

A “middle-of-the-road” projection of human development using Shared Socio-Economic Pathway 2 in International Futures

Jonathan D. Moyer

Steve Hedden

Working Paper

Frederick S. Pardee Center for International Futures

Josef Korbel School of International Studies

University of Denver

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Abstract:

The international community has committed to achieving the Sustainable Development Goals, a set of targets, indicators, and values that track progress in improving human and natural system development. These ambitious global targets are meant to be achieved by 2030. While a significant undertaking how achievable are these targets, goals, and indicators? We explore this using a scenario taken from the climate change integrated assessment modeling community called shared socio-economic pathway 2. This scenario is described as a “middle-of-the-road” path. Along this scenario, we find that we make only moderate progress towards achieving human development indicators within the SDG framework with significant regional variation.

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Introduction

The Sustainable Development Goals (SDGs) are a framework of development objectives with 17 broad goals (Griggs et al., 2013; UNDP, 2016; UNGA, 2015). They represent a global agreement across United Nation's member states. This working paper explores whether or not selected SDG targets are likely to be achieved by 2030 under a 'middle-of-the-road' scenario.

The Shared Socio-Economic Pathways (SSPs) are a set of scenarios in widespread use (O'Neill et al., 2014). The SSPs are five scenarios to frame global development trajectories. The SSPs provide a useful set of baselines for SDG evaluation as they were created as, "reference pathways describing plausible alternative trends in the evolution of society and ecosystems," (O'Neill et al., 2014, p. 387).

SDGs

The following table lists the SDG targets (and their corresponding indicators and goals) evaluated in this working paper.

Table 1: SDG targets evaluated in this working paper.

Goal	Target	Indicator	Variable	Target Value	Historical data source
1: End poverty in all its forms everywhere	1.1: By 2030 eradicate extreme poverty for all people everywhere	1.1.1: Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural).	% of the population living on less than \$1.90 a day at 2011 international prices.	Below 3% of total population.	World Bank, Development Research Group.
2: End hunger, achieve food security, improve nutrition and promote sustainable agriculture	2.1: By 2030 end hunger and ensure access by all people in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.	2.1.1: Prevalence of undernourishment.	% of population whose food intake is insufficient to meet dietary requirements continuously.	Below 3% of total population.	FAO.
2: End hunger, achieve food security, improve	2.2: By 2030, end all forms of malnutrition including achieving, by 2025, the internationally agreed the	2.2.1: Prevalence of stunting (height for age <-2 standard deviation from the median of World Health	% of children under 5 whose weight for age is more than two standard deviations	Below 3% of total population.	WHO, Child Growth and Malnutrition.

nutrition and promote sustainable agriculture	internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and old people.	Organization Growth Standards) among children under 5 years of age, by type (wasting and overweight).	below the median for the international reference population ages 0-59 months.		
3: Ensure health lives and promote well-being for all at all ages.	3.2: By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.	3.2.1: Under-five mortality rate.	The probability of a child born in a specific year dying before reaching the age of 5 years, expressed per 1000 live births.	Less than or equal to 25 deaths per 1000 live births.	UN Inter-Agency Group for Child Mortality Estimation.
4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	4.1: By 2030 ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.	4.1.1: Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and © at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex.	The number of students successfully completing the last year of primary school in a given year, divided by the number of graduate age.	Greater than 97%.	UNESCO Institute for Statistics (UIS).

4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	4.1: By 2030 ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.	4.1.1: Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and © at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex.	The number of students successfully completing the last year of lower secondary school in a given year, divided by the number of graduate age.	Greater than 97%	UNESCO Institute for Statistics (UIS).
6: Ensure availability and sustainable management of water and sanitation for all.	6.1: By 2030 achieve universal and equitable access to safe and affordable drinking water for all.	6.1.1: Proportion of population using safely managed drinking water services.	% of population with access to an 'improved' water source	Greater than 97%	WHO/UNICEF Joint Monitoring Programme.
6: Ensure availability and sustainable management of water and sanitation for all.	6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls in vulnerable situations.	6.2.1: Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water.	% of population with access to sanitation services	Greater than 97%	WHO/UNICEF Joint Monitoring Programme.
7: Ensure access to affordable, reliable,	7.1: By 2030 ensure universal access to affordable, reliable, and modern energy services.	7.1.1: Proportion of population with access to electricity.	% of the population with access to electricity	Greater than 97%	World Bank's WDI.

and sustainable energy for all					
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SSPs

The following table lists the exogenous assumptions taken from the SSP scenarios and used in the International Futures (IFs) model.

Table 2: SSP2 exogenous forecast series used in this analysis

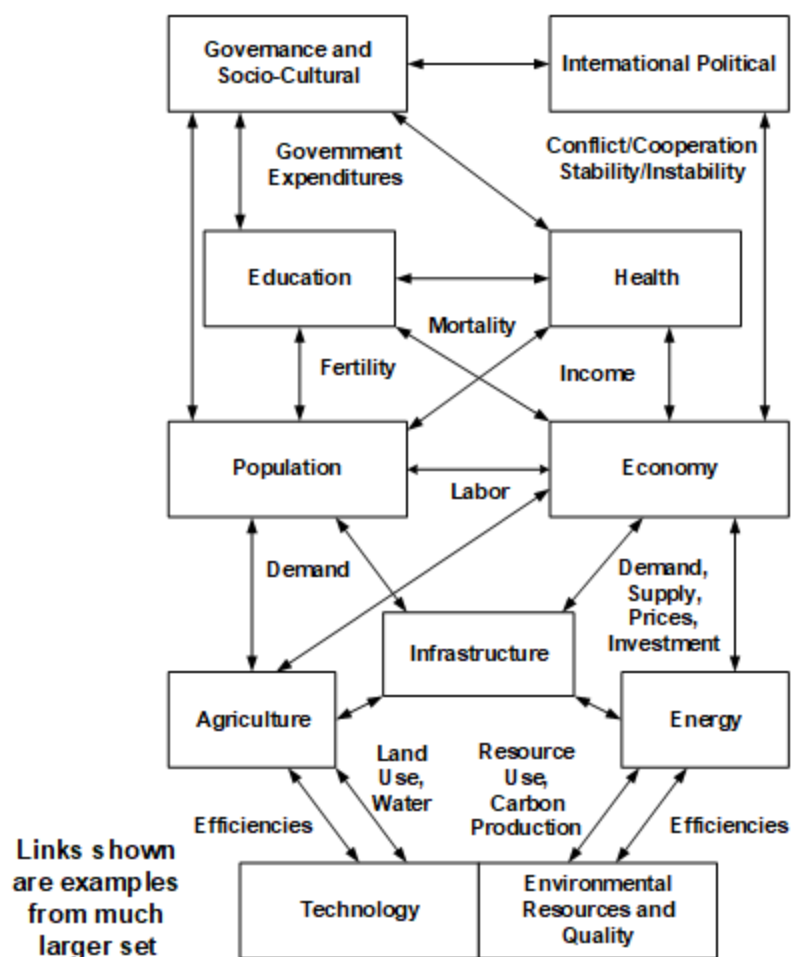
Variable	Source for exogenous dataset	Publication describing construction of dataset for SSPs	Summary of assumptions and variable values
Population in millions	IIASA	(Samir KC & Lutz, 2017)	SSP2 assumes a medium level of mortality, fertility, education and migration across all countries. These assumptions are similar to those of UN's Medium variant used in the World Population Prospects. Globally, population increases from 7.37 million in 2015 to 9.33 million by 2050 and reaches a value of 9.2 million by 2100.
Total number of births in millions	IIASA	(Samir KC & Lutz, 2017)	SSP2 assumes a medium level of mortality, fertility, education and migration across all countries. These assumptions are similar to those of UN's Medium variant used in the World Population Prospects. Globally, births decrease from 141 million in 2015 to 122 million in 2050 and finally reach 83 million by 2100.
Total number of deaths in millions	IIASA	(Samir KC & Lutz, 2017)	SSP2 assumes a medium level of mortality, fertility, education and migration across all countries. These assumptions are similar to those of UN's Medium variant used in the World Population Prospects.

			Globally, deaths increase from 57 million in 2015 to 92 million in 2050 and finally reach 112 million by 2100.
Total fertility rate (births per woman)	IIASA	(Samir KC & Lutz, 2017)	SSP2 assumes a medium level of mortality, fertility, education and migration across all countries. These assumptions are similar to those of UN's Medium variant used in the World Population Prospects. Globally, the total fertility rate decreases from 2.48 births per woman in 2015 to 2 births per woman in 2050 to 1.76 births per woman in 2100
Urban Population as a percent of total population	NCAR	(Jiang & O'Neill, 2017)	This pathway assumes an extension of current trends in urbanization in all parts of the world, along with similar middle of the road assumptions about population growth, technological change, and economic growth. High income countries continue their practices in urban development; developing countries generally follow the historical urbanization experiences of the more developed countries. Urban population as a percent of total population increases from 53.7 percent in 2015 to 67.4 percent in 2050 and reaches 79.2 percent by 2100
GDP per capita at PPP (Current international dollars at 2011 PPP)	OECD	(Dellink et al., 2017)	SSP2 assumes a medium level of growth in total factor productivity (TFP) for the most developed countries (the frontier) and a medium speed of convergence towards the frontier. GDP per capita increases from 14 thousand USD in 2015 to 34 thousand USD in 2050 and reaches a value of 86 thousand USD by 2100.

Migration rate (net) as a percent of the population	IIASA	(Samir KC & Lutz, 2017)	SSP2 assumes a medium level of mortality, fertility, education and migration across all countries. These assumptions are similar to those of UN's Medium variant used in the World Population Prospects. Globally, population increases from 7.37 million in 2015 to 9.33 million by 2050 and reaches a value of 9.2 million by 2100.
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Methodology

We use the International Futures (IFs) modeling platform to project the variables corresponding to each SDG indicator (Table 1). We chose this model based on its breadth of human development sector representation, accessibility, its ability to produce country level forecasts, and its level of integration. IFs can be used to evaluate a range of SDG indicators, and is one of few public IAMs that can assess SDG achievement at the country level (Allen, Metternicht, & Wiedmann, 2016; Millennium Institute, 2017; The World Bank, 2018b). The IFs tool forecasts hundreds of interacting variables across human, social, and natural system dimensions for 186 countries. The tool has been widely used previously in academic and policy publication (Bohl, Hughes, & Johnson, 2016; Burt et al., 2014; Hughes, 2016; Joshi, Hughes, & Sisk, 2015; Moyer, Porter, Johnson, Moyer, & Bohl, 2015; O'Neill et al., 2015). See Figure 1 for a broad overview of the systems represented in IFs.



Findings

This research indicates that progress towards these SDG targets will be limited. The table below show progress across these nine indicators by geographic region.

Row Labels	Europe and Russian Federation	Latin America & Caribbean	Middle East and North Africa	Non OECD Asia Pacific	North America	OECD Asia Pacific	South Asia	Sub-Saharan Africa	Global
Extreme Poverty	100	68	85	70	100	100	79	21	67
Undernourishment	95	32	70	26	100	100	43	10	48
Underweight children	82	48	30	26	100	50	14	0	37
Child Mortality	98	90	90	74	100	100	71	6	67
Primary school completion	100	94	85	78	100	100	86	33	77

Lower secondary school completion	89	35	40	48	100	100	50	4	45
Access to improved water	98	94	95	70	100	100	93	17	72
Access to improved sanitation	80	29	65	43	100	100	43	4	44
Access to electricity	100	68	90	48	100	100	71	2	60

Conclusion

The world is not on track to achieve the nine SDG targets evaluated in this working paper, though there is significant regional variation. Very few countries in Sub-Saharan Africa achieve any of the targets. Disaggregating SDG achievement to the country level is important because while the world is making progress towards achieving many of these targets, some countries are left behind. The SDGs are meant to be national targets and should be evaluated as such.

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