METHODOLOGY SHEET FOR GLOBAL PARTNERSHIP FOR EDUCATION (GPE) INDICATORS

Indicator title	**Indicator (11)** Equitable allocation of teachers, as measured by the relationship (R^2) between the number of teachers and the number of pupils per school in each DCP
Result measured (from GPE Results Framework):	**Strategic Goal (3)** Effective and efficient education systems delivering equitable, quality educational services for all

JUSTIFICATION FOR INDICATOR

Background/context for indicator:	Sustainable Development Goal 4 is: "By 2030, ensure that all girls and boys complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes." To realize this, education systems need effective teaching and an adequately distributed supply of teachers at all levels, especially in basic education. In this respect, according to UNESCO International Institute for Educational Planning (IIEP), it is important to recruit an adequate number of highly effective teachers into the profession and strategically deploy (and maintain) them throughout a country [1]. There are often great differences across and within countries in the way teachers are being allocated. For example, in sub-Saharan Africa, degrees of randomness data in teacher allocation (as related to number of students) ranged between 9% in Guinea and 54% in Benin[2]. Typically, the higher this parameter, the more the allocation of teachers is related to factors other than the number of students. Disparities in teacher distribution may indicate that shortages of teachers are more prevalent in some areas than in others, which impedes students' equitable access to learning, regardless of the level of demand for education. Such data on allocation of teachers within a GPE developing country partner (DCP) and at the national level provide valuable information that helps governments set policies and systematic mechanisms in terms of staff deployment/redeployment, as well as with regards to management, incentivization or other aspects related to the distribution of teachers in a country. "Large disparities in the allocation of teachers are the result of weak resource management practices, but these disparities can be reduced rapidly through improved resource management practices".[2] In that spirit, and with the aim to ultimately increase equitable access to quality education and learning outcomes for all children, the Global Partnership for Education (GPE), through its Strategic Plan 2016-2020, recognizes that more teachers, improved teaching, and better distributed teachers come together to play a prominent role in enhancing efficiency

[1] UNESCO, *Recruiting and Deploying Effective Teachers*, (International Institute for Educational Planning, IIEP learning portal, 2015) http://learningportal.iiep.unesco.org/en/improve-learning/teachers-pedagogy/teacher-recruitment-and-deployment

[2] K Majgaard and A Mingat, *Education in sub-Saharan Africa. A comparative analysis* (International Bank for Reconstruction and Development / The World Bank, 2012), retrieved July 21, from https://openknowledge.worldbank.org/bitstream/handle/10986/13143/9780821388891.pdf?sequence=1

	and effectiveness of countries' education systems[3] and ultimately, equitable access to quality education for all children. In fine, "the analysis of the consistency of the posting of teachers throughout a country is a fundamental management issue,"[4], and GPE is thus committed to ensuring an equitable allocation of teachers in its developing country partners, by tracking and supporting in the planning of teacher deployment, that is in turn conducive to better service delivery and hence, more equitable, quality learning.
Rationale for indicator selection:	This indicator is included to reflect an aspect of the extent to which Strategic Goal 3, "effective and efficient education systems delivering equitable, quality educational services for all" is achieved. This considers that the analysis of the consistency of the posting of teachers is a fundamental management issue, which is tied to the principle of equity in learning conditions that would have the number of teachers in a school be proportional to the number of students. Thus, all schools with approximately the same number of students should have a comparable number of teachers[4]. Specifically, this indicator evaluates the consistency in the posting of teachers at the national level and allows for comparison with neighboring countries, at the regional level, and beyond. It captures the widespread differences in allocation that are more often less controlled reasons for differences in number of teachers and the number of pupils per school and is also a complementary management tool to the Pupil Teacher Ratio indicator regarding consistency in teacher distribution.
DEFINITION	
Indicator definition:	**Equitable allocation of teachers, as measured by the correlation between the number of teachers and the number of pupils per school in each DCP.** • "Equitable allocation" refers to situations where the number of teachers in a school is proportional to the number of students, across schools. In this respect, schools with approximately the same number of students should have a comparable number of teachers and as the number of students goes up (down) the number of teachers should also go up (down). • In order to assess the equitable allocation of teachers, the R^2 (R squared), also called coefficient of determination, is used. The statistic Pearson's r (also called correlation coefficient) gives the direction and strength of the correlation between two variables. The R^2 supplements the Pearson r and shows the goodness-of-fit of the assumed type of correlation between the two variables. Expressed as the squared value of Pearson's r, the R^2 gives the *percentage* of the variations of one variable that is explained by the other variable. The R^2, for this corporate indicator, uses school-level data on the number of students and the number of teachers in each school. For the present corporate indicator, the R^2 examines the percentage of strength of relationship between two variables: the number of students per school and the number of teachers per school. The value of the R^2 coefficient typically ranges between 0 and 1. The closer to 1,

[3] Global Partnership for Education, *GPE 2020. Improving learning and equity through stronger education systems* (Washington, DC: The World Bank, 2016), retrieved July 20, 2016 from http://www.globalpartnership.org/content/gpe-2020-strategic-plan

[4] UNESCO, World Bank, UNICEF, and Global Partnership for Education, *Education Sector Analysis Methodological Guidelines, Volume 1. Sector-wide Analysis, with emphasis on primary and secondary education,* 2014, retrieved July 19, 2016 from http://www.globalpartnership.org/content/methodological-guidelines-education-sector-analysis-volume-1

	the greater the relationship between the number of students and the number of teachers at the school level. Notes: - R^2's complementary coefficient, 1-R^2, usually referred to as degree of randomness, measures the share of teacher postings that are explained by factors other than the number of students in a school. The greater the degree of randomness, the greater the inconsistencies in teacher posting. Most education sector analyses that include teacher allocation data may refer to the degree of randomness in the analysis rather than to the correlation coefficient R^2. The correlation coefficient R^2 is then simply calculated as follows: *R^2 = 1 - degree of randomness.* - Illustrative example of how to interpret R2 and 1-R^2 data4: "In Burkina Faso, the value of R2 is 0.78. The degree of randomness in the teacher distribution process, measured by the 1 – R2 value, is thus 0.22. This indicates that approximatively 22 percent of the teacher posting process among government primary schools is not related to the number of students, but rather to other factors."
Unit of measurement:	"n out of N," expressed as a percentage, where: - n represents the number of DCPs with a R^2 of at least 0.8 - N represents the total number of DCPs in the sample for that reporting year
Disaggregation:	By FCAC / non-FCAC status
Year for data reported (select only one and mark an "x")	__ fiscal year _X_ calendar year
Frequency of data collection:	Every other year (i.e., 2018 and 2020)

DATA TREATMENT

Source of information for collecting data:	Source document, template, etc.:	• Education Sector Analysis reports from different countries that include but are not limited to the following sources: World Bank Group's Country Status Reports, RESENs, Education Sector Reports, and World Bank Country Reports • Pôle de Dakar indicators database, available at https://www.iipe-poledakar.org/en/indicateurs-en/indicator-database
	Source agency:	Pôle de Dakar, World Bank, UNICEF, GTZ, DCPs' Ministries of Education
Formula:		(1) ***Calculate the R^2 at the country level:*** This step (1) is not performed by the GPE Secretariat, as the R^2 statistic is already available in education sector analyses. To generate the R^2 in a country, one must first calculate the Pearson's *r* coefficient of correlation (sample data) between the number of teachers and number of students per school in that country. The Pearson's r value obtained for country *j* may range from -1 to +1. Then, the coefficient of determination R^2 is generated by calculating the square value of Pearson's *r* for the country. Example: If a Pearson's r correlation coefficient between teachers and students per school is 0.8, then the R^2 will be: 0.8 * 0.8 = 0.64. This means that although there is a strong relationship between these two variables (as expressed by Pearson's r), the variable on students enrolled only explains 64% of the distribution of teachers, the remainder 36% being explained by other factors. (2) ***Assess whether the R^2 of a DCP meets the required threshold:*** To be considered as meeting the threshold for this indicator, DCP *j* is required to have a R^2 of at least 0.8.

	$$THMR_{j,t} = \begin{cases} 1, & if\ R^2_{j,t} \geq 0.8 \\ 0, & if R^2_{j,t} < 0.8 \end{cases}$$ Where: $R^2_{j,t}$ = R^2 for DCP *j*, with a value ranging from 0 to 1 in year t
Aggregation formula:	The total number of DCPs in the reporting year sample with a R^2 meeting the threshold of at least 0.8 is compiled and provides the numerator for calculating the corporate-level indicator, with the denominator being the total number of DCPs included in that year's sample. $$PROP(R^2_{j,t} \geq 0.8) = \left[\frac{\sum_{j=1}^{N} THMR_{j,t}}{N}\right] * 100$$ Where: *Prop* ($R^2_{j,t} \geq 0.8$) = proportion of DCPs with a R^2 of at least 0.8 in year t $THMR_{j,t} = \begin{cases} 1, & if\ R^2_{j,t} \geq 0.8 \\ 0, & if R^2_{j,t} < 0.8 \end{cases}$ $R^2_{j,t}$ = R^2 for DCP *j*, with a value ranging from 0 to 1, in year t*N* = total number of DCPs included in sample
Data limitations (if any known / anticipated):	• R^2 data points are not necessarily available for all countries and the statistic is collected only every few years through country-level education sector analyses. • In practice, there can be various reasons for two schools with the same number of students to have different numbers of teachers, and these reasons are not captured through this indicator. There may be positive discrimination policies, providing better schooling conditions (including more teachers) in schools operating in contexts that are more difficult. There may be some effect of the class sizes, for example, without multi-grade teaching, two classes of 20 students require two teachers, while 40 students in the same class may need only one teacher[4]. • Comparison across countries or regions may be biased. When performing analysis between different R^2s this should be taken into account. Similarly, comparability within countries across different years might also be rendered difficult as the school samples used to get the R^2 may differ from year to year. • For some countries, the school-based sample used to calculate the national R^2 at the baseline (which comprises R^2s data points from 2010 to 2014) is considerably smaller than others, with cases where the national R^2 is a proxy taken from the analysis performed on only one or a few provinces. • A qualitative analysis should be performed to complement that of the quantitative coefficient of determination. The R^2 by itself does not explain the reasons behind the differences in numbers of students and teachers per school in a country. The examination of policies on and process of teacher posting to schools, as well as analyses of teachers' job satisfaction and socio-professional context are needed to understand the underlying circumstances of R^2 data[4]. • The analysis of R^2 data does not imply causality, but rather helps

	understand aspects of the strength of association between variables. • Some published R^2s may not be available at the country level but only for one or more sub territorial areas or provinces in a DCP. A footnote will be added in this indictor's analysis when this is the case. • When a teacher covers various classes or a class has various teachers, as is often the case for secondary, TVET, and higher education, the total learning time (measured in hours of teaching service supplied) per school is compared to the total number of hours needed for all students of the school[4]. At the pre-primary and primary levels, however, only one teacher is typically responsible for one class. The approach for calculating R^2 is thus different depending on the education level, and these different calculations methods affect the interpretation of R^2s across levels. • It is assumed that the correlation between the number of students and the number of teachers is strong when the value of the R^2 is higher or equals to 0.8. This does not necessarily imply that the correlation between the two variables is statistically significant. In fact, depending on the distribution of these two variables, the corresponding coefficient of correlation may not be statistically significant even when the R^2 value is high.
Interpretation	The closer to 1 is the value of the R2 (which ranges between 0 and 1), the greater the relationship between the number of students and the number of teachers at the school level. As "equitable allocation" refers to situations where the number of teachers allocated to a school is proportional to the number of students in that school, a high value of this indicator suggests that, generally, DCPs are making the allocation of teachers in public primary schools more equitable according to the number of students in each school. This means that schools with approximately the same number of students have a comparable number of teachers, addressing issues of (in)equity in learning conditions across schools.

REFERENCES

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ANNEXES

Annex 1- Data Collection tool

Data collection tool utilized for collecting the data, if any:	Data collection matrix by the R&P sub-team within the SPP team of the GPE Secretariat

Annex 2- Standard Operating Procedure

Process Name: Data Collection, Quality Assurance, & Storage for	**Owner:** R&P	**Updated:**

Indicator # 11 of the GPE Results Framework	Team	
Function: Measuring GPE Impact	**Version #:** 1	**Review:**

Material changes from prior version of SOP

None; this is the first version.

Summary

This SOP describes the process for data collection, quality assurance, and storage for indicator # 11 (Equitable allocation of teachers, as measured by the relationship (R^2) between the number of teachers and the number of pupils per school in each DCP) of the GPE results framework.

Results / Outputs

This process should result in the results framework being updated with quality assured data on indicator #11.

Interim outputs of the Secretariat:

Completed data collection template

Final Output:

Updated results framework database

Scope

- Begins: The process begins with the M&E Data Analyst collecting data on the latest available coefficient of determination R^2s between the number of teachers and the number of pupils per school in each DCP from most recently published education sector analysis documents using the Education Sector Analysis Reports from different countries, Ministries of Education, World Bank Group's Country Status Reports, RESENs, Education Sector Reports, World Bank Country Reports and any other data sources that maybe available.
- Ends: The process ends with updated data being integrated into the results framework database by the Monitoring and Evaluation Data Manager.
- Includes: All procedural aspects
- Excludes: Methodological aspects of calculating the indicator value. These can be found in the methodology sheet.
- Note: Data will be collected every other year 2018 and 2020.

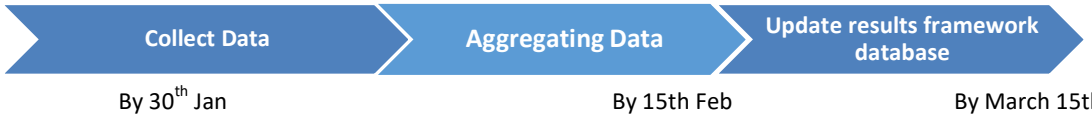
Standards (Policies, Approvals, Deadlines, etc.):

- Policies: GPE 2020, Monitoring Sheet for GPE Results Framework Indicator #11
- Deadlines: M & E Data Manager updates results framework database with the Indicator # 11 data by March 15th
- Approval: The completed data template is prepared by the M&E Data Analyst and includes quality checks by the M & E Data Manager and final approval from the Head of M & E

Issues /Risks:

- Relevant documents might not be updated with the latest data in time and this might delay the process.

Overview:



Steps in the Process	Roles / Responsibilities	Outputs / Deliverables	Tools / Templates

1. Collect Data **Typically by 30th January**			
• Collect data of latest available coefficient of determination R^2s between the number of teachers and the number of pupils per school in each DCP from most recently published education sector analysis documents using the Education Sector Analysis Reports from different countries, Ministries of Education, World Bank Group's Country Status Reports, RESENs, Education Sector Reports, World Bank Country Reports and any other data sources that maybe available.	• M & E Data Analyst		Data Collection Matrix
• Review the most recently published Education Sector Analysis documents and confirm if the data collected is the same and up to date.	• M & E Data Analyst		Education Sector Analysis
Aggregate Data **Typically by 15th February**			
• Enter data into the template provided by the M&E Data Manager	• M & E Data Analyst		• Data Collection template
• Compute indicator values using the completed data collection template, based on the latest available classification of Countries Affected by Fragility and Conflict and forward to M & E data Manager.	• M & E Data Analyst	• Completed data collection template	• List Countries Affected by Fragility and Conflict from the GPE Intranet
• Review completed data collection template and send comments/queries to the M & E Data Analyst	• M & E Data Manager		
• Respond to the comments/queries, update data collection template as necessary and forward to M & E data Manager	• M & E Data Analyst	Updated data collection template.	

Update Results Framework Database **Typically by 15th March**			
• Forward data collection template to the Head of M & E for review and approval	• M & E Data Manager		
• Review and approve completed data collection template	• Head of M & E	Approved data collection template	
• Update database using completed template submitted by the M & E Data Analyst	• M & E Data Manager	Updated database	N/A
• Notify the secretariat on the availability of data in the results framework database through the intranet	• M & E Data Manager	Notification on GPE intranet	

Annex 3- Additional Analysis

- When several time-series data points are available for one same DCP, the change in R^2 over time in that DCP can be analyzed to assess progress in teacher allocation. That type of change can also be analyzed across DCPs, while taking in consideration the fact that the time elapsed between two R^2s which may vary by DCP, as well as the intrinsic contextual nuances at the DCP level.
- Different thresholds of R^2s may be used to calculate the number of DCPs fall under each.
- When school-level data on number of teachers and number of students are available (which are used to calculate the R^2 at the country level) and when this is feasible, these data can be plotted in a graph (scatterplot) to visually represent the degree of association between these two variables.