

For translating these broader narratives into bundles of specific demographic assumptions, the countries were divided into two groups depending on whether their total fertility level as assessed in 2005-10 was above 3.0 (HiFert) or below this level (LoFert), with an exception in differentiating fertility assumptions between high-income OECD countries and the rest of the LoFert countries in SSP1 and SSP5. The Medium (SSP2) scenario combines the above described medium assumptions for all demographic components. Also, high and low assumptions were defined relative to these medium assumptions.

For fertility, the high (low) pathway was assumed to have TFRs that are 20 % higher (lower) than the medium up to 2030, with the difference after that increasing to 25 %. Table 1 also gives in two cells a 'medium-low' fertility assumption, which is just 10 % (after 2030, 12.5 %) lower than medium to be consistent with the general narrative of SSP1 and SSP5 for Lo-Fert countries, which also includes very good economic conditions in countries that already have low fertility. For mortality, the high (low) variant assumed that over the entire period, the changes in life expectancy by decade are one year lower (higher) than in the medium variant.

In terms of migration, the medium assumptions set in- and outmigration rates constant at the long-term average level from observed data. The low variant assumes migration rates go to zero by 2030, and the high variant assumes migration rates double by 2030 and then remains constant.

For education, two different benchmark scenarios have been defined on top of the Global Education Trend (GET) scenario described above. The Constant Enrolment Rates (CER) assumes recently observed school enrolment rates at each level, in each country, are frozen at current levels. On the optimistic side, the SDG scenario assumes that Sustainable Development Goal 4, which aims for high quality universal primary and secondary education, will be achieved by 2030. For some of the countries with currently very low education levels, this is an extremely ambitious goal that might not be realistic. But since this is part of the globally agreed SDGs, which resemble the spirit of the SSP1/SSP5 narrative, we decided to make this assumption. Since the SDGs were only defined after the publication of the previous 2014 assessment (Lutz et al., 2014), these new SSP1/SSP5 education assumptions are also different and more ambitious than the previous ones. This SDG boost to secondary education also spills over to higher education resulting in significant increases in the proportions of young cohorts with post-secondary education for most countries. The number of people with completed secondary education to which the transition rate is applied will continue to grow rapidly.

Narratives of the demographic component of the SSPs:

SSP1 (Sustainability/Rapid Social Development): This scenario assumes a future moving toward a more sustainable path, with educational and health investments accelerating the demographic transition, leading to a relatively low world population. The emphasis is on strengthening human wellbeing. This is associated with high education, low mortality and low fertility.

SSP2 (Continuation/Medium Population Scenario): This is the middle-of-the-road scenario in which trends typical of recent decades continue, with some progress toward achieving development goals, reductions in resource and energy intensity, and slowly decreasing fossil fuel dependency. The development of low-income countries is uneven, with some countries making good progress, while others are left behind. This is associated with medium fertility, mortality and education.

SSP3 (Fragmentation/Stalled Social Development): The scenario portrays a world separated into regions characterised by extreme poverty, pockets of moderate wealth, and many countries struggling to maintain living standards for rapidly growing populations. The emphasis is on security at the expense of international development. This is associated with low education, high mortality and high fertility.

SSP4 (Inequality): This refers to a world of high inequalities between and within countries. There is increasing stratification between a well-educated, internationally connected society on the one hand and a poorly educated society that works in labor-intensive low-tech industries. In terms of education, this is reflected in a special scenario that differs from the standard low-high in the sense that in every country, it produces a more polarized education distribution with a certain group of very highly educated and large groups with low education. In terms of fertility at the national averages, this implies continued high fertility in today's high fertility countries and continued low fertility in both groups of low fertility countries. For mortality, the high fertility countries are assumed to suffer from high levels, whereas the other two groups have medium mortality. Migration is assumed to be at the medium level for all countries.

SSP5 (Fossil-fuel/Conventional Development): This refers to a world that stresses technological progress and where economic growth is fostered by the rapid development of human capital. This is reflected in high education assumptions and low mortality assumptions across all countries. For fertility, we assume similar assumptions as in SSP1. The emphasis on market solutions and globalization also implies the assumption of high migration for all countries.

Table 1: Matrix with Shared Socioeconomic Pathway (SSP) Definitions (revised Table 1 in KC and Lutz 2014)

	Country Groupings	Fertility	Mortality	Migration	Education
SSP1 Rapid Development	HiFert	Low	Low	Medium	High (SDG)
	Rich-OECD	Low	Low	Medium	High (SDG)
	LoFert (Rest)	Medium-Low	Low	Medium	High (SDG)
SSP2 Medium	HiFert	Medium	Medium	Medium	Medium (GET)
	LoFert	Medium	Medium	Medium	Medium (GET)
SSP3 Stalled Development	HiFert	High	High	Low	Low (CER)
	LoFert	High	High	Low	Low (CER)
SSP4 Inequality	HiFert	High	High	Medium	CER-10%/GET
	LoFert	Low	Medium	Medium	CER-10%/GET
SSP5 Conventional Development	HiFert	Low	Low	High	High (SDG)
	Rich-OECD	Low	Low	High	High (SDG)
	LoFert (Rest)	Medium-Low	Low	High	High (SDG)

HiFert: high fertility; LoFert: low fertility; OECD: Organization for Economic Co-operation and Development; GET: global education trend; CER: constant education rate; SDG: Sustainable Development Goals.

Results

Projected population and educational attainment and mean years of schooling by age and sex for all SSPs can be downloaded from IIASA's data repository (http://dare.iiasa.ac.at/105/). The following picture shows the difference between the 2014 and 2018 updates.

As the figure shows, in terms of global population growth, the newly updated scenarios are somewhat higher than the original ones. This is mostly due to higher baseline population counts, which among several factors are due to faster than expected decreases in child mortality. These unexpectedly rapid improvements in child survival, mostly in Africa, are likely to be the consequence of highly targeted public health interventions generously funded by international donors. Since better child survival has the same effect on the population as higher fertility, the progress in child survival has actually contributed to faster population growth.

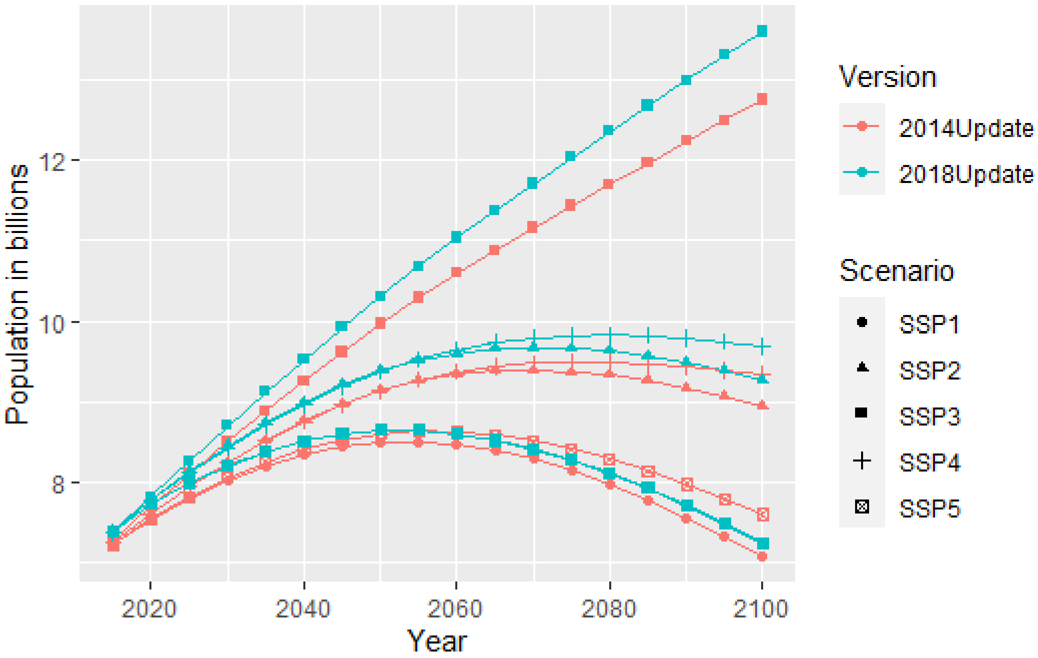

Figure 1: Population for all SSPs between two versions of WIC (2014-Update, 2018-Update)

The new SSPs (Figure 1) results in the population of the world in the range between 8.7-10.3 billion and 7.2-13.6 billion by the end of the century. While SSP1 and SSP3 are at the extremes, the population for the rest of the scenarios is around 9.4 billion. The total population is higher in all SSPs, except SSP5 due to lower fertility assumptions, in the 2018-Update than in 2014-Update (Figure 1) and are relatively parallel, mostly explained by a higher starting population (in 2015).

In the following Table 2, we show total population size and mean years of schooling for adults ages 15 and above for the world, continents, and some larger countries.

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Table 2: Total population size and mean years of schooling among the adult population aged 15 years and above for major world regions and selected countries

		Population in Millions					Mean years of schooling, age 15+				
		SSP1	SSP2	SSP3	SSP4	SSP5	SSP1	SSP2	SSP3	SSP4	SSP5
World	2015	7,383	7,383	7,383	7,383	7,383	8.48	8.48	8.48	8.48	8.48
	2050	8,654	9,383	10,304	9,381	8,655	11.90	10.60	9.53	9.37	11.90
	2100	7,229	9,278	13,601	9,690	7,252	14.50	12.91	9.41	9.46	14.50
Africa	2015	1,194	1,194	1,194	1,194	1,194	6.20	6.20	6.20	6.20	6.20
	2050	1,816	2,254	2,672	2,566	1,796	12.12	9.38	7.49	7.17	12.13
	2100	1,725	2,919	4,860	4,276	1,663	14.99	12.16	7.62	7.49	14.98
Asia	2015	4,420	4,420	4,420	4,420	4,420	8.00	8.00	8.00	8.00	8.00
	2050	4,940	5,150	5,586	4,949	4,909	11.57	10.48	9.59	9.52	11.57
	2100	3,825	4,366	6,328	3,830	3,744	14.41	13.12	9.82	10.41	14.41
Europe	2015	741	741	741	741	741	11.57	11.57	11.57	11.57	11.57
	2050	707	724	714	680	739	13.17	13.02	12.70	12.41	13.13
	2100	614	726	765	571	711	14.65	14.24	12.97	12.70	14.66
Latin America and Carribbean	2015	632	632	632	632	632	8.47	8.47	8.47	8.47	8.47
	2050	727	763	862	724	705	11.40	10.53	9.78	9.57	11.36
	2100	577	655	1,042	530	527	13.61	12.38	10.13	10.25	13.55
Northern America	2015	356	356	356	356	356	12.57	12.57	12.57	12.57	12.57
	2050	414	437	417	407	452	13.29	13.06	12.89	12.41	13.22
	2100	435	545	539	420	543	14.25	13.84	12.97	12.39	14.24
Oceania	2015	40	40	40	40	40	11.84	11.84	11.84	11.84	11.84
	2050	51	55	53	54	55	13.62	13.05	12.43	11.94	13.59
	2100	52	67	67	63	63	15.02	14.38	12.43	11.88	15.02
Brazil	2015	206	206	206	206	206	7.57	7.12	7.57	7.57	7.57
	2050	224	230	247	215	224	10.49	9.61	9.04	8.80	10.49
	2100	169	180	252	130	169	12.86	11.65	9.45	9.52	12.87
China	2015	1,397	1,397	1,397	1,397	1,397	8.33	8.33	8.33	8.33	8.33
	2050	1,307	1,302	1,355	1,232	1,301	11.05	10.77	10.33	10.29	11.04
	2100	802	812	1,104	608	787	13.74	13.35	11.22	12.31	13.74
Egypt	2015	94	94	94	94	94	8.36	8.36	8.36	8.36	8.36
	2050	137	142	160	126	134	12.06	12.01	11.00	10.66	12.05
	2100	142	155	226	99	134	13.98	13.87	11.61	11.85	13.98
Germany	2015	82	82	82	82	82	13.24	13.24	13.24	13.24	13.24
	2050	78	80	74	76	85	14.20	13.98	13.67	13.23	14.12
	2100	71	84	71	70	90	15.36	14.93	13.78	12.92	15.34
India	2015	1,309	1,309	1,309	1,309	1,309	6.82	6.82	6.82	6.82	6.82
	2050	1,575	1,642	1,799	1,507	1,571	11.67	10.03	8.97	8.94	11.67
	2100	1,327	1,462	2,126	1,002	1,316	14.93	13.26	9.52	10.58	14.93
Indonesia	2015	258	258	258	258	258	8.77	8.77	8.77	8.77	8.77
	2050	303	308	333	283	300	11.83	11.26	10.32	10.29	11.82
	2100	249	259	353	178	241	13.84	13.19	10.62	11.36	13.83
Iran (Islamic Republic of)	2015	79	79	79	79	79	8.77	8.77	8.77	8.77	8.77
	2050	96	98	104	92	97	11.97	11.34	10.49	10.67	11.97
	2100	78	83	109	64	80	14.61	13.68	11.03	12.09	14.61
Kenya	2015	47	47	47	47	47	7.87	7.87	7.87	7.87	7.87
	2050	76	91	110	107	76	12.35	10.67	8.64	9.02	12.35
	2100	72	114	195	175	72	14.84	12.77	8.83	9.94	14.84
Nigeria	2015	181	181	181	181	181	6.60	6.60	6.60	6.60	6.60
	2050	313	383	459	457	312	12.58	10.54	8.30	7.76	12.58
	2100	366	603	973	925	362	15.00	13.06	8.58	8.47	14.99
Republic of Korea	2015	51	51	51	51	51	11.91	11.91	11.91	11.91	11.91
	2050	48	48	49	46	48	13.55	13.57	13.44	13.03	13.52
	2100	29	33	37	27	30	14.32	14.20	13.74	12.83	14.29
Russian Federation	2015	144	144	144	144	144	11.17	10.32	11.17	11.17	11.17
	2050	133	133	129	125	141	12.71	12.37	12.35	11.92	12.68
	2100	122	132	132	103	144	14.29	13.78	12.61	12.41	14.32
South Africa	2015	55	55	55	55	55	9.69	9.69	9.69	9.69	9.69
	2050	69	71	76	65	72	12.11	11.57	10.64	10.60	12.12
	2100	61	68	88	47	68	13.84	12.82	10.74	11.12	13.86
Spain	2015	46	46	46	46	46	10.43	10.43	10.43	10.43	10.43
	2050	47	48	45	45	51	12.79	12.66	12.16	12.02	12.79
	2100	41	49	42	40	53	14.63	14.17	12.49	12.41	14.61
United States of America	2015	320	320	320	320	320	12.54	12.54	12.54	12.54	12.54
	2050	372	393	378	365	404	13.27	13.04	12.84	12.39	13.21
	2100	390	488	495	374	482	14.27	13.85	12.94	12.43	14.27

Discussion

After the publication of the first set of SSPs in 2013, we received comments suggesting that the divide between OECD member countries and other low fertility countries – a distinction being made in all aspects of the SSPs – was rather artificial and implausible in terms of demographic trends. In particular, there have been cases of very similar countries next to each other. One was a member of OECD and hence got very different demographic assumptions from the other countries.

For this reason, for the 2018 update, we decided to make the same assumptions for the two groups of countries, except for fertility in SSP1 and SSP5. At the global level, the SSP population trajectories do not change except being shifted slightly at a higher level due to a larger base-year population. However, at the country level, some differences in population size and structure between the two updates exist due to some modifications in the fertility, migration, and educational scenarios.

Population projection needs periodic updates. The UN does it every 2-3 years and, in their methodology, also revises past estimates and long-term assumptions. In the case of the IIASA-WIC projections, which are based on the SSP scenarios, we are aiming at updates every five years with the long term assumptions only being revisited every ten years based on an extensive global expert solicitation. (Lutz, Butz, and KC 2014)For the intermediate revisions, five years later, only the new baseline is taken into account, and necessary adjustments are being made for the near term assumptions. es3This has also been the case for the 2018 update described in this paper.

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