

Estimating the Teacher Gap and Funding Requirements in Eastern and Southern Africa

September 2021

***UNICEF Eastern and Southern Africa Regional
Office Social Policy Working Paper***

Estimating the Teacher Gap and Funding Requirements in Eastern and Southern Africa

© United Nations Children’s Fund (UNICEF), Eastern and Southern Africa Regional Office (ESARO)
United Nations Complex, Gigiri, PO Box 44145 – 00100, Nairobi, Kenya
September 2021

This is a working document. It has been prepared to facilitate the exchange of knowledge and to stimulate discussion.

The findings, interpretations and conclusions expressed in this document are those of the author and do not necessarily reflect the policies or views of UNICEF or the United Nations.

The text has not been edited to official publication standards, and UNICEF accepts no responsibility for errors.

The designations in this document do not imply an opinion on the legal status of any country or territory, or of its authorities, or the delimitation of frontiers.

UNICEF EASTERN AND
SOUTHERN AFRICA
REGIONAL OFFICE SOCIAL
POLICY WORKING PAPER

SEPTEMBER 2021

Estimating the Teacher Gap and Funding Requirements in Eastern and Southern Africa

Matthew Cummins
Social Policy Regional Adviser
UNICEF ESARO

JEL Classification: C53, H52, I21

Keywords: teacher requirements, teacher salaries, school age population projections, out of school children, pupil-teacher ratios, education expenditure, education financing

Comments may be addressed to the author at mcummins@unicef.org

Acknowledgements

The author is very grateful to Tobias Lindé (former Public Finance Fellow, ESARO) for his support in developing a previous version of the modelling approaches presented in this paper. The author is also grateful to the following persons for their comments and guidance (in alphabetical order by first name): Abhiyan Jung Rana (Education Regional Adviser, UNICEF ESARO), Beifith Kouak Tiwab (Education Specialist, UNICEF ESARO), Bob Muchabaiwa (Public Finance Specialist, UNICEF ESARO), Haogen Yao (Education Specialist, UNICEF Headquarters), Haritz Goya Lujambio (Education Specialist, UNICEF West and Central Africa Regional Office), Lieke van de Wiel (Deputy Regional Director, UNICEF ESARO), Maniza Ntekim (Early Childhood Development Regional Adviser, UNICEF ESARO) and Ximena Bethsabe Jativa Sierra (Education Consultant, UNICEF Office of Research - Innocenti).

Table of Contents

List of Figures and Tables	ii
List of Acronyms	iii
Executive Summary	iv
1. Introduction	1
2. Methodology	3
2.1. Previous estimation approaches and enhancements	3
2.2. Data sources.....	4
2.3. Description of the model	5
2.4. Caveats	7
3. Results	9
3.1. Affordability.....	9
3.2. Scenario 1: Baseline	10
3.3. Scenario 2: Slightly ambitious	11
3.4. Scenario 3: Ambitious	12
3.5. The Impact of Expenditure Benchmarks on P-T Ratios.....	12
4. Conclusions and Recommendations	16
References	18
Annex 1. Modelling results by country	20
Annex 2. Key indicators, estimates and modelling results by country	41

List of Figures and Tables

Figure 1. School-age population projections in ESA, 2020 and 2030	1
Figure 2. Enrolled, OOS and school-age projections in ESA, 2020 and 2030	2
Figure 3. Select baseline indicators for ESA, 2020 or latest available	5
Figure 4. Estimated # of affordable teachers in ESA by level of education,	9
Figure 5. Average P-T ratios in ESA if teacher compensation constant, 2020-30.....	10
Figure 6. Estimated # of required & affordable teachers based on baseline scenario.....	11
Figure 7. Estimated # of required & affordable teachers based on slightly ambitious scenario ..	11
Figure 8. Estimated # of required & affordable teachers based on ambitious scenario.....	12
Figure 9. Comparing affordable numbers of teachers in ESA in 2030	13
Figure 10. Avg P-T ratios in 2030 under different levels of expenditure: 6% of GDP	14
Figure 11. Avg P-T ratios in 2030 under different levels of expenditure: 4-10% of GDP	15
Table 1. Estimating the demand for teachers in Sub-Saharan Africa:.....	3
Table 2. Official school age by level of education in ESAR countries	4
Table 3. 2030 targets for each scenario	6

List of Acronyms

EMIS	education management information system
ESA	Eastern and Southern Africa
GDP	gross domestic product
GER	gross enrollment ratio
IMF	International Monetary Fund
NER	net enrollment ratio
OLS	ordinary least squares
OOS	out of school
P-T	pupil-teacher
SDG	Sustainable Development Goal
SDR	Special Drawing Right
UIS	UNESCO's Institute for Statistics
UNDESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organization

Executive Summary

Teachers represent the largest and most important investment in education systems for countries in Eastern and Southern Africa (ESA). The size of the teaching force relative to school-age populations as well as the funding needs to pay for their salaries are key determinants to learning opportunities and outcomes for children, both present and future.

This paper estimates the number of teachers required to meet different pupil-teacher (P-T) ratio targets in 2030 for all education levels in ESA. It also assesses the affordability of those targets, presenting detailed projections for the region as well as individual countries. While more research is needed to better understand the quality and geographical placement of teachers over time, as well as the skills gaps around digital learning approaches, the outlook is not good.

Even if governments maintain their latest teacher compensation spending trends, classroom sizes will quickly become unmanageable. For instance, if government spending on teachers at the pre-primary level does not increase, the average P-T ratio is projected to balloon from around 40:1 in 2020 to more than 110:1 in 2030 as classrooms absorb the growing number of school-age children each year as well as the large out of school (OOS) populations. Similar trends are observed across secondary and tertiary levels. Primary school is the lone exception due to the relatively larger stock of teachers and better progress in addressing OOS children. Although cross-country data were unavailable for this study, classroom size disparities in rural areas are likely to be especially severe in most places.

To meet global and national goals around education, governments in ESA will need to pay for more than 5 million additional teachers by 2030. When compared to affordability estimates, which reflect the latest teacher compensation spending trends, current spending levels will need to double, on average. While there is variation across countries, the compounding shortage of teachers is a serious risk to improving access to and the quality of learning across the region.

These findings highlight the need to invest more resources in teachers and education systems more generally. If governments were able to progressively increase education spending to reach 6% of GDP in 2030, which is in line with the most ambitious target in the Incheon Declaration, it would be possible to recruit an additional 3 million teachers, which partially closes the gap. However, to maximize learning opportunities and outcomes for all children, most governments will need to spend much more e.g. up to 7 or 8% of GDP.

Boosting investments in education systems is particularly challenging in the context of COVID-19 and the multitude of competing priorities. Nevertheless, governments are strongly encouraged to:

- Steadily increase the amount of resources allocated to the education sector in the annual budget cycle;

- Convert some of the new Special Drawing Rights (SDRs) allocated by the International Monetary Fund (IMF) to invest in the education sector;
- Strengthen efforts to improve value for money and transparency in education spending processes;
- Develop compelling investment cases to attract greater external support for education from donors and international financial institutions; and
- Negotiate for debt relief that directly benefits the education sector, including through debt-for-education swaps.

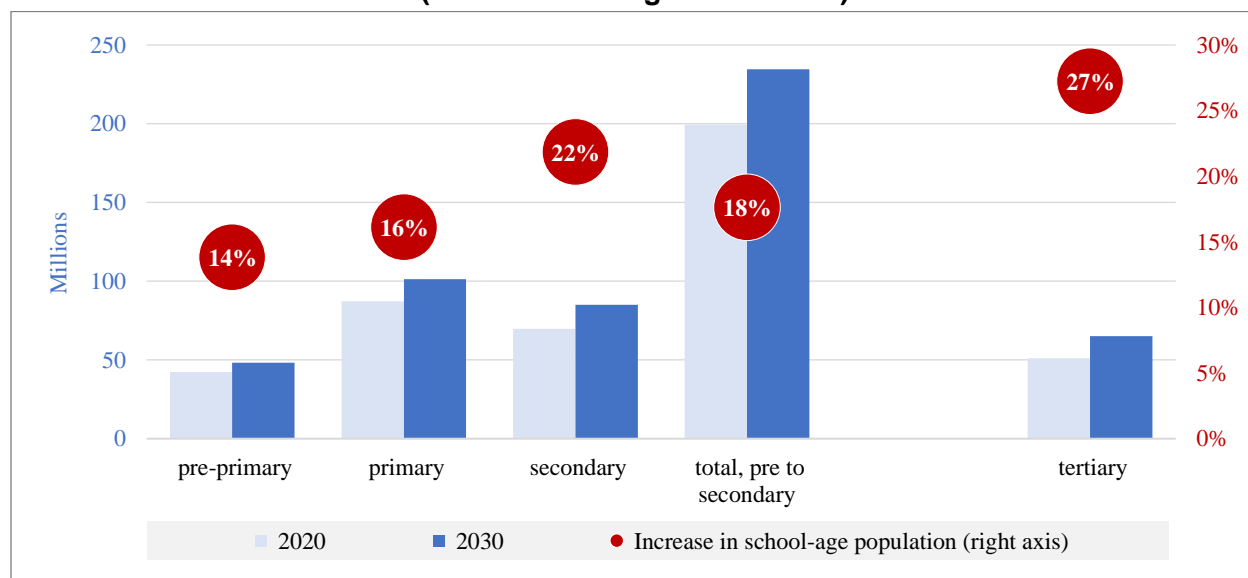
More and better investments in education systems are required if governments in ESA are to have any hope of recruiting and maintaining an adequate supply of teachers. This is foundational to strengthening the human capital base and maximizing economic growth and development progress, and even more so in a new world order characterized by recurring school closures and accumulated lost learning. Without greater public investment in education and teachers, everybody loses.

1. Introduction

Eastern and Southern Africa (ESA)¹ continues to experience explosive demographic growth. Between 2020 and 2050, the population is on course to double from 540 million to more than one billion people. Focusing on the next decade, the region will need to care for approximately 180 million new babies (close to 18 million annually) as well as create work opportunities for 150 million young workers that transition into labor markets (Cummins 2019).

Demographic forces pose particularly difficult challenges to the education sector. First and foremost, education systems need to absorb the growing number of school-age children each year. Between 2020 and 2030, the pre-primary to secondary school-age population will increase by nearly 20%, from around 200 to 235 million children (Figure 1).

**Figure 1. School-age population projections in ESA, 2020 and 2030
(in millions and growth as a %)**



Source: Author's calculations based on UNDESA World Population Prospects: The 2019 Revision (medium variant)

Note: School-age populations reflect national definitions of entrance age and duration for each school level

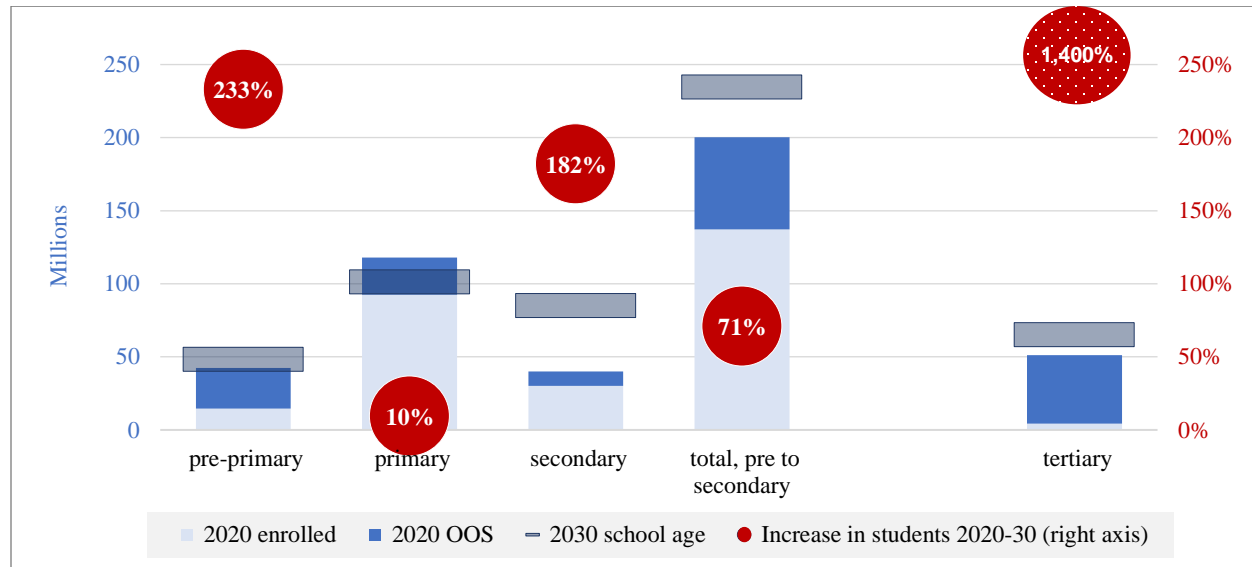
At the same time, to make meaningful progress toward Sustainable Development Goal (SDG) 4,² education systems will also need to get out of school (OOS) children into classrooms. Regional estimates for 2020 point to around 28 million OOS children at pre-primary level, 25 million at primary level and 10 million at secondary level (Figure 2). When factoring in population growth and OOS children, around 100 million additional pre-primary, primary and secondary students will need to be inside classrooms and learning in 2030 compared to 2020, which is more than a 70% increase. Moreover, since only around 4.3 million of the 51 million

¹ ESA includes 21 countries: Angola, Botswana, Burundi, Comoros, Eritrea, Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Rwanda, Somalia, South Africa, South Sudan, Tanzania (United Republic of), Uganda, Zambia and Zimbabwe.

² SDG 4 aims to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."

adolescents and young adults were estimated to be enrolled in tertiary education as of 2020, the potential pool of additional students for higher learning programs could top 60 million in 2030.

Figure 2. Enrolled, OOS and school-age projections in ESA, 2020 and 2030 (in millions and growth as a %)



Source: Author's calculations based on UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

Education is the foundation of inclusive and sustainable development. In addition to creating lifelong opportunities and helping reduce poverty, education is a basic building block of human capital that drives future innovation, productivity and economic growth. And while ensuring that all school-age children are attending school and learning is a complex process that requires many things ranging from qualified staff and learning materials to classrooms and toilets, a good starting point is the supply of teachers.

Within education systems, teachers represent the largest and most important investment. Understanding the size of the teaching staff relative to school-age populations as well as the current and potential funding to pay for their salaries are key to understanding learning opportunities and outcomes for children, both today and tomorrow.

This paper estimates the number of teachers required to meet different pupil-teacher (P-T) ratio targets in 2030 for all education levels (pre-primary to tertiary) in 20 countries in ESA as well as the affordability of those targets.³ It begins by describing the methodology, including previous estimation approaches, data sources, the construction of the model and caveats (Section 2). It then presents the modelling results, which focus on key regional trends (Section 3). The paper concludes by summarizing the main findings and offering recommendations for governments to help close the teacher gap as quickly as possible in the context of COVID-19 (Section 4). Annex 1 visually presents the results for all 20 countries, and Annex 2 presents country-level data for key indicators, baseline estimates and the modelling results.

³ Somalia is excluded due to data unavailability.

2. Methodology

2.1. Previous estimation approaches and enhancements

The modelling approach builds on previous efforts by the United Nations Educational, Scientific and Cultural Organization (UNESCO). UNESCO (2009) set out a detailed methodology to project future teacher demand at the primary school level in all countries in the world, which included regional breakdowns. This applied the following assumptions: (i) a net enrollment ratio (NER) of 100% by the target year (i.e. there are no out of school children); (ii) repetition rates fall in half and do not exceed 10%; (iii) P-T ratios improve to meet the minimum standard of 40 – or country-specific rates are used if lower than the benchmark; and (iv) population growth follows projections by the United Nations Department of Economic and Social Affairs (UNDESA). Using this approach, UNESCO produced annual fact sheets from 2012 to 2016 that updated the estimates, with two editions also looking at secondary education. These studies projected the number of new teaching posts needed to achieve universal enrolment by a certain year while also considering attrition. The series of UNESCO studies, including their main findings for Sub-Saharan Africa, are presented in Table 1.

**Table 1. Estimating the demand for teachers in Sub-Saharan Africa:
A summary of UNESCO studies**

Study	Modelling parameters	Education levels and target P-T ratio	Period modelled	Baseline and projected teaching posts required (in millions) and affordability
UNESCO (2009)	# required	Primary: 40	2007-15	From 2.8 to 3.7
UNESCO (2012)	# required	Primary: 40	2010-15	From 3.1 to 4.1
UNESCO (2013)	# required	Primary: 40 Lower secondary: 32	2011-30	Primary: from 3.2 to 5.3 Lower secondary: from 1.1 to 3.6
UNESCO (2014)	# required and affordability	Primary: 40	2012-30	From 3.4 to 5.7 Affordable in 23/27 countries
UNESCO (2015)	# required	Primary: 40	2013-30	From 3.5 to 5.7
UNESCO (2016)	# required	Primary: 40 Secondary: 25	2014-30	Primary: From 3.8 to 6.2 Secondary: From 2.2 to 9.3

This paper expands on UNESCO's earlier work. First, while most of the previous studies exclusively focused on primary education, this paper estimates the demand for teachers for the whole education system, from pre-primary to tertiary levels. This offers a more complete picture and allows for assessing possible allocative inefficiencies. Second, rather than using a global norm to establish a desired P-T ratio (e.g. 40 in the case of primary education), this paper applies more practical benchmarks. This includes a business as usual scenario whereby the latest P-T values in each country are maintained through 2030, which is then compared against more ambitious targets based on regional reference points. Third, this paper assesses whether governments can meet the spending requirements to maintain the numbers of teachers under the different scenarios while also gauging the impact of satisfying the education spending targets in

the Incheon Declaration.⁴ Fourth, this paper publishes findings at the country level to inform further analysis and advocacy.

2.2. Data sources

The model relies on data from the IMF, UNDESA and UNESCO. Data from these sources were extracted, harmonized, and gap filled using interpolation and nearest neighbor imputation methods. To establish the 2020 baseline for all indicators, the 2017-19 average value was used where actual data were unavailable. A summary of the sources is provided below.

Information on gross domestic product (GDP) is drawn from the IMF’s World Economic Outlook database (April 2021). This contains projections for 20 countries⁵ in ESA through 2026. The 2024-26 average growth rate is then applied to estimate GDP from 2027 to 2030. The size of the 20 economies is expected to expand by just over 50% between 2020 and 2030 in real terms,⁶ with average annual growth amounting to 4.1% during the period or 1.8% on a per capita basis.

Demographic information is derived from UNDESA’s World Population Prospects: The 2019 Revision. This provides single-year age estimates for all countries over the projection period. This is combined with data from UNESCO’s Institute for Statistics (UIS) on the official school-age population for each level of education to align the age categories in the UNDESA dataset.⁷ On average, the official school ages in the region are 3-5 years for pre-primary, 6-12 for primary, 13-17 in secondary and 18-22 in tertiary education (Table 2).

Table 2. Official school age by level of education in ESAR countries

Country	Pre-primary	Primary	Secondary	Tertiary
Angola	4-5	6-11	12-17	18-22
Botswana	3-5	6-12	13-17	18-22
Burundi	5-6	7-12	13-19	20-24
Comoros	3-5	6-11	12-18	19-23
Eritrea	4-5	6-10	11-17	18-22
Eswatini	3-5	6-12	13-17	18-22
Ethiopia	4-6	7-12	13-18	19-23
Kenya	3-5	6-11	12-17	18-22
Lesotho	3-5	6-12	13-17	18-22
Madagascar	3-5	6-10	11-17	18-22
Malawi	3-5	6-11	12-17	18-22
Mozambique	3-5	6-12	13-17	18-22
Namibia	5-6	7-13	14-18	19-23
Rwanda	4-6	7-12	13-18	19-23
South Africa	3-6	7-13	14-18	19-23

⁴ UNESCO (2014) did present an affordability analysis, which assumed that the historical growth rate of government spending on primary education was maintained between 2014 and 2030. This paper, in contrast, takes the latest available 3-year average of government spending on teacher compensation for each level of education as a percentage of GDP and projects forward using GDP estimates produced by the International Monetary Fund (IMF).

⁵ Somalia was excluded in this exercise due to data gaps.

⁶ All calculations are based on constant GDP figures to account for inflation.

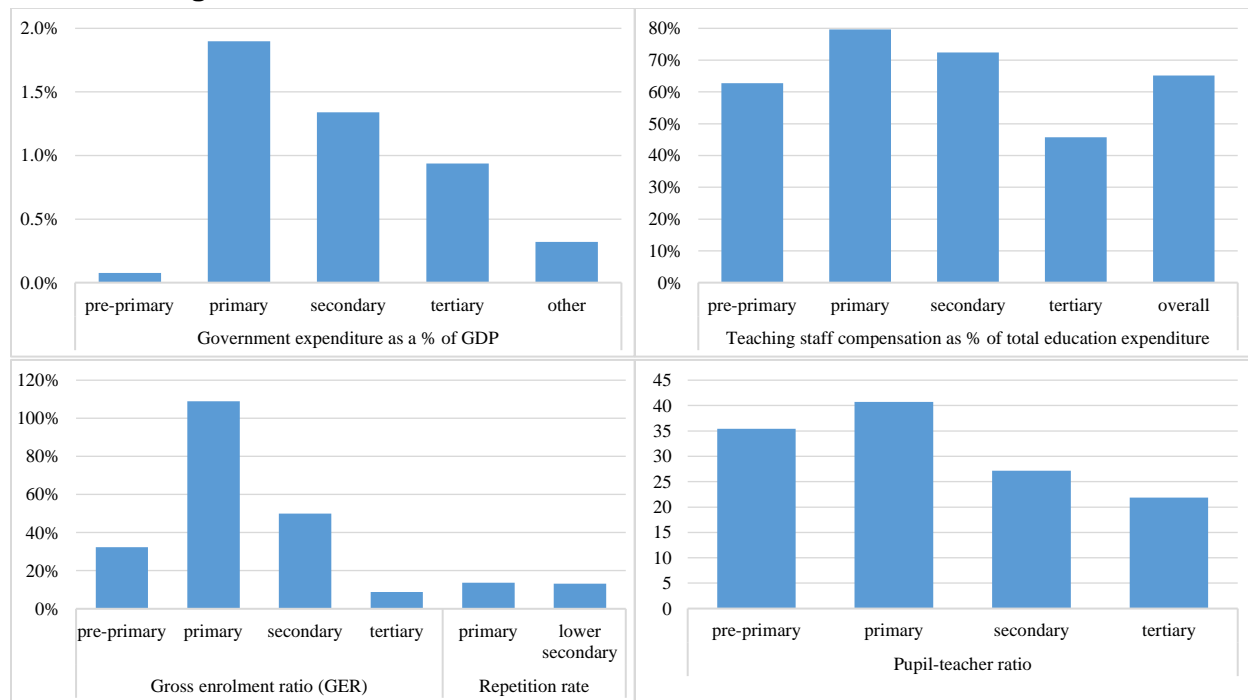
⁷ A comparison of the estimated school-age population in 2020 using the UNDESA dataset and the information reported by UNESCO shows a statistically insignificant difference (-0.45%, on average), with 45/60 observations being identical.

Country	Pre-primary	Primary	Secondary	Tertiary
South Sudan	3-5	6-11	12-17	18-22
Tanzania	5-6	7-13	14-19	20-24
Uganda	3-5	6-12	13-18	19-23
Zambia	3-6	7-13	14-18	19-23
Zimbabwe	4-5	6-12	13-18	19-23
ESAR average	4-5	6-12	13-18	19-23

Source: UNESCO UIS.Stat (2021)

All educational indicators are retrieved from UNESCO UIS. For each level of education, this includes: (i) government expenditure on education as a % of GDP; (ii) teaching staff compensation as a % of total expenditure on education; (iii) gross enrolment ratios (GER); (iv) number of teachers; (v) P-T ratios; (vi) number of enrolled students; and (vii) repetition rates. Regional baseline figures for comparable indicators are presented in Figure 3 below.

Figure 3. Select baseline indicators for ESA, 2020 or latest available



Source: Authors' calculations based on UNESCO UIS.Stat (2021)

2.3. Description of the model

The number of affordable teachers in the year 2030 in country i at level of education l is estimated with Equation (3) below. The first step is to calculate the average cost per teacher, which is based on the total value of expenditure on each level of education and the corresponding number of teachers (Equation 1). The relationship between education expenditure and the economy as well as teacher compensation and education expenditure are then held constant between 2020 and 2030 (Equation 2). The number of affordable teachers in 2030 therefore depends on the number of teachers in 2020 and GDP growth between 2020 and 2030 (Equation 3).

$$avg_teacher_comp_{2020,i,l} = \frac{gdp_{2020,i} * expenditure_{2020,i,l} * teacher_comp_{2020,i,l}}{\# \text{ of teachers}_{2020,i,l}} \quad (1)$$

$$affordable_{2030,i,l} = \frac{gdp_{2030,i} * expenditure_{2020,i,l} * teacher_comp_{2020,i,l}}{avg_teacher_comp_{2020,i,l}} \quad (2)$$

$$= teachers_{2020,i,l} * \frac{gdp_{2030,i}}{gdp_{2020,i}} \quad (3)$$

The number of required teachers in the year 2030 in country *i* at level of education *l* is estimated with Equation (5) below. The GER is defined as the product of the target NER and one plus the target repetition rate (Equation 4). The number of teachers can then be determined by multiplying the projected student-age population for each level of education in 2030 by the target GER and dividing by the target P-T ratio (Equation 5). This is applied under three scenarios: (i) baseline or “business as usual”; (ii) slightly ambitious; and (iii) ambitious. Each scenario has unique targets for enrollment rates, repetition rates and P-T ratios, which are summarized in Table 3 and described below.

$$GER_{2030,target,l} = NER_{2030,target,l} * (1 + (repetition_{2030,target,l})) \quad (4)$$

$$required_{2030,i,l} = \frac{school_age_population_{2030,i,l} * GER_{2030,target,l}}{\min(PT_ratio_{2020,i,l}, PT_ratio_{2030,target,l})} \quad (5)$$

Table 3. 2030 targets for each scenario

Scenario	Enrollment rates (NER)				Repetition rates				P-T ratios			
	pre	primary	second-ary	tertiary	pre	primary	second-ary	tertiary	pre	primary	second-ary	tertiary
Baseline									2020 estimated value			
Slightly ambitious	100%	100%	100%	24%*	0%	half of 2020 estimated value or 10%		capture d by GER	35 or baseline**	41 or baseline**	27 or baseline**	22 or baseline**
Ambitious									23 or baseline***	31 or baseline***	20 or baseline***	18 or baseline***

Source: Author’s calculations based on UIS.Stat (2021)

* Represents the lower-middle-income country global average; Botswana was the only country in the region that exceeded this (latest 3-year average was 25%) so its baseline value was held constant through 2030

** Represents estimated regional average in 2020

*** Represents estimated regional top 25 percentile in 2020

Enrollment rate targets are aligned to the SDGs in all scenarios. Achieving SDG Target 4.1 would require enrollment rates of 100% in primary and secondary education, while an enrollment rate of 100% in pre-primary education would contribute to the achievement of Target 4.2.⁸ However, when reaching the age of tertiary education, young women and men face other

⁸ SDG Target 4.1: “By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and Goal-4 effective learning outcomes.”

SDG Target 4.2: “By 2030, ensure that all girls and boys have access to quality early childhood development, care and preprimary education so that they are ready for primary education.”

opportunities, like technical or vocational training or entering the labor market, which means that the enrollment rate for tertiary education should not be 100% to reach Target 4.3.⁹ As a result, NERs are set at 100% for pre-primary, primary and secondary levels while the lower-middle-income country global average GER in 2019 is used for tertiary education under all scenarios (24%).

The target repetition rates are also the same across all scenarios and reflect those used in UNESCO’s methodology. For primary and secondary education, the baseline estimated repetition rates improve over time, falling by half between 2020 and 2030. However, if the projected rate for 2030 remains greater than 10%, then 10% is used as the target value. For pre-primary education, there are generally no attainment requirements to proceed to the next grade, so a 0% repetition rate is assumed. And for tertiary education, repetition is captured by using the lower-middle-income country global average GER (or higher).

The target P-T ratios vary across each scenario to account for different levels of ambition. In the baseline scenario, the estimated P-T ratios for 2020 are held constant through 2030. As a result, the number of required teachers changes relative to the change in the number of enrolled students at each level of education (i.e. to reflect the growing number of school-age students as well as the absorption of all OOS children and falling repetition rates). In the slightly ambitious scenario, the P-T ratios equal the regional average or better for each level of education based on the 2020 values. Hence, countries that are above (or worse than) the regional average in 2020 progressively reach this level in 2030, while countries that are below (or better than) maintain their latest ratio for all years.¹⁰ Under the ambitious scenario, P-T ratios achieve the regional top 25 percentile or better in 2030, which are also based on 2020 values.

2.4. Caveats

Before interpreting the regional and country-level findings, it is important to understand the caveats that underpin the interpretation of the analyses. These are discussed below.

First, the analysis exclusively relies on information from global databases. While this was the only way to allow for meaningful comparisons across countries, data from national sources could vary significantly.

Second, there is substantial missing and antiquated data. For example, only nine countries have data available on the number of teachers at pre-primary level since 2017, 13 at primary level, ten at secondary level and nine at tertiary level. Similarly, only six countries have data on expenditure by levels of education and staff compensation since 2017. Repetition rates and P-T ratios face similar constraints. As a result, gap filling methods were extensively applied, including nearest neighbor imputation, interpolation and the application of regional average values where data were non-existent.

⁹ SDG Target 4.3: “By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.”

¹⁰ Note that the ratios for primary and secondary education are similar to those used in UNESCO (2016).

Third, the modelling results are driven by many assumptions. These include:

- GDP growth projections by the IMF through 2026, as well as further projections to 2030 based on ordinary least squares (OLS), provide an accurate picture of economies over time.
- Government expenditure by level of education relative to the size of the economy between 2020 and 2030 remains identical to the latest available 3-year average for each country; this further applies to the portion of government expenditure at each level of education that is devoted to teacher compensation.
- UNDESA's projections for school-age populations are reliable through 2030.
- Repetition rates in lower secondary education are the same across upper secondary education (Note: There are no estimates for secondary as a whole or for upper secondary).
- COVID-19 did not radically change the 2020 baseline estimates for numbers of teachers, enrolled students and OOS or repetition rates.

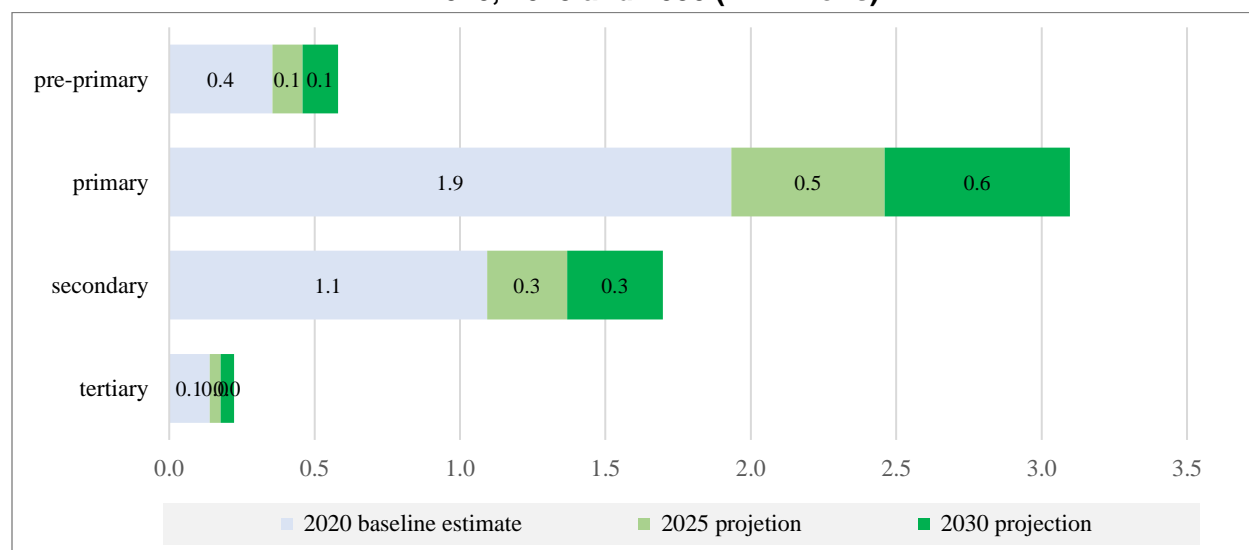
Fourth, the analysis does not capture attrition, skills or the location of teachers. As demonstrated by the earlier UNESCO studies, many teachers in the region will need to be replaced as they either move on to other jobs or reach retirement age. This comes on top of the need to replace or train unqualified teachers across all education levels so that they have adequate knowledge of their respective subject matters but also so they can support digital learning approaches in the context of COVID-19, which is a new skills gap. In addition, the analysis does not account for the allocation of teachers across different geographic regions within countries, which presents another major challenge in terms of equalizing classroom sizes, especially between rural and urban settings. In short, more research is needed to arrive at a more comprehensive understanding of current and long-term teacher requirements in ESA.

3. Results

3.1. Affordability

The model predicts that governments in ESA will be able to afford 5.6 million teachers across all levels of education in 2030, which is 2.1 million more than in 2020 or a 60% increase (Figure 4). The affordability analysis assumes that governments continue to invest the same amount of resources in teacher compensation over time relative to the size of their economies. Thus, when applying the latest available expenditure estimates for all countries, ESA will be able to pay for around 0.58 million teachers at the pre-primary level, 3.1 million at primary, 1.7 million at secondary and 0.22 million at tertiary in 2030. The biggest projected change over the 2020-30 period is at the pre-primary level (a 64% increase) followed by primary and tertiary (both at 60%), with secondary expanding by around 55%. Note country-level information is presented in Annexes 1 and 2.

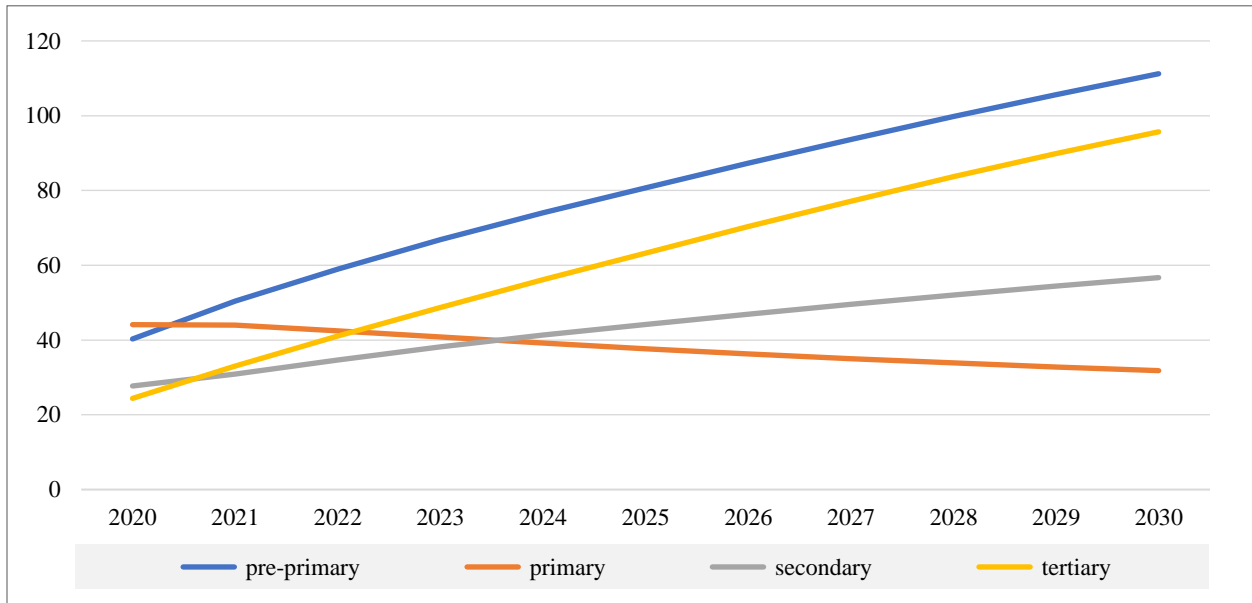
Figure 4. Estimated # of affordable teachers in ESA by level of education, in 2020, 2025 and 2030 (in millions)



Source: Author's calculations based on the IMF's World Economic Outlook Database (April 2021), UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

The main challenge of maintaining the latest teacher compensation trends is that classroom sizes will quickly become unmanageable. If additional teachers are not recruited at the pre-primary level, for instance, the average P-T ratio in ESA would balloon from around 40:1 in 2020 to more than 110:1 in 2030 as classrooms cope with growing numbers of school-age children each year while also gradually absorbing all OOS children and dealing with repeat students (Figure 5). At the secondary level, the P-T ratio would jump from approximately 28:1 to 57:1, on average, over the same period, and go from 24:1 to 96:1 at the tertiary level. The primary level is the lone exception where the average P-T ratio would decline from 44:1 to 32:1 between 2020 and 2030. This reflects the large stock of teachers as well as the strong progress in addressing OOS children compared to other education levels as of 2020.

Figure 5. Average P-T ratios in ESA by level of education if teacher compensation trends remain constant, 2020-30



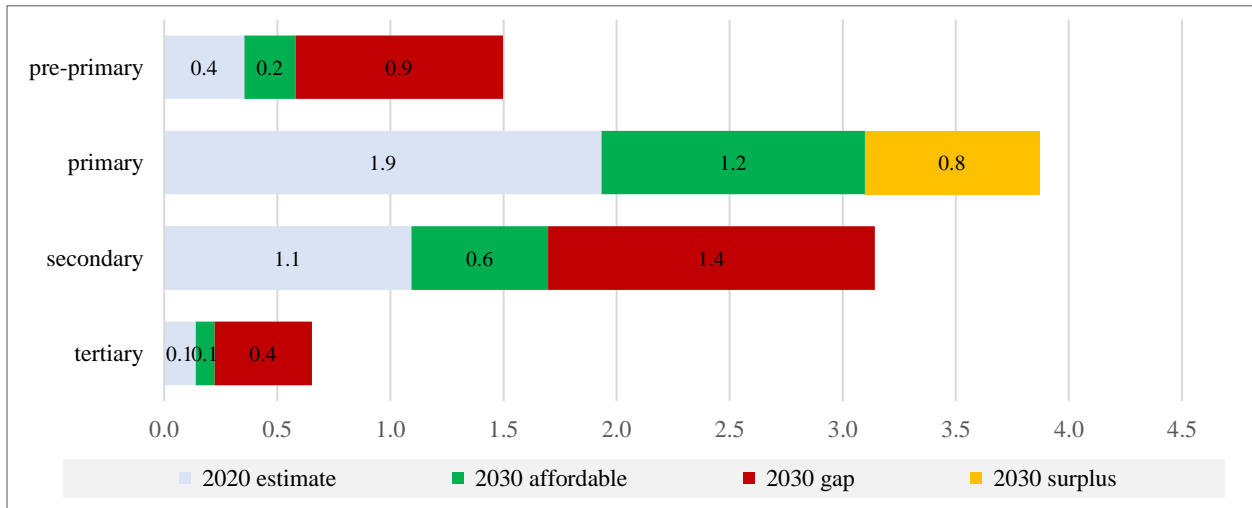
Source: Author's calculations based on the IMF's World Economic Outlook Database (April 2021), UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

3.2. Scenario 1: Baseline – 2020 P-T ratios are maintained through 2030

Under the baseline or “business as usual” scenario, the model predicts that 7.6 million teachers will be required across all levels in 2030 (Figure 6). This translates into a net shortage of around 2 million teachers or a 27% gap based on the affordability analysis. This scenario assumes that governments simply maintain their latest P-T ratios between 2020 and 2030, which means that classroom sizes remain identical. As a result, the number of teachers only adjusts to accommodate the increasing number of school-age children as well as OOS and repeat students across the basic education cycle (NERs reach 100%) with a modest enrollment target at the tertiary level (GERs reach 24%). The biggest staffing imbalance emerges at the secondary level (1.4 million teachers), which is followed by pre-primary (0.92 million) and then tertiary (0.43 million).

This scenario also indicates a surplus of 0.77 million teachers at the primary level. As highlighted by the orange bar in Figure 6, the region would end up with more primary school teachers in 2030 than are required to maintain the current P-T ratio based on current investment trends. For governments interested in pursuing staffing targets under this scenario, this points to an allocation inefficiency that would require a gradual shifting of new recruitment from primary teachers to address shortages across other levels of the system. For instance, the surplus at the primary level could be re-directed to the pre-primary level and nearly cover the full requirement. However, even under this situation, there would still be a 46% shortfall in the number of teachers at the secondary level, which reaches 66% at the tertiary level.

Figure 6. Estimated # of required and affordable teachers in ESA by level of education in 2030 based on the baseline scenario (in millions)

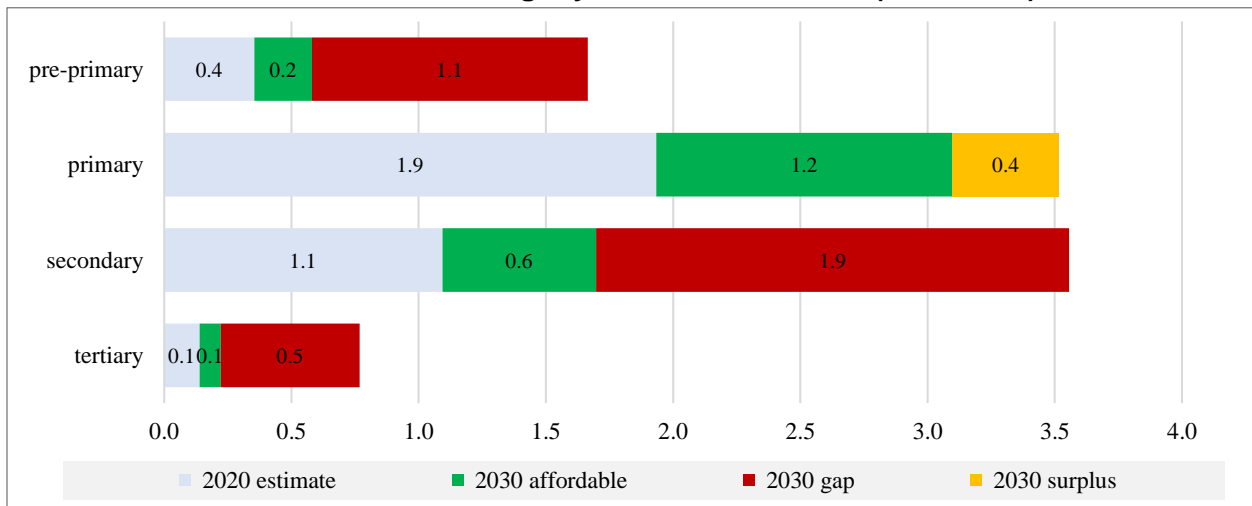


Source: Author's calculations based on the IMF's World Economic Outlook Database (April 2021), UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

3.3. Scenario 2: Slightly ambitious – P-T ratios achieve 2020 regional averages in 2030 (35:1 pre-primary, 41:1 primary, 27:1 secondary, 22:1 tertiary)

In the slightly ambitious scenario, the model predicts 8.7 million teachers are needed in 2030, which amounts to a net shortfall of around 3.1 million teachers or a 35% deficit compared levels of affordability (Figure 7). Rather than maintaining the latest P-T ratios, if all countries were to progressively reach the latest regional average P-T ratios in 2030, there would be a gap of 1.1 million teachers at the pre-primary level, 1.9 million at the secondary level and 0.55 million at the tertiary level. As in the baseline scenario, a surplus appears at the primary level that could potentially be re-deployed elsewhere (0.42 million teachers).

Figure 7. Estimated # of required and affordable teachers in ESA by level of education in 2030 based on the slightly ambitious scenario (in millions)

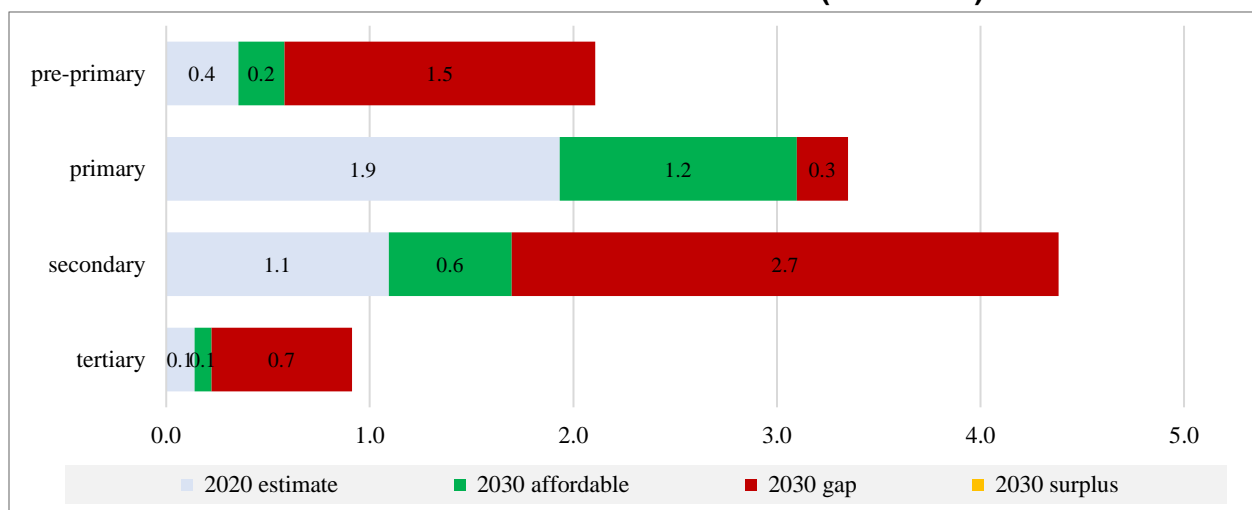


Source: Author's calculations based on the IMF's World Economic Outlook Database (April 2021), UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

3.4. Scenario 3: Ambitious – P-T ratios achieve 2020 regional top 25 percentiles in 2030 (23:1 pre-primary, 31:1 primary, 20:1 secondary, 18:1 tertiary)

Under the ambitious scenario, 10.7 million teachers would be required across all education levels in 2030, which suggests a shortage of 5.2 million teachers or a 48% gap compared to projected levels of affordability (Figure 8). By pursuing P-T ratios that would be considered grandiose in most country contexts, the teacher requirements expand significantly across all levels. Here, the shortfall reaches 1.5 million teachers at the pre-primary level, 0.25 million at the primary level, 2.7 million at the secondary level and 0.69 million at the tertiary level. Notably, the surplus of teachers at the primary level that appeared in earlier scenarios disappears.

Figure 8. Estimated # of required and affordable teachers in ESA by level of education in 2030 based on the ambitious scenario (in millions)



Source: Author's calculations based on the IMF's World Economic Outlook Database (April 2021), UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

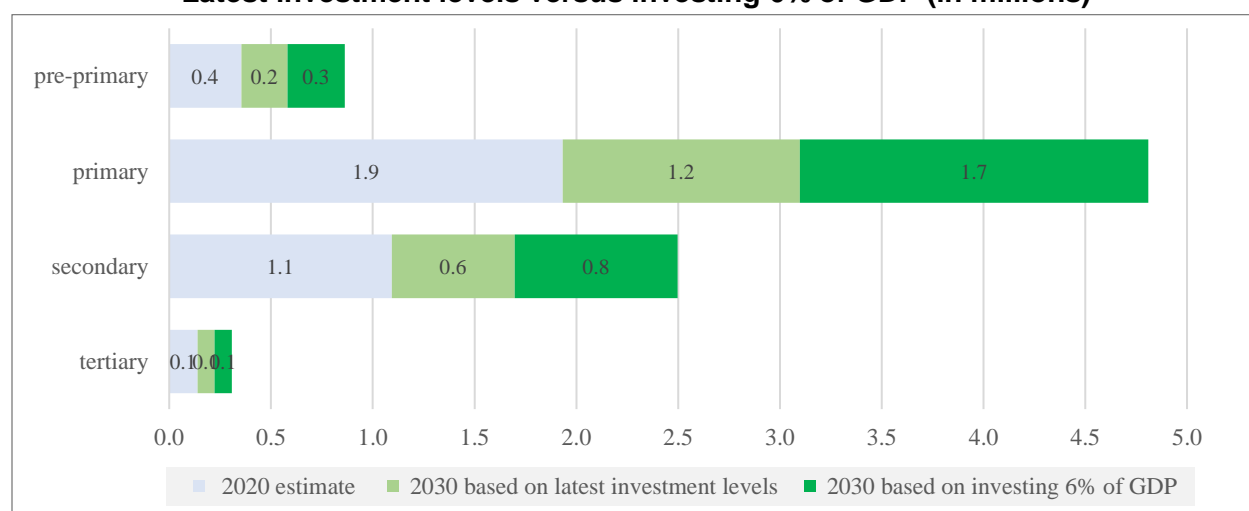
3.5. The Impact of Expenditure Benchmarks on P-T Ratios

How would the estimated shortage of teachers change if governments in ESA met global education expenditure targets? In 2015, the *Incheon Declaration and Framework for Action for the Implementation of SDG 4* was adopted by 184 governments worldwide. Signatories committed to provide 12 years of free, publicly funded primary and secondary education, and were also encouraged to provide at least one year of free and compulsory pre-primary education. To deliver on these bold commitments, the Declaration included annual spending targets for the education sector as a whole: at least 4-6% of GDP and/or 15-20% of total public expenditure (UNESCO et al. 2015). In poorer countries, the Declaration notes that governments “need to reach or exceed the upper end of these benchmarks if they are to achieve the targets laid out in this framework” (ibid, p. 67).

If education expenditure reached the high end of the Incheon Declaration benchmark in economic terms (6% of GDP), the region could potentially achieve 8.5 million teachers in 2030 (Figure 9). This is nearly 3 million more teachers than the affordability projections and nearly

enough to meet the teacher requirements under the slightly ambitious scenario (scenario 2). Assuming that the composition of expenditure across all levels of education remained constant, this aggregate level of investment in education would potentially translate into 0.86 million teachers at pre-primary level, 4.8 million at primary, 2.5 million at secondary and 0.31 million at tertiary.

Figure 9. Comparing affordable numbers of teachers in ESA in 2030: Latest investment levels versus investing 6% of GDP (in millions)

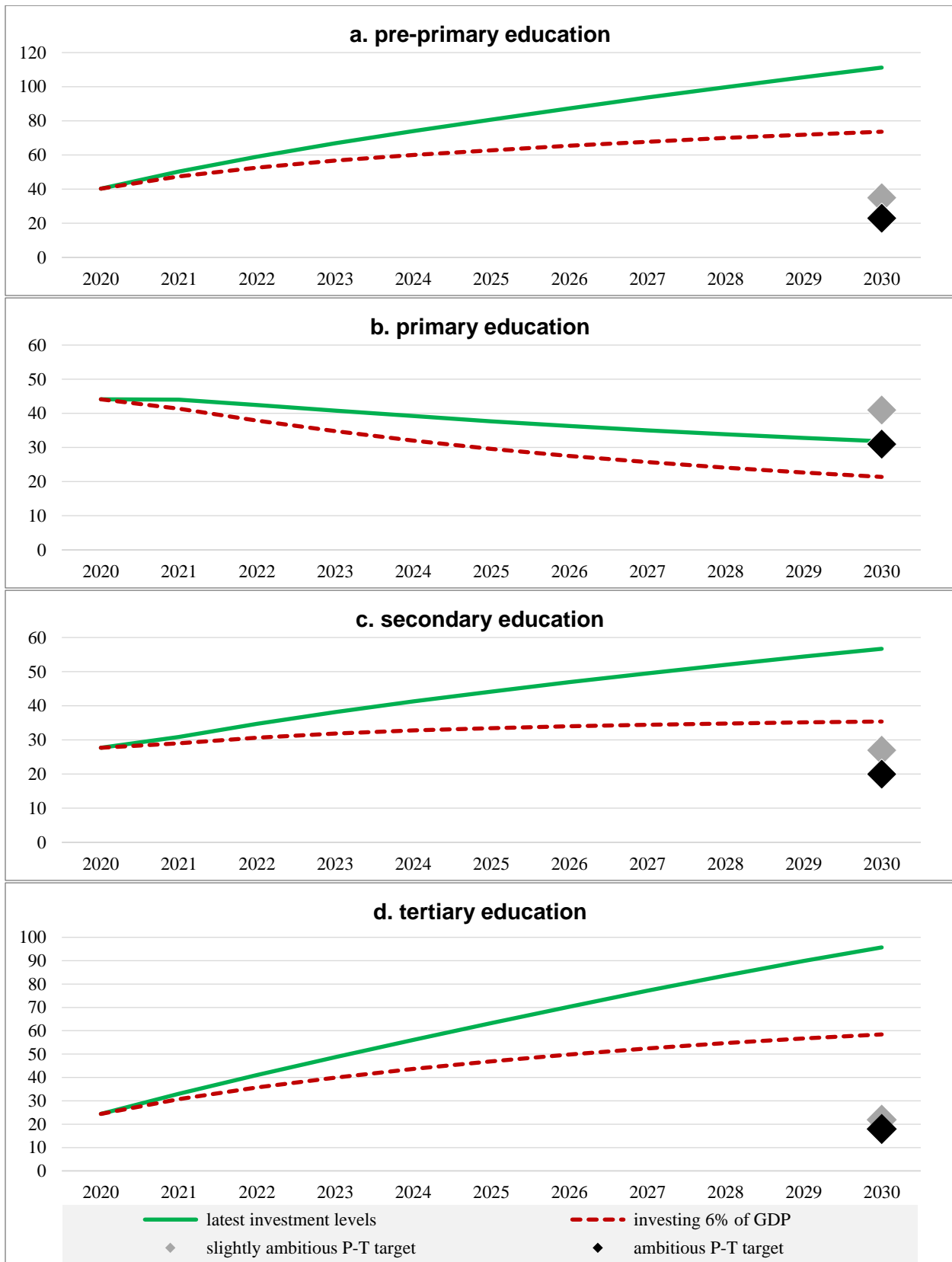


Source: Author's calculations based on the IMF's World Economic Outlook Database (April 2021), UNDESA World Population Prospects: The 2019 Revision (medium variant) and UNESCO UIS.Stat (2021)

Notes: (i) Government expenditure on education was incrementally increased to achieve 6% of GDP in 2030 for all countries, except where baseline expenditure exceeded that threshold in which case the latest estimates were maintained throughout the period (this includes Botswana, Eswatini, Lesotho and South Africa); and (ii) the ratio of expenditure across education levels remained constant

While this staffing outlook is much more favorable than the “business as usual” trend, there are still gaps. For instance, rather than getting classroom sizes down to an average of 35 students at the pre-primary level (the slightly ambitious target P-T ratio), progressively increasing education expenditure to 6% of GDP would only achieve a P-T ratio of 74:1 by 2030, although this is much better than 111:1 as estimated under current trends (Figure 10a). At the secondary level, achieving the Incheon Declaration expenditure target is predicted to result in an average P-T ratio of 35:1 (Figure 10c). This is significantly better than the present trajectory (a P-T ratio of 57:1) but still insufficient to meet the slightly ambitious scenario target of 27:1. The P-T ratio at the tertiary level remains the furthest away under the same conditions, landing at 58:1 in 2030, which is much better than the current path (96:1) but far short of the target (22:1) (Figure 10d). The number of teachers at the primary level is the outlier. Given that current expenditure trends were projected to nearly meet the target P-T ratio under the ambitious scenario (31:1), additional increases in expenditure indicate a potential P-T ratio of 21:1 (Figure 10b).

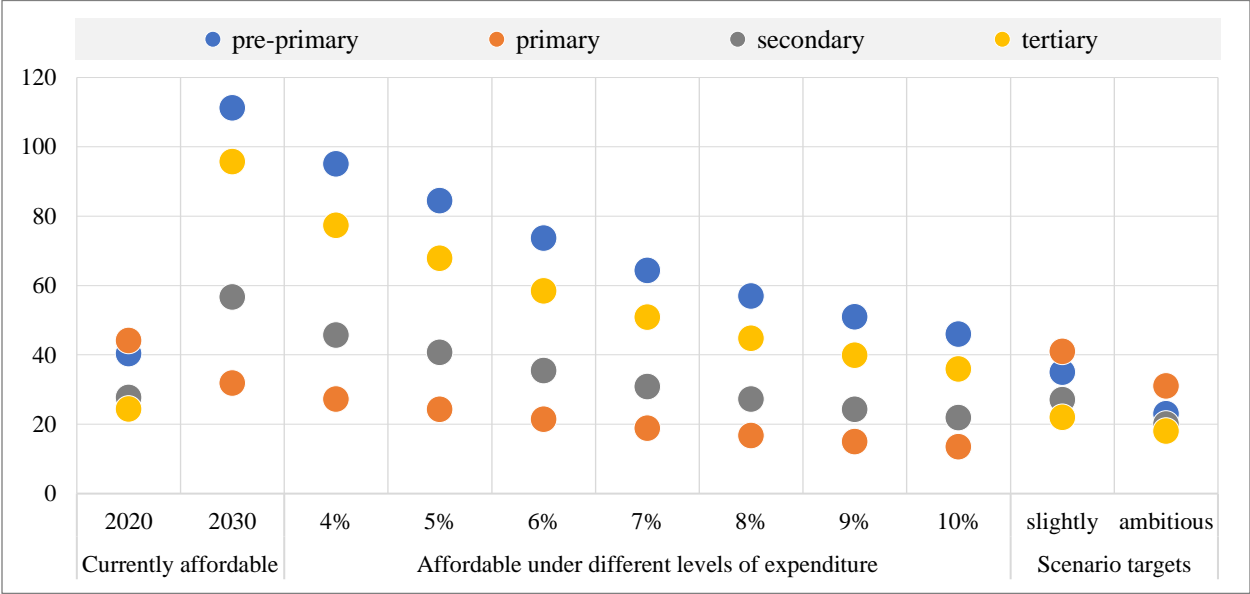
**Figure 10. Average P-T ratios in ESA in 2030 under different levels of expenditure:
Latest investment levels versus investing 6% of GDP**



Source and notes: Same as in Figure 9

How relevant are the global education spending targets to countries in ESA relative to the size of the economy? The results from this exercise indicate that achieving the upper band of the expenditure target (6% of GDP) in ESA could potentially deliver P-T ratios under the slightly optimistic scenario as long as the surplus of primary teachers was efficiently re-allocated to other levels of the system. However, introducing more aggressive investment targets would have a much bigger impact on learning. For instance, if total education expenditure reached 8% of GDP in 2030, the P-T ratio under the slightly ambitious scenario could be achieved at the secondary level while also generating a large surplus of teachers at the primary level that could be re-directed to pre-primary and tertiary levels (Figure 11). This presents a strong case for further classifying the expenditure targets in the Incheon Declaration to better reflect the financing needs among low and lower-middle-income countries in sub-Saharan Africa, e.g. from 6% to 7% or 8% of GDP.

Figure 11. Average P-T ratios in ESA in 2030 under different levels of expenditure: 4 to 10% of GDP



Source and notes: Same as in Figure 9

4. Conclusions and Recommendations

To enable quality learning for all children in ESA, governments need to address the growing demand for teachers. This is particularly challenging given the fast population growth, the large numbers of OOS children and the big classroom sizes that characterize most education systems at present.

This paper attempts to quantify both the demand and affordability of teachers in ESA through the end of the SDG period. Under a “business as usual” situation where governments simply maintain their latest P-T ratios through 2030, around 2 million additional teaching positions would be required, which is a 27% gap compared to affordable levels. In contrast, if governments were to achieve the regional average P-T ratios¹¹ in 2030, ESA would need an additional 3.1 million teachers (or a 35% gap). And if governments were to reduce P-T ratios to those of the best performers in the region,¹² the teacher deficit would exceed 5 million, which is a nearly 50% shortfall compared to affordability estimates. While there is variation across countries, the compounding shortage of teachers is a serious risk to improving both access to and the quality of learning across the region and acts as a massive barrier to meeting basic education targets, including the SDGs.

The key takeaway is the need to invest more resources in teachers. If governments were able to progressively increase their investment in education to reach 6% of GDP in 2030, which is in line with the most ambitious target in the Incheon Declaration, an additional 3 million teachers could be recruited. This could potentially enable the region to achieve P-T ratios under the slightly optimistic scenario. However, to maximize learning opportunities and outcomes for all children in the region, more resources are needed in most contexts e.g. from 4.6% of GDP, on average, in 2020 to 7% or 8% of GDP by 2030.

Of course, teachers are only one part of the education financing equation. This paper did not look at other essential spending items, which range from administrative and support staff and education management information systems (EMIS) to learning materials and new classroom construction and upgrading to teacher training and operational costs, among others. It also did not account for the additional financing needs brought about by COVID-19 to re-open schools and keep them open, including improving water and sanitation facilities and getting protective equipment. Then there are the other costs to bolster access and learning, such as eliminating school fees, providing textbooks and uniforms, delivering school feeding programs, connecting classrooms to electricity and the Internet, and so on (Evans and Mendez Acosta 2021).

Investing more in education is an even taller order in the context of COVID-19. The pandemic has created immense fiscal pressures across ESA and led some governments to reduce expenditure on education in 2020 and 2021 (Muchabaiwa 2020). Reversing this trend will therefore depend on the ability of governments to fund other priority areas to end the pandemic,

¹¹ Pre-primary is 35 or baseline value, primary is 41, secondary is 27 and tertiary is 22.

¹² Pre-primary is 23 or baseline value, primary is 31, secondary is 20 and tertiary is 18.

safely re-open economies and protect vulnerable households from various shocks (Cummins 2020). To this end, governments in ESA are encouraged to:

- **Progressively increase the amount of resources allocated to the education sector via annual budget processes:** Governments should aim to reach or exceed Incheon Declaration targets by 2025. This can be enabled by continuous assessment of options to expand fiscal space, with special attention to reallocating resources away from low priority areas (e.g. the military/defense, long-term infrastructure projects) and introducing or expanding progressive tax measures (on corporate income, financial transactions, property, luxury goods, digital economic activity, etc.) (Ortiz et al. 2017).
- **Use a portion of the new Special Drawing Rights (SDRs):** In August 2021, governments in ESA were allocated an equivalent of US\$12.4 billion in new SDRs by the IMF, which can be converted into foreign currency and invested in education systems.
- **Improve value for money in education sector budgets:** Among other things, this includes better balancing spending on teachers across different levels of the system (e.g. from primary to pre-primary), identifying and removing wasteful spending (e.g. on “ghost” teachers or ineffective teacher credential programs), maintaining teachers in the system (through financial as well as local housing, health and security-related incentives as well as in-service training opportunities and more efficient teaching post allocations), and making the teaching profession attractive for younger populations (via communication campaigns, organizing national debates on their importance, etc.).
- **Boost budget transparency in the education sector:** This can be achieved by strengthening procurement and salary payment systems as well as by providing timely and comprehensive reporting on how financial resources are spent across all levels of the system.
- **Develop compelling cases to receive greater external financial support for education from donors and the international financial institutions, especially through grants and highly concessional loans:** This involves demonstrating that new support will be spent as intended and deliver strong human capital gains.
- **Negotiate for debt relief that directly benefits the education sector:** Beyond making the case for both temporary and permanent reductions in debt service, governments can propose innovative options to link debt relief directly to education e.g. via debt-for-education swaps.

More and better investments in education systems are required if governments in ESA are to have any hope of recruiting and maintaining an adequate supply of teachers. This is foundational to strengthening the human capital base and maximizing economic growth and development progress, and even more so in a new world order characterized by recurring school closures and accumulated lost learning. Without greater public investment in education and teachers, everybody loses.

References

- Cummins, Matthew (2020). [COVID-19: A Catastrophe for Children in Sub-Saharan Africa](#). Dakar and Nairobi: UNICEF WCARO and UNICEF ESARO.
- Cummins, Matthew (2019). "[Population Dynamics and the Demographic Dividend Potential of Eastern and Southern Africa: A Primer](#)." UNICEF ESARO Social Policy Working Paper.
- Evans, David and Amina Mendez Acosta (2021). "[Education in Africa: What Are We Learning?](#)" *Journal of African Economies* 30(1) pp. 13-54.
- International Monetary Fund (IMF) (2021). [World Economic Outlook Database: April 2021 Edition](#). Washington, DC: IMF.
- Muchabaiwa, Bob (2020). "[Financing the Recovery from COVID-19: Building education back better](#)." UNICEF ESARO Social Policy Working Paper.
- Ortiz, Isabel, Matthew Cummins and Kalaivani Karunanethy (2017). "[Fiscal Space for Social Protection and the SDGs: Options to Expand Social Investments in 187 Countries](#)." ESS Working Paper No. 48, ILO, UNICEF and UN Women.
- United Nations (2016). [Education 2030: Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4](#). Incheon: UNESCO, UNDP, UNFPA, UNHCR, UNICEF, UN Women, World Bank and ILO.
- United Nations Department of Economic and Social Affairs (UNDESA) (2019). [World Population Prospects: The 2019 Revision](#). New York City: UNDESA.
- United Nations Educational, Scientific and Cultural Organization (UNESCO) (2021). [UNESCO UIS.Stat](#). Montreal: UNESCO Institute for Statistics.
- UNESCO (2016). "[The World Needs Almost 69 Million New Teachers to Reach the 2030 Education Goals](#)." UIS Fact Sheet No. 39, UNESCO Institute for Statistics.
- UNESCO (2015). "[Sustainable Development Goal for Education Cannot Advance Without More Teachers](#)." UIS Fact Sheet No. 33, UNESCO Institute for Statistics.
- UNESCO et al. (2015). [Incheon Declaration and Framework for Action for the Implementation of SDG 4](#). Paris: UNESCO, UNDP, UNFPA, UNHCR, UNICEF, UN Women, World Bank and ILO.
- UNESCO (2014). "[Wanted: Trained Teachers to Ensure Every Child's Right to Primary Education](#)." UIS Fact Sheet No. 30, UNESCO Institute for Statistics.

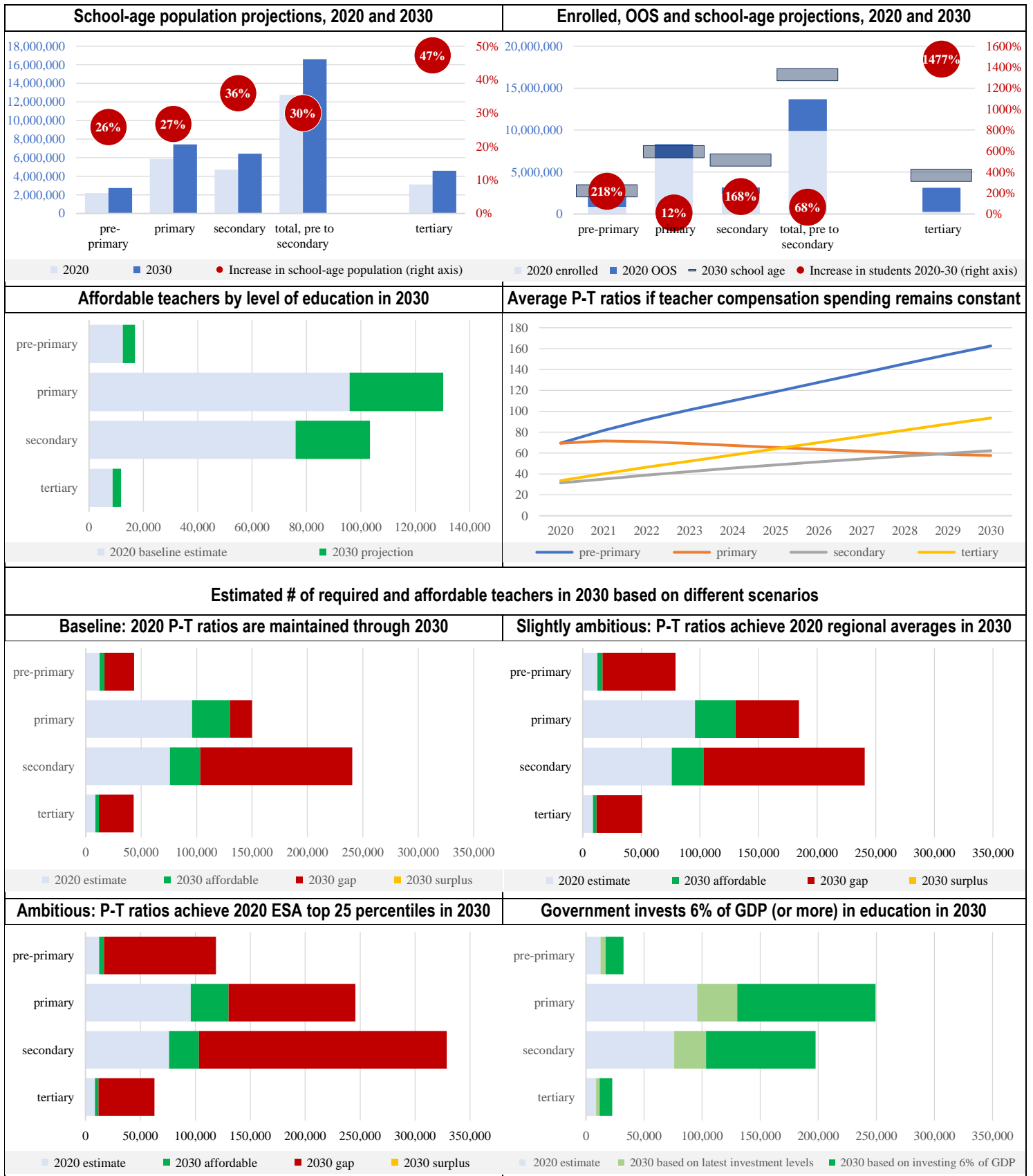
UNESCO (2013). "[A Teacher for Every Child: Projecting Global Teacher Needs from 2015 to 2030.](#)" UIS Fact Sheet No. 27, UNESCO Institute for Statistics.

UNESCO (2012). "[The Global Demand for Primary Teachers: 2012 Update.](#)" UIS Information Bulletin No. 10, UNESCO Institute for Statistics.

UNESCO (2009). "[Projecting the Global Demand for Teachers: Meeting the Goal of Universal Primary Education by 2015.](#)" Technical Paper No.3, UNESCO Institute for Statistics.

Annex 1. Modelling results by country

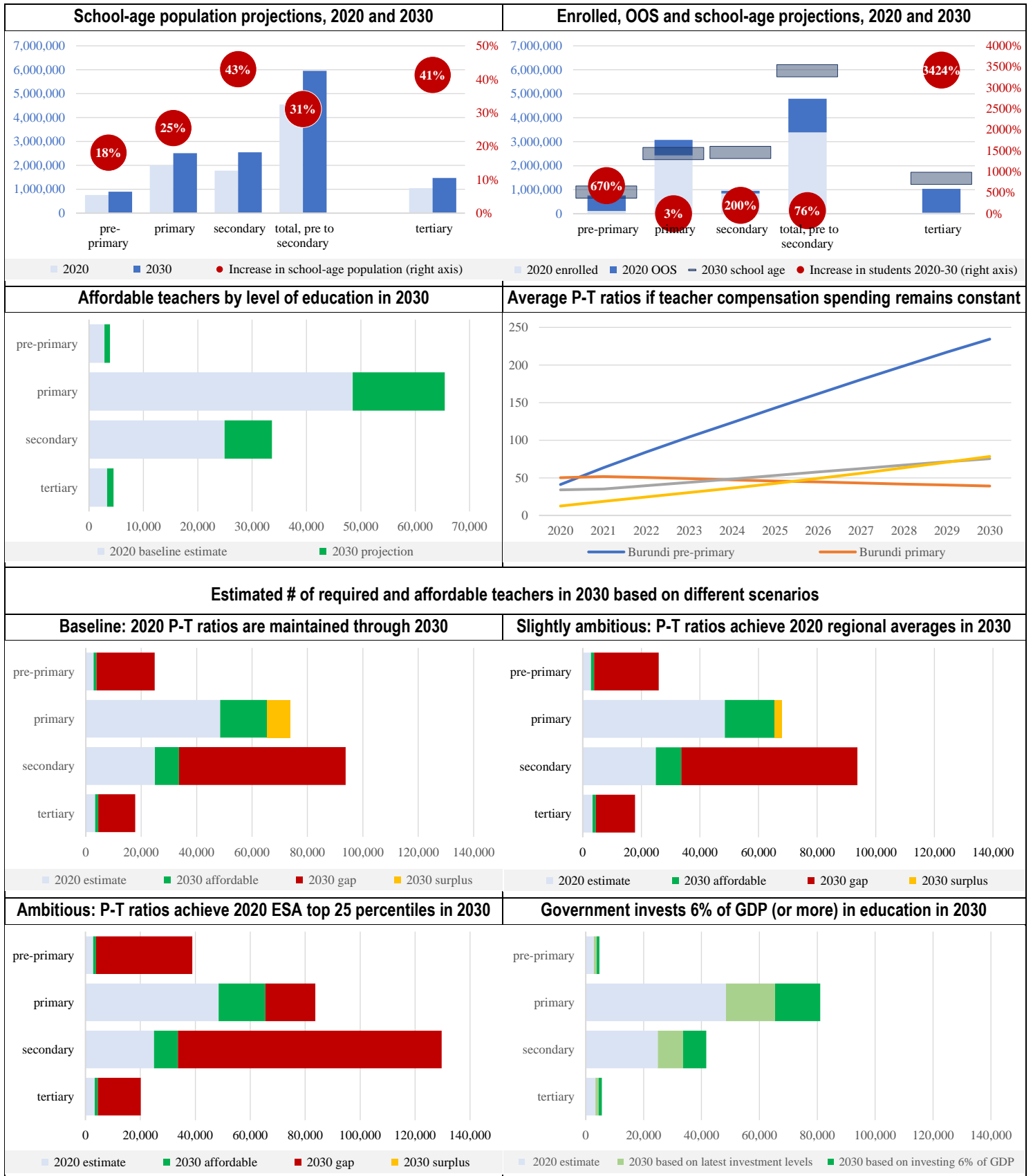
Angola



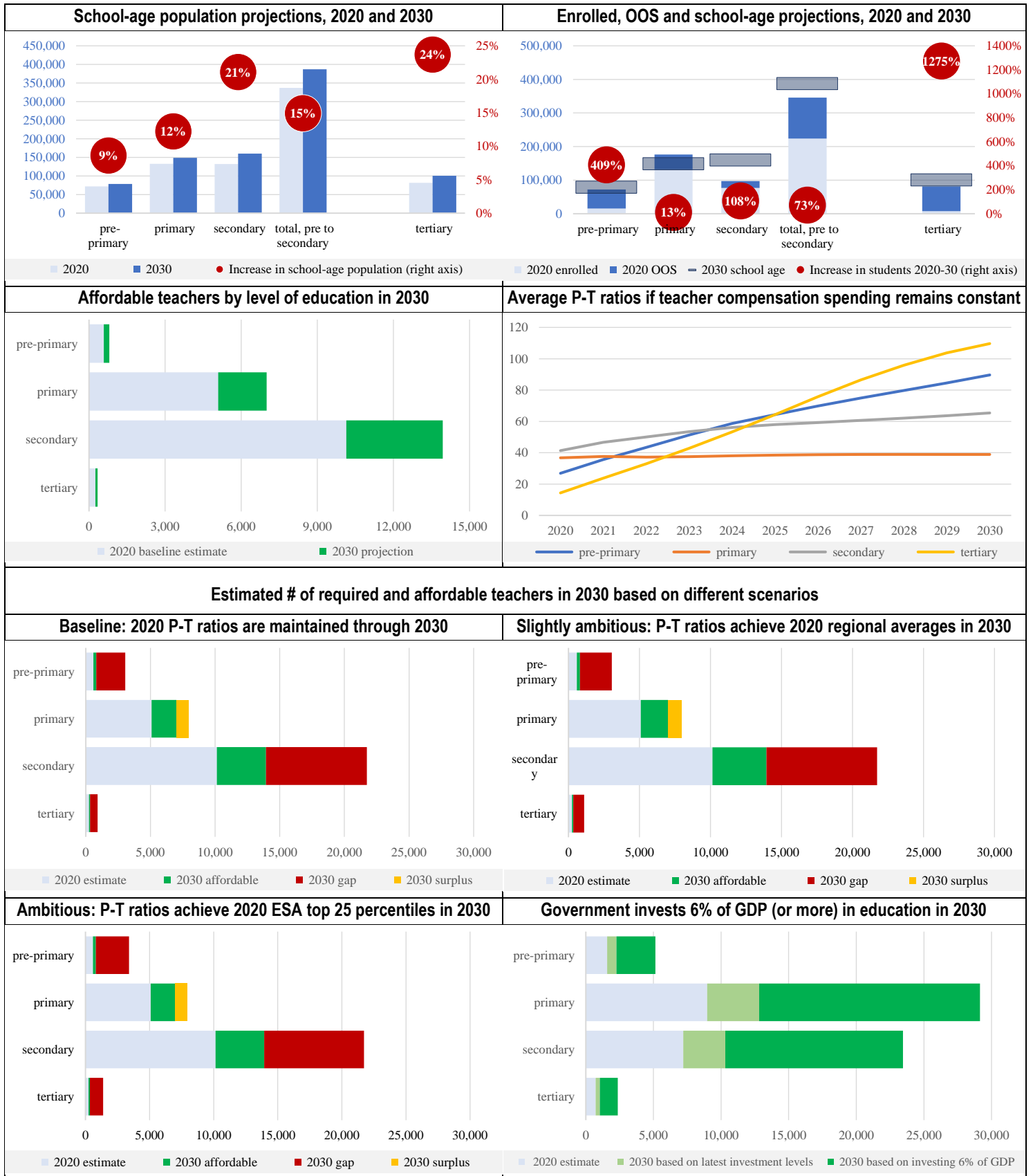
Botswana



Burundi



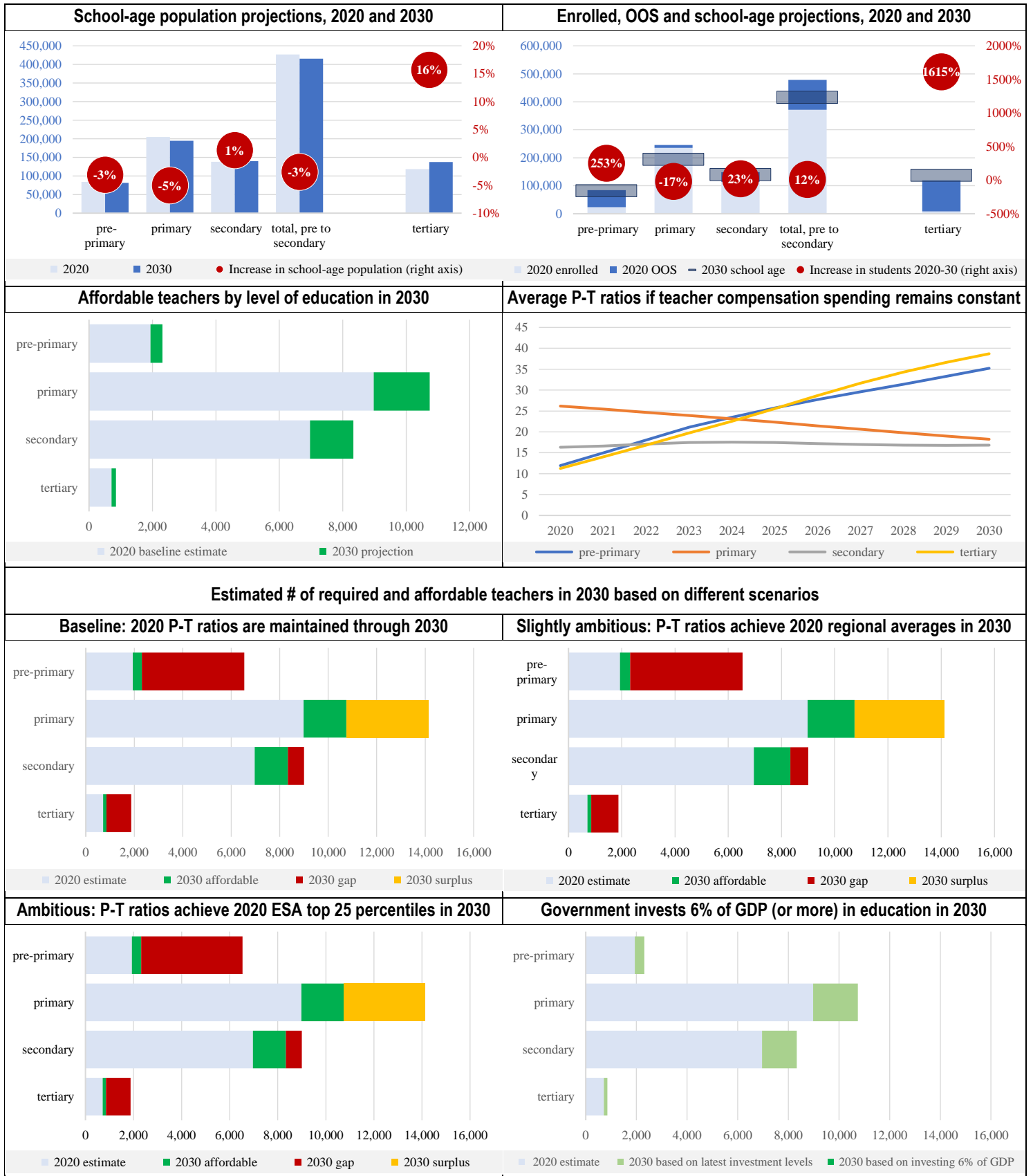
Comoros



Eritrea



Eswatini



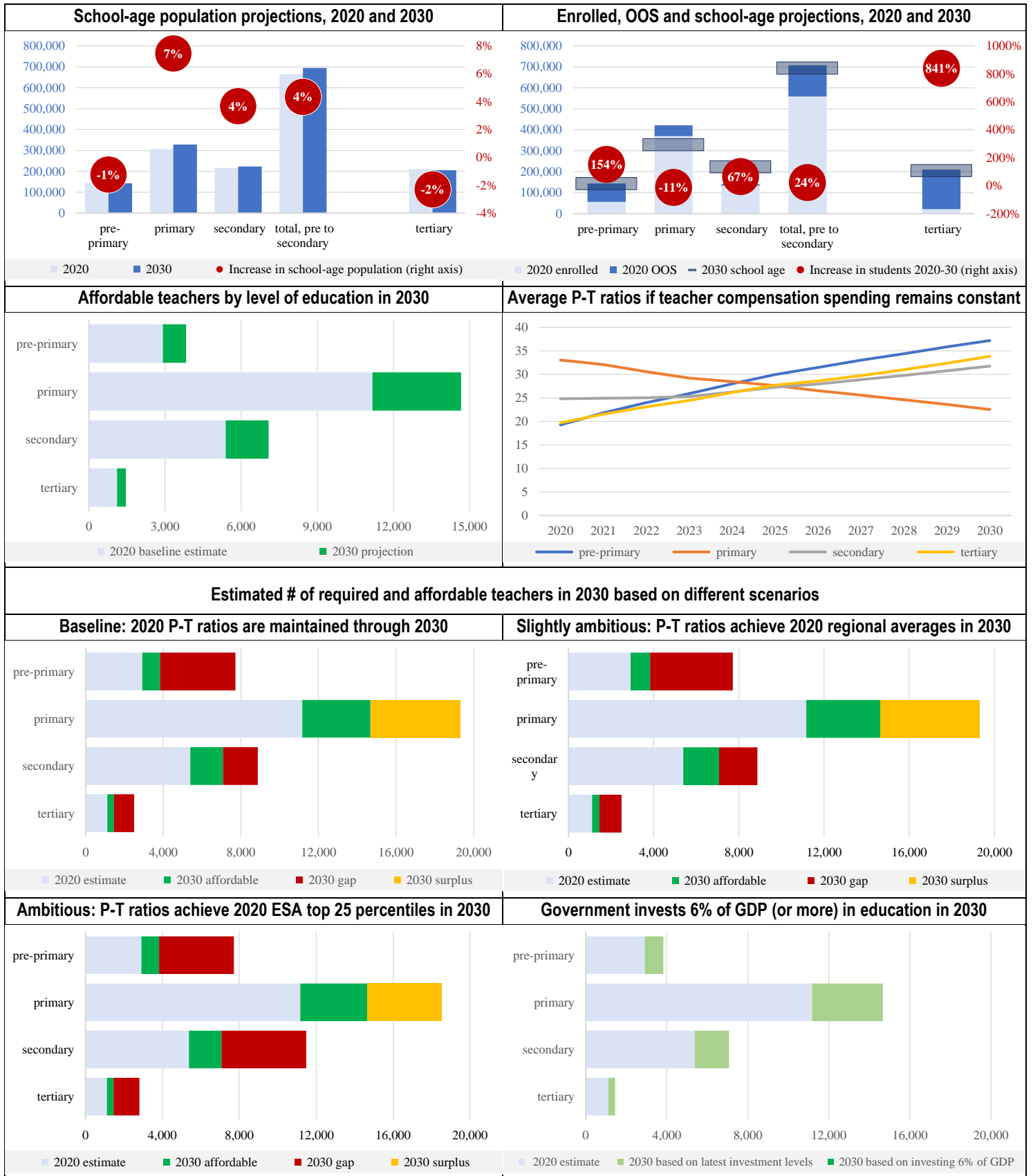
Ethiopia



Kenya



Lesotho



Madagascar



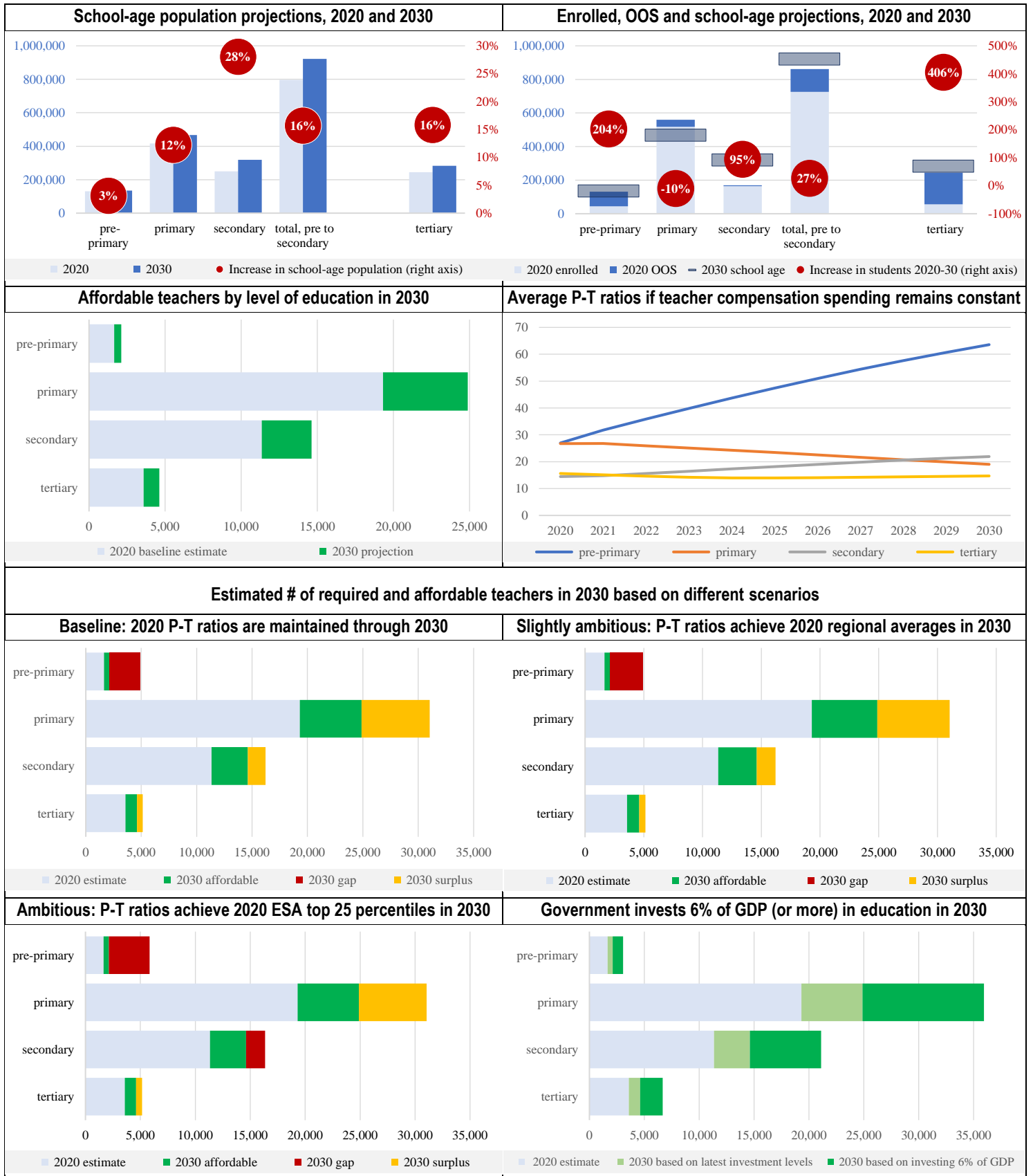
Malawi



Mozambique



Namibia



Rwanda



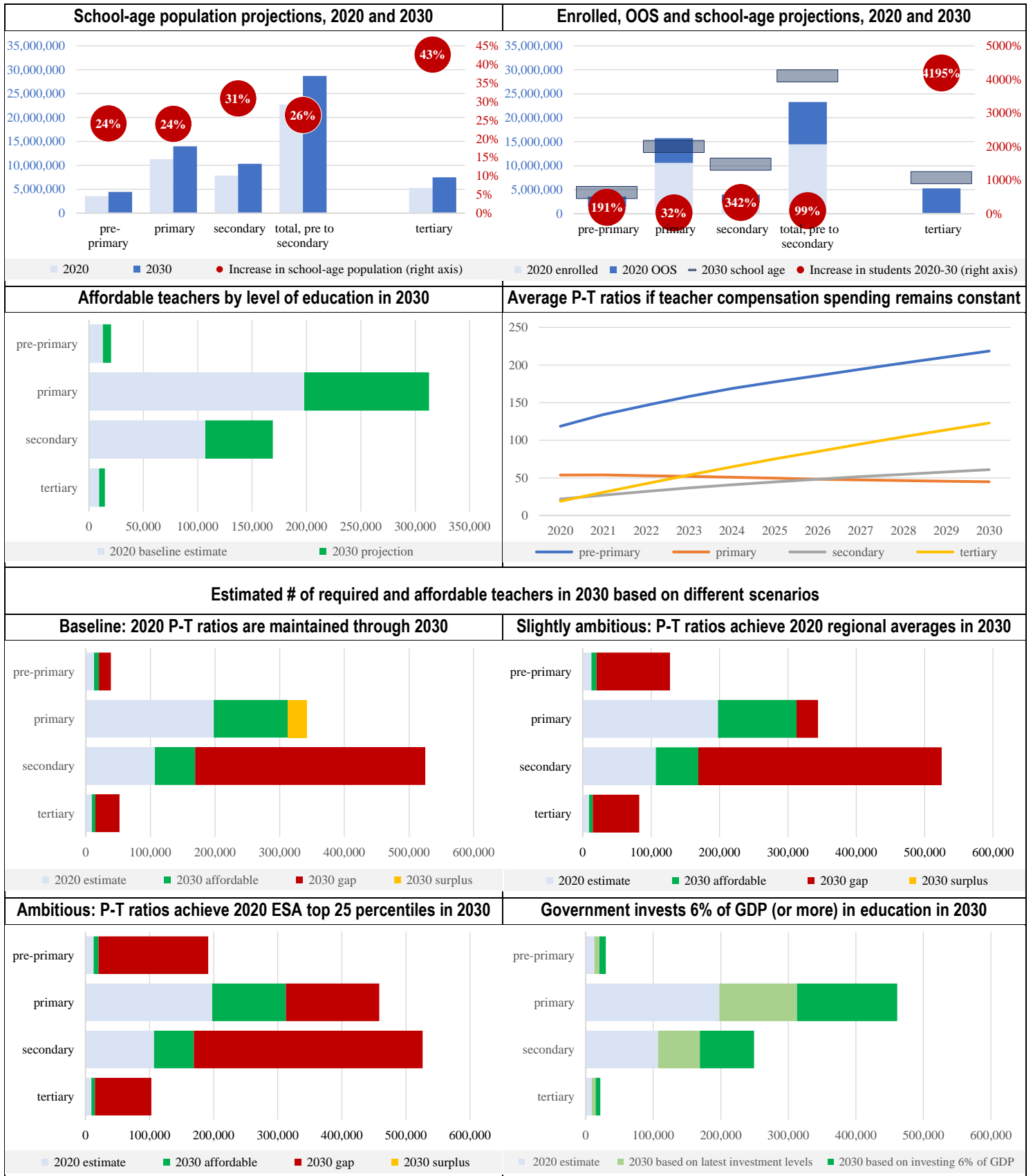
South Africa



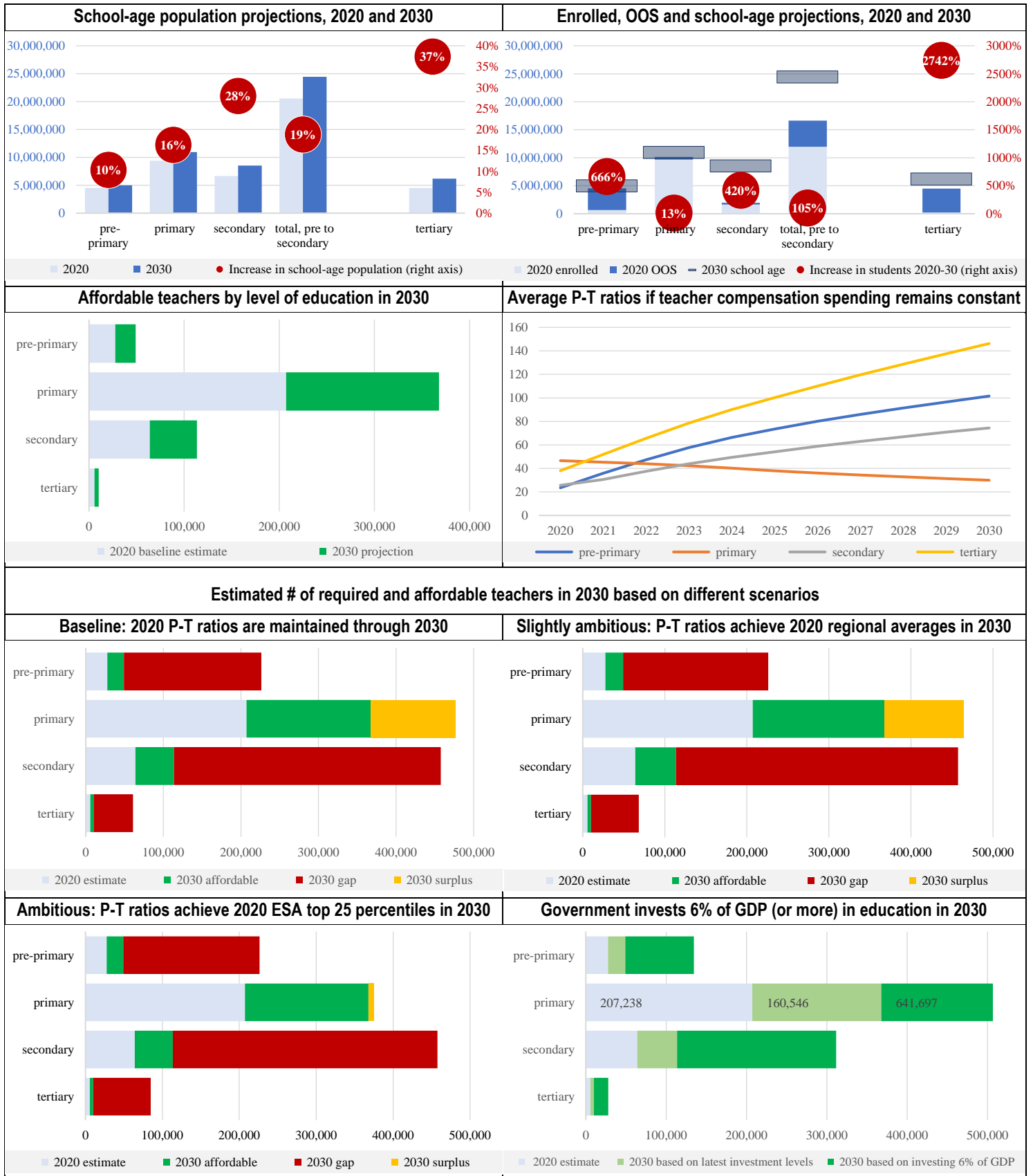
South Sudan



Tanzania



Uganda



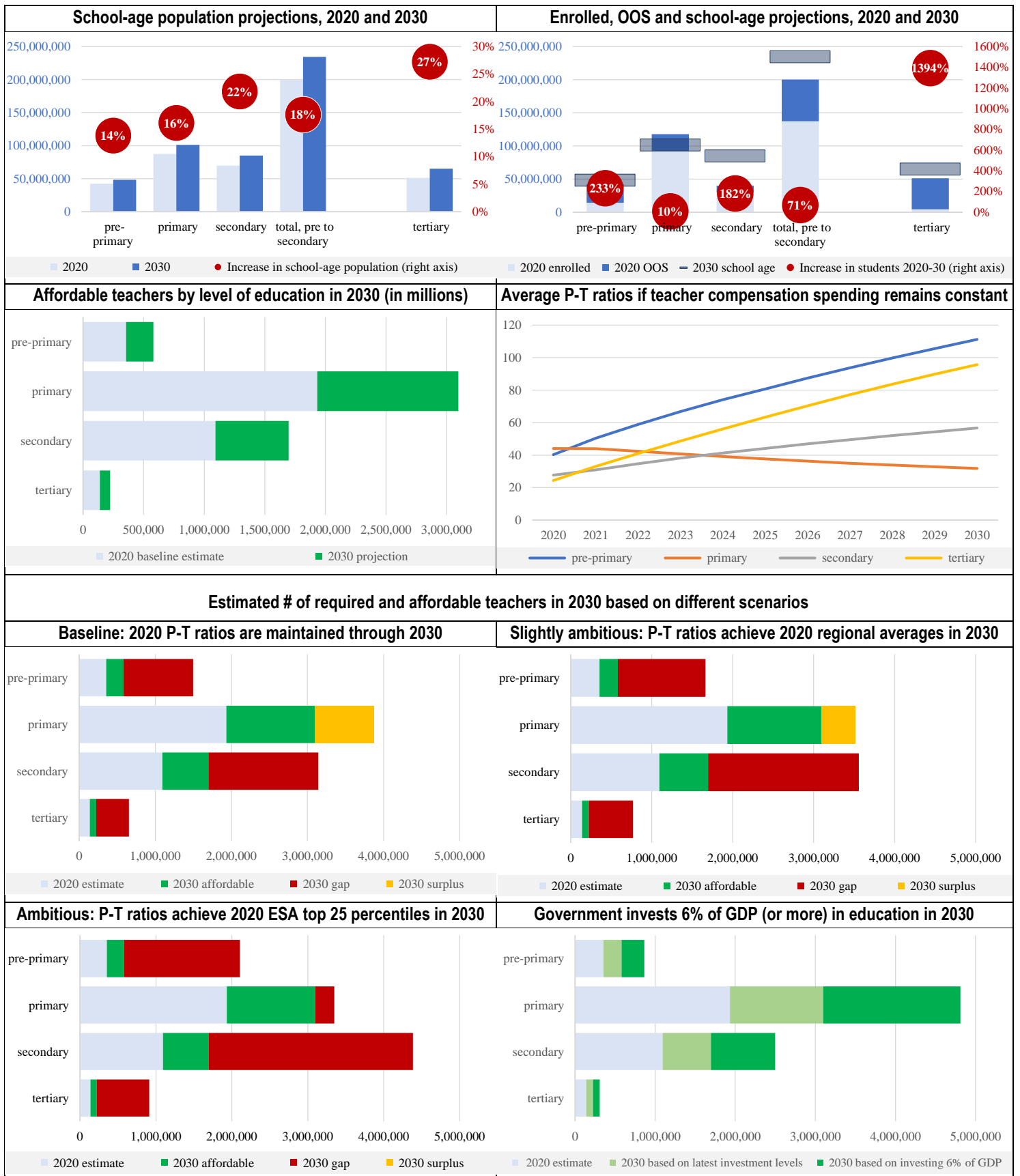
Zambia



Zimbabwe



Eastern and Southern Africa (20 countries – excludes Somalia)



Annex 2. Key indicators, estimates and modelling results by country

Country	Level of education	Economic and financial indicators					# of enrolled students		# of teachers						P-T ratios					
		Avg annual GDP growth (2020-30)	Education expenditure as % of GDP (2020 estimate)	Teacher compensation as % of education expenditure	Avg annual compensation per teacher (in LCU)	Ratio of compensation to per capita GDP	2020 estimate	2030 (reflects all school-age children and repetition rates)	2020 estimate	2030					2020 estimate	2030				
										based on current spending trends (baseline)	if 2020 P-T ratios are maintained (scenario 1)	if P-T ratios achieve 2020 ESA averages (scenario 2)	if P-T ratios achieve 2020 ESA top 25 percentiles (scenario 3)	if government invests 6% of GDP (or more)		based on current spending trends (baseline)	if 2020 P-T ratios are maintained (scenario 1)	if P-T ratios achieve 2020 ESA averages (scenario 2)	if P-T ratios achieve 2020 ESA top 25 percentiles (scenario 3)	if government invests 6% of GDP (or more)
Angola	Pre-primary	3.1%	0.43%	61%	313,007	6.5	865,107	2,749,258	12,440	16,913	43,602	79,138	118,799	32,355	70	163	63	35	23	85
	Primary		1.00%	60%	92,233	1.9	6,651,621	7,509,466	95,827	130,282	150,101	184,532	245,640	249,236	69	58	50	41	31	30
	Secondary		1.35%	71%	185,601	3.9	2,393,044	6,436,753	75,997	103,322	240,481	240,481	328,749	197,660	31	62	27	27	20	33
	Tertiary		0.28%	39%	185,273	3.9	291,045	1,101,838	8,660	11,774	43,169	50,609	62,771	22,524	34	94	26	22	18	49
Botswana	Pre-primary	4.3%	0.06%	61%	20,185	0.0	35,208	158,421	1,589	2,416	8,187	8,187	2,416	22	66	19	19	19	19	66
	Primary		1.96%	93%	113,813	2.9	374,980	375,850	14,533	22,096	15,850	15,850	15,850	22,096	26	17	24	24	24	17
	Secondary		3.40%	71%	151,722	3.9	187,092	269,189	14,436	21,948	19,477	19,477	19,477	21,948	13	12	14	14	14	12
	Tertiary		3.48%	39%	426,733	11.0	52,680	64,078	2,907	4,420	3,511	3,511	3,650	4,420	18	14	18	18	18	14
Burundi	Pre-primary	3.0%	0.06%	69%	244,679	0.0	116,895	899,980	2,845	3,839	24,894	25,906	38,889	4,755	41	234	36	35	23	189
	Primary		2.25%	84%	683,564	4.6	2,428,086	2,558,373	48,483	65,437	56,995	62,868	83,686	81,049	50	39	45	41	31	32
	Secondary		1.27%	64%	571,265	3.9	848,335	2,538,560	24,937	33,657	93,759	93,759	129,654	41,687	34	75	27	27	20	61
	Tertiary		1.00%	47%	2,451,548	16.6	41,827	353,793	3,343	4,512	17,872	17,872	20,155	5,589	13	78	20	20	18	63
Comoros	Pre-primary	3.2%	0.18%	96%	1,255,885	2.7	15,430	78,538	585	803	3,053	3,053	3,394	1,885	26	98	26	26	23	42
	Primary		1.42%	92%	1,071,298	2.3	131,934	151,044	5,095	7,002	6,040	6,040	6,040	16,426	26	22	25	25	25	9
	Secondary		0.72%	95%	280,294	0.6	76,764	158,856	10,144	13,941	21,731	21,731	21,731	32,705	8	11	7	7	7	5
	Tertiary		0.24%	99%	3,977,682	8.5	7,324	24,173	247	339	919	1,110	1,377	796	30	71	26	22	18	30
Eritrea	Pre-primary	3.6%	0.06%	61%	7,537	0.0	42,571	202,766	1,582	2,262	6,926	6,926	5,144	27	90	29	29	23	39	
	Primary		0.61%	100%	23,028	2.4	329,740	498,652	8,966	12,815	12,816	12,816	16,311	29,148	37	39	39	39	31	17
	Secondary		0.56%	100%	26,178	2.7	298,350	674,313	7,213	10,309	18,975	24,850	34,440	23,448	41	65	36	27	20	29
	Tertiary		0.84%	26%	101,575	10.6	10,437	113,798	726	1,038	8,075	8,075	8,075	2,360	14	110	14	14	14	48
Eswatini	Pre-primary	1.8%	0.06%	10%	1,178	0.0	23,085	81,545	1,935	2,315	6,537	6,537	6,537	2,315	12	35	12	12	12	35
	Primary		3.51%	50%	81,318	2.2	234,991	195,953	8,980	10,745	7,368	7,368	7,368	10,745	26	18	27	27	27	18
	Secondary		2.45%	65%	94,331	2.6	113,664	139,988	6,966	8,335	9,005	9,005	9,005	8,335	16	17	16	16	16	17
	Tertiary		0.92%	16%	86,231	2.4	8,010	32,967	712	852	1,878	1,878	1,878	852	11	39	18	18	18	39
Ethiopia	Pre-primary	6.9%	0.07%	40%	22,589	1.1	2,802,298	10,833,972	23,467	45,575	395,240	395,240	468,149	59,280	119	238	27	27	23	183
	Primary		1.26%	75%	72,726	3.6	17,568,124	20,663,201	259,636	504,237	375,222	507,763	675,909	655,871	68	41	55	41	31	32
	Secondary		0.98%	62%	99,122	4.8	5,547,323	18,567,550	122,147	237,221	460,155	684,253	948,314	308,558	45	78	40	27	20	60
	Tertiary		2.10%	22%	384,315	18.8	977,443	3,329,586	24,252	47,100	106,645	152,934	189,683	61,263	40	71	31	22	18	54
Kenya	Pre-primary	5.8%	0.06%	34%	8,812	0.1	3,186,795	4,674,284	110,819	195,447	161,883	161,883	201,982	219,390	29	24	29	29	23	21
	Primary		1.93%	74%	271,415	2.6	8,584,807	8,767,094	266,511	470,036	286,034	286,034	286,778	527,616	32	19	31	31	31	17
	Secondary		2.28%	66%	380,275	3.7	4,363,016	8,302,447	198,752	350,532	248,256	305,963	424,037	393,473	22	24	33	27	20	21
	Tertiary		0.73%	39%	691,374	6.7	637,644	1,636,290	20,837	36,749	60,612	75,158	93,218	41,251	31	45	27	22	18	40
Lesotho	Pre-primary	2.8%	0.02%	31%	390	0.0	56,137	142,410	2,914	3,828	7,714	7,714	7,714	3,828	19	37	18	18	18	37
	Primary		4.26%	93%	73,926	7.3	369,220	330,611	11,167	14,671	10,034	10,034	10,815	14,671	33	23	33	33	31	23
	Secondary		2.29%	95%	83,548	8.3	133,651	224,741	5,386	7,076	8,868	8,868	11,478	7,076	25	32	25	25	20	32
	Tertiary		0.70%	88%	114,886	11.4	21,833	49,303	1,108	1,456	2,494	2,494	2,809	1,456	20	34	20	20	18	34
Madagascar	Pre-primary	4.6%	0.01%	81%	37,808	0.0	914,459	2,839,178	38,708	60,807	127,417	127,417	127,417	132,364	24	47	22	22	22	21
	Primary		1.46%	69%	1,726,540	2.3	5,012,971	4,501,725	123,032	193,272	112,701	112,701	147,255	420,714	41	23	40	40	31	11
	Secondary		0.63%	65%	1,086,565	1.4	1,615,193	5,363,865	79,740	125,264	274,419	274,419	274,419	272,674	20	43	20	20	20	20
	Tertiary		0.44%	59%	9,506,856	12.5	150,375	818,292	5,815	9,135	33,554	37,586	46,617	19,885	26	90	24	22	18	41
Malawi	Pre-primary	5.5%	0.01%	61%	3,204	0.0	1,419,762	2,056,260	32,361	54,979	48,906	59,190	88,854	73,334	44	37	42	35	23	28
	Primary		2.03%	89%	346,986	4.9	4,668,022	3,802,419	76,585	130,112	63,498	93,438	124,380	173,550	61	29	60	41	31	22

Country	Level of education	Economic and financial indicators					# of enrolled students		# of teachers					P-T ratios						
		Avg annual GDP growth (2020-30)	Education expenditure as % of GDP (2020 estimate)	Teacher compensation as % of education expenditure	Avg annual compensation per teacher (in LCU)	Ratio of compensation to per capita GDP	2020 estimate	2030 (reflects all school-age children and repetition rates)	2020 estimate	2030				2020 estimate	2030					
										based on current spending trends (baseline)	if 2020 P-T ratios are maintained (scenario 1)	if P-T ratios achieve 2020 ESA averages (scenario 2)	if P-T ratios achieve 2020 ESA top 25 percentiles (scenario 3)		if government invests 6% of GDP (or more)	based on current spending trends (baseline)	if 2020 P-T ratios are maintained (scenario 1)	if P-T ratios achieve 2020 ESA averages (scenario 2)	if P-T ratios achieve 2020 ESA top 25 percentiles (scenario 3)	if government invests 6% of GDP (or more)
Mozambique	Secondary	7.0%	1.25%	84%	989,967	14.0	1,116,343	3,313,443	15,660	26,604	48,381	122,107	169,230	35,486	71	125	68	27	20	93
	Tertiary		1.04%	39%	6,677,640	94.3	16,205	629,263	897	1,524	46,255	46,255	46,255	2,033	18	413	14	14	14	310
	Pre-primary		0.06%	61%	11,681	0.0	907,121	3,612,403	20,227	39,610	77,889	103,983	156,096	42,262	45	91	46	35	23	85
	Primary		2.84%	53%	85,002	4.0	6,844,781	7,636,264	119,099	233,223	140,558	187,648	249,788	248,839	57	33	54	41	31	31
	Secondary		1.69%	53%	180,811	8.6	1,330,834	4,745,260	33,281	65,172	129,851	174,873	242,358	69,536	40	73	37	27	20	68
	Tertiary		0.73%	53%	183,568	8.7	229,360	1,008,079	14,148	27,704	68,065	68,065	68,065	29,559	16	36	15	15	15	34
Namibia	Pre-primary	2.6%	0.04%	56%	6,396	0.3	44,502	135,134	1,650	2,126	4,892	4,892	5,839	3,071	27	64	28	28	23	44
	Primary		0.61%	95%	14,147	0.8	516,946	473,220	19,311	24,877	18,714	18,714	18,714	35,947	27	19	25	25	25	13
	Secondary		0.58%	85%	20,512	1.1	164,031	320,224	11,343	14,613	13,004	13,004	16,355	21,115	14	22	25	25	20	15
	Tertiary		1.63%	44%	94,295	5.0	55,967	67,976	3,582	4,615	4,086	4,086	6,668	6,668	16	15	17	17	17	10
Rwanda	Pre-primary	6.4%	0.15%	68%	1,399,118	1.9	250,622	1,179,508	6,674	12,422	33,842	33,952	50,968	23,281	38	95	35	35	23	51
	Primary		1.03%	62%	1,356,318	1.9	2,599,309	2,323,223	43,286	80,560	39,404	57,089	75,994	150,989	60	29	59	41	31	15
	Secondary		1.49%	54%	2,395,898	3.3	702,660	2,049,019	30,415	56,606	80,266	80,266	104,651	106,094	23	36	26	26	20	19
	Tertiary		0.39%	58%	6,345,525	8.8	82,510	372,847	3,254	6,057	15,341	17,126	21,241	11,352	25	62	24	22	18	33
South Africa	Pre-primary	1.5%	0.09%	68%	63,819	1.3	934,823	4,488,957	28,902	33,661	151,430	151,430	193,973	33,661	32	133	30	30	23	133
	Primary		2.40%	74%	209,891	4.3	7,866,943	8,032,682	249,103	290,123	264,824	264,824	290,123	32	28	30	30	30	28	
	Secondary		1.88%	75%	214,465	4.4	5,091,065	5,866,615	192,359	224,035	212,427	216,197	299,630	224,035	26	26	28	27	20	26
	Tertiary		0.98%	25%	358,833	7.3	1,139,606	1,351,944	19,822	23,086	61,015	62,097	77,019	23,086	57	59	22	22	18	59
South Sudan	Pre-primary	4.7%	0.01%	96%	366	0.3	110,474	1,118,533	3,197	5,049	32,267	32,267	48,333	21,423	35	222	35	35	23	52
	Primary		0.69%	97%	3,771	3.4	1,306,702	2,083,451	27,248	43,029	44,566	51,197	68,151	182,589	48	48	47	41	31	11
	Secondary		0.22%	91%	5,148	4.6	170,383	1,850,925	5,974	9,434	67,368	68,210	94,534	40,032	29	196	27	27	20	46
	Tertiary		0.50%	93%	93,033	82.8	22,624	333,246	766	1,210	15,118	15,307	18,985	5,134	30	275	22	22	18	65
Tanzania	Pre-primary	4.7%	0.25%	61%	14,520,960	6.8	1,520,909	4,428,895	12,823	20,266	38,862	127,486	191,378	29,878	119	219	114	35	23	148
	Primary		2.00%	80%	10,074,773	4.7	10,603,257	14,006,920	197,902	312,768	283,123	344,196	458,177	461,123	54	45	49	41	31	30
	Secondary		0.74%	71%	6,095,645	2.8	2,330,827	10,296,656	107,002	169,109	524,996	524,996	525,889	249,322	22	61	20	20	20	41
	Tertiary		0.87%	39%	45,651,325	21.3	174,818	1,802,024	9,282	14,670	52,309	82,770	102,660	21,628	19	123	34	22	18	83
Uganda	Pre-primary	5.9%	0.06%	61%	1,602,470	0.0	650,615	4,983,422	27,641	49,054	226,195	226,195	226,195	134,643	24	102	22	22	22	37
	Primary		1.27%	63%	4,847,967	1.6	9,663,693	11,025,750	207,238	367,784	258,462	270,939	360,661	1,009,481	47	30	43	41	31	11
	Secondary		0.58%	19%	2,136,571	0.7	1,638,358	8,447,962	63,957	113,504	457,492	457,492	457,492	311,542	26	74	18	18	18	27
	Tertiary		0.34%	11%	8,471,122	2.8	217,862	1,486,171	5,724	10,158	60,725	68,263	84,666	27,882	38	146	24	22	18	53
Zambia	Pre-primary	1.4%	0.02%	82%	1,453	0.2	172,054	2,773,964	14,397	16,502	75,918	79,849	119,866	24,558	12	168	37	35	23	113
	Primary		2.69%	91%	43,054	5.9	3,518,999	4,270,220	78,099	89,516	101,527	104,933	139,682	133,213	45	48	42	41	31	32
	Secondary		0.89%	67%	18,253	2.5	953,819	2,746,264	44,836	51,391	97,920	101,206	140,262	76,476	21	53	28	27	20	36
	Tertiary		0.44%	1%	1,264	0.2	74,907	588,336	5,495	6,298	26,146	27,023	33,517	9,373	14	93	23	22	18	63
Zimbabwe	Pre-primary	2.6%	0.12%	99%	1,955	1.8	422,859	823,126	9,992	12,961	21,984	23,694	35,568	13,244	42	64	37	35	23	62
	Primary		2.77%	99%	6,300	5.7	3,240,979	2,844,824	73,148	94,886	78,137	78,137	93,056	96,957	44	30	36	36	31	29
	Secondary		1.56%	97%	6,025	5.4	1,081,100	2,600,203	42,585	55,240	115,649	115,649	132,802	56,446	25	47	22	22	20	46
	Tertiary		1.09%	77%	18,676	16.8	143,343	460,177	7,561	9,808	25,664	25,664	26,216	10,022	19	47	18	18	18	46
ESA average	Pre-primary	4.1%	0.09%	63%	...	1.2	...	...	...	...	...	...	...	...	40	111	35	29	22	74
	Primary		1.90%	80%	...	3.5	...	...	...	...	...	...	...	...	44	32	41	36	29	21
	Secondary		1.34%	72%	...	4.2	...	...	...	...	...	...	...	...	28	57	27	23	18	35
	Tertiary		0.94%	46%	...	17.5	...	...	...	...	...	...	...	...	24	96	22	20	17	58
ESA total	Pre-primary	...	...	...	...	...	14,491,725	48,260,554	354,749	580,836	1,497,640	1,664,940	2,106,902	863,089	...	...	...	...	...	...
	Primary		...	...	...	...	92,516,104	102,050,941	1,933,249	3,097,470	2,325,972	2,677,121	3,349,082	4,810,383	...	...	...	...	...	...
	Secondary		...	...	...	...	30,155,850	84,912,833	1,093,130	1,697,311	3,142,481	3,556,806	4,384,506	2,497,647	...	...	...	...	...	...
	Tertiary		...	...	...	...	4,355,819	15,624,181	139,139	222,505	653,452	767,883	912,943	307,133	...	...	...	...	...	...