Department for Education

2017/18 Teacher Supply Model Methodological Annex.

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Glossary of key terms.

- **Active stock (or active teacher stock):** The number of qualified teachers employed in regular roles (non-supply) in the state-funded schools sector as defined by the TSM (see the definition of the state-funded schools sector further down).
- **Deferred entrants:** Teachers entering the active stock more than a year after graduating from ITT, i.e. entrance to the active stock is deferred or delayed by a year or more. Deferred entrants are included within the 'entrants that are new to the state-funded sector' group. They were previously classed as an independent group in the 2015/16 version of the TSM.
- **DTR:** Database of Teacher Records.
- **English Baccalaureate (EBacc):** The English Baccalaureate (EBacc) was introduced in 2010 and defined an academic core including GCSE-level examinations in English, Mathematics, science, humanities and languages. To enter the EBacc, pupils are required to take GCSE-level examinations in English Language and English Literature, Mathematics, two or three science subjects,[1] History or Geography, and an ancient or a modern language. Find out more about the EBacc, including information on which qualifications count towards the EBacc.
- **Entrants that are new to the state-funded sector:** Teachers entering the active stock that are new to the state-funded schools sector. In other words, they are not recorded on datasets held by the department as having taught in a regular teaching role in the state-funded schools sector. They may have taught previously outside of the state-funded schools sector (see the definition of the state-funded schools sector further down) or in supply roles.
- **FTE or full-time equivalent rate**: A teacher that is employed as a full-time teacher is assumed to have a 1.0 FTE rate. A teacher who is employed as a part-time teacher and works 50% of their school's full-time contracted hours is assumed to have a 0.5 FTE rate.
- **ITT:** Initial teacher training.
- **MFL:** Modern Foreign Languages (Ancient Languages such as Latin or Ancient Hebrew are included within 'Classics').
- **NCTL:** National College for Teaching and Leadership.
- **Newly qualified teacher entrants:** Teachers entering the active stock in the year following ITT.

[1] Any of the following alternatives: Core & Additional Science; Double Award Science; Combined Science; or any three of Biology, Chemistry, Physics or Computer Science.

- **NQT:** Newly qualified teacher.
- **PGCE:** Postgraduate Certificate in Education.
- **PTR:** Pupil:teacher ratio. The current pupil:teacher ratio is calculated by dividing the full-time equivalent (FTE) number of pupils by the FTE for all teachers employed, broken down by phase[2]. For statistical purposes only, pupils who do not attend both morning and afternoon at least five days a week are regarded as part-time. Each part-time pupil is treated as 0.5 FTE. A teacher's FTE rate is based on the number of hours they work in a week divided by the number of hours the school sets as full time. PTR values are then forecast for future years based on pupil projection numbers and modelling assumptions on how PTRs will change in future.
- **Re-entrants:** Teachers entering the active stock having taught previously in the state-funded schools sector as defined by the TSM[3].
- **State-funded schools sector:** For the purposes of the TSM, the state-funded schools sector covers state-funded nursery, primary, and secondary schools in England (including school sixth forms). Academies and free schools are also included but independent schools, further education institutions, state-funded special schools, or pupil referral units are *not* counted as being in the state-funded schools sector. Only teachers employed in regular roles (i.e. non-supply) within the state-funded schools sector are considered (by the TSM) as being in service in the state-funded schools sector[4]. It is worth noting that the School Workforce Census SFR[5] uses a slightly different definition of what the state-funded schools sector is (PRUs and special schools are included). This results in some current/historical workforce data differing in the TSM and the School Workforce Census SFR.
- **SWC:** School Workforce Census.

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[2] The calculation of PTR in the TSM differs from certain other Government publications (e.g. the SWC) because it includes occasional and centrally employed teachers, as well as both qualified and unqualified teachers.

[3] As recorded on datasets held by the department.

[4] Whilst the TSM does not consider state-funded special schools and PRUs as being within the state-funded schools sector, the model does account for qualified teachers entering active service within such institutions (either through wastage or NQTs entering those sectors post-ITT). Therefore, the model is (indirectly) estimating and accounting for the number of qualified teachers needed by schools in England that are outside of the state-funded schools sector (as defined by the TSM). The same approach is used for independent schools and FE colleges in England too.

[5] Read the latest School Workforce Census SFR (2015).

- **Wastage:** Teachers in publicly-funded schools leaving the profession for reasons other than retirement or death in service. This includes teachers leaving to teach outside of England, in independent schools, special schools, pupil referral units or other school settings not included within the state-funded sector as defined by the model. It also includes those teachers leaving to other (non-teaching) professions or to become economically inactive. It does not include teachers taking maternity leave. Teachers that are barred from service are now counted towards the wastage rate (previously they were included within a ‘deaths in service and barred from service’ group within the 2015/16 model that was published online in 2014).

Chapter 1: The 2017/18 Teacher Supply Model methodological annex.

This methodological annex provides information to help model users understand the 2017/18 Teacher Supply Model (TSM) and the user testing that has been made available in the model.

This methodological annex explains:

- The **data and assumptions** that are used in the 2017/18 Teacher Supply Model.
- Which **data sources** are used.[6]
- How the model is **structured** and how this differs from the previous year's model (2016/17 TSM).[7]
- How the model calculates:
    - The **teacher need** (the number of qualified teachers needed in the active stock[8] each year);
    - The **entrant teacher need** (the number of qualified teachers required to enter into the active stock each year by all entrance routes into the profession);
    - The **newly qualified teacher entrant need** or **NQT entrant need** (the number of newly qualified teachers required to enter into the active stock in the 2018/19 academic year to meet the needs of the system) and;
    - The **postgraduate** '**initial teacher training' trainee need** or **postgraduate ITT trainee need** (the number of ITT places required in the 2017/18 academic year to generate this number of NQTs entering into the active stock in 2018/19).
        - This **postgraduate ITT trainee need** is the **final output** of the 2017/18 Teacher Supply Model and feeds into the NCTL 2017/18 ITT recruitment process. The outputs of

[6] The flow of information for the TSM can be seen in **Annex A1**, Figure 22.

[7] A full map of the model can be seen in **Annex A2**, Figure 23.

[8] The number of qualified regular teachers in active service within state-funded nursery, primary, and secondary schools (including academies and free schools).

the TSM directly inform the phase/subject-level ITT recruitment controls and the amount of funding made available to support trainees.

- What **assumptions are used within the model** and how these compare to the previous year's model (2016/17 TSM).

    - The model makes assumptions to estimate the number of new teachers required in the future and the number of training places that are required to meet this need. For example, the model projects how the size of the active stock of teachers will change over time with changing pupil numbers.

    - Where government policy is confirmed, then the model assumes the expected direction from announced government policy. Where the government position has yet to be announced, a range of scenarios is modelled in line with government policy and the central scenario is presented. Where government policy has yet to be confirmed, but a direction of travel has been indicated, the analytical teams review a range of possible scenarios and utilise the central estimate of these. Therefore, the TSM uses some assumptions that are made ahead of a final policy decision being reached.

    - The modelling assumptions used are not formal departmental *policies* on how things will change in future, as many of the changes in the school system almost entirely depend on decisions made by schools themselves. Instead, they are simply *estimations* of what we might expect to happen in the future given what has happened in the past, based on the most reliable and up-to-date information we had available at the time that the model was produced.

    - In other words, if the model assumes that the primary pupil:teacher ratio (PTR) will increase to 24 over the next ten years, this is not a governmental policy that there should be 24 primary pupils per teacher in future. This is actually a modelling *assumption* that we most likely expect a PTR of 24 in future given known projected pupil numbers and evidence on previous trends in teacher recruitment and pupil numbers.

    - There are some specific policy-based assumptions used within the model (referred to as 'policy assumptions'). These assumptions are applied separately to primary and secondary phase calculations, and a separate tab in the model identifies

these for each phase (**Policy assumptions PRIM** and **Policy assumptions SEC**). Some policy assumptions were present in the 2016/17 model (although they may have been amended slightly), and some are new to this year.

- For more information on policy assumptions, see **Chapter 3.14**.

- **User testing** that can be undertaken within the model and how model users can implement it. There are a number of features for user testing that have been added in the 2017/18 TSM; features from previous versions of the model have also been simplified to aid user interaction.
    - For example, the model allows users to test different scenarios for the size of the future pupil population and to examine the impact that these scenarios might have on the number of teachers and ITT places required in future.
        - In other words, what impact would higher/lower pupil numbers have on the outputs of the model?
    - In the 2016/17 TSM, some example scenario testing outputs were provided. These were the very unrealistic, highest and lowest values[9] that could be derived using the model testing capability. The TSM 2017/18 provides default output values (i.e. the actual model outputs, which have been used to underpin the department's 2017/18 ITT allocations process), the values derived by the user (by making selections of the scenarios to use in the model on the **USER TESTING TAB**), and the values derived under a 'scenario A'[10]. Scenario A values have been chosen as illustrative only, and should not be viewed as being related to government targets. They are only to show the effects of different starting assumptions on the calculations within the model.

This methodological annex supports the 2017/18 Teacher Supply Model. The 2015/16 and 2016/17 Teacher Supply Models and model user guides were published in October 2014 and 2015 respectively[11].

[9] These values were *extreme* and unrealistic values, illustrating the very highest and very lowest ITT place values that could be derived by scenario testing, i.e. all the scenario tests had the greatest possible impact in the same direction.

[10] Scenario A values were derived using 'high' pupil projection figures and the latest (November 2015) rates for the proportion of teachers that will be unqualified in future.

[11] The previous Teacher Supply Models.

1.1 Improved functionality to the 2017/18 Teacher Supply Model.

There are a number of improvements to the model this year:

1. The TSM is now presented in one Excel workbook rather than two, allowing easier testing of different scenarios by model users.

2. The TSM now provides additional user/scenario testing including testing around unqualified teacher rates and post-ITT employment rates (see the **USER TESTING TAB**).

3. The TSM now includes a planning assumption for the impact of increased EBacc entry rates within the teacher need estimations. Users can also test the impact of different EBacc entry rate scenarios (see the **USER TESTING TAB**).

4. Comparisons between historical time series to projections made by the model are now provided within the TSM (see the **Outputs with historical data** tab).

5. To improve functionality the TSM now provides projections of ITT places beyond one year (see the **Historical and projected ITT** tab, and the accompanying caveats). It is important to note that projected figures may change in future models, due to these models using the most contemporary data and information available at the time. They also do not include any policy assumptions (i.e. they are ‘raw’ outputs of the model).

6. The TSM now has the built-in capability to address potential 'self-fulfilling prophecies' within the model such as increases in the percentage of teachers that are unqualified. See **Chapter 1.2** below.

7. The 2017/18 TSM contains an additional tab (**SUMMARY OUTPUTS**) which allows users to quickly select outputs (**teacher need**, **entrant need** or **ITT places**) and compare the effects of user testing on particular academic subjects. It also includes hyperlinks to other useful output tabs.

1.2 Addressing potential self-fulfilling prophecies within the 2017/18 Teacher Supply Model.

There is the possibility for potential 'self-fulfilling prophecies' to impact upon the Teacher Supply Model. For example, the percentage of teachers that are unqualified (as recorded in the SWC) might increase because of an undersupply of qualified teachers (among other things). Subsequently, the TSM would use this higher percentage value for the percentage of teachers that are unqualified to make forward projections of teacher need. This higher value would have a negative (and downward) impact on the model's projections of teacher need and in turn, ITT place requirements. This could potentially make the undersupply situation *worse* (i.e. a 'self-fulfilling prophecy').

There are three areas of the model that could act as potential self-fulfilling prophecies, namely:

- The percentage of teachers that are unqualified.
    - An increase in the percentage of teachers without QTS might be a result of teacher under-supply.
- The percentage of entrants that are NQTs (as opposed to re-entrants or new to state-funded schools sector).
    - A fall might be the result of a shortage of NQTs.
- The post-ITT employment rates.
    - If there were a shortage of NQTs, post-ITT employment rates might increase as more employment opportunities are available.

Whilst trends in these areas have been analysed and assessed on an annual basis, this is the first year that solutions to address issues such as these have been directly added into the TSM modelling calculations.

Via the **USER TESTING TAB**, the model allows users to enter the values from the year before when modelling in all three of the areas listed above, e.g. using the percentage of teachers that are unqualified from the 2014, as opposed to 2015, SWC.

In the most recent year, only the percentage of teachers that are unqualified appears to have shown evidence of being a *potential* 'self-fulfilling prophecy'.[12]

Therefore, in the 2017/18 TSM modelling calculations, values for the percentage of teachers that are unqualified have been sourced from November 2014 rather than 2015 if the value for a specific subject *increased* (otherwise the higher/identical 2015 value is used). These adjustments are only used if the value increased in LA maintained schools[13] and the increases *do not* relate to increases in the number of Teach First and/or School Direct (salaried) trainees, both of which are recorded as being unqualified teachers in the SWC.

Using this lower value for the future percentage of teachers that will be unqualified and adding the additional teachers required to make this adjustment on to the 2018/19 **entrant teacher need** requirements (see the **OUTPUTS FOR SECTION 2** tab) allows the TSM to take direct action to address a potential 'self-fulfilling prophecy'.

These issues will continue to be revised in future versions of the TSM.

1.3 Using projections from the 2017/18 Teacher Supply Model.

Some tabs within the model show projected values of teacher or pupil numbers, or subject teaching hours (among others). It is important to note that these projected estimates have been derived using the latest information and data available to the model, and adjustments that reflect the latest understanding of the impacts of teacher-related policies. The projections for a particular future academic year *will not* be the same as projections from

[12] The percentage of teachers that are unqualified (as recorded in the School Workforce Census) increased between November 2014 and 2015 for some (but not all) subjects. Part of this increase was a result of increases in the number of unqualified teachers training via routes such as Teach First and School Direct (salaried) that are recorded as being 'unqualified teachers' within the SWC. However, part of the increase *may* be linked to the supply of qualified teachers. If the higher current value of the percentage of teachers that are unqualified (*which related to supply reasons only*) were used within the TSM going forward, this may *potentially* reduce the number of teachers trained in future and thus create a *potential* 'self-fulfilling' and *downward* prophecy. The updated TSM this year allows the model to address and counter such prophecies within the modelling calculations.

[13] To reflect the greater flexibility of academies around the recruitment of teachers.

previous versions of the TSM: modelling in the TSM is retrospectively updated each year to reflect policy and the most up-to-date census data.

Chapter 2: The overall structure of the 2017/18 Teacher Supply Model.

2.1 The two sections of the 2017/18 Teacher Supply Model.

The Teacher Supply Model is a statistical model that seeks to estimate the future national need for teachers. It is used to inform Government decisions about the allocation of funding and places for initial teacher training at a national level. Actual decisions about the employment and deployment of teachers at a school level fall under the responsibility of schools themselves.

The 2016/17 TSM was split into two separate parts, which were in turn within two separate Excel workbooks: Part One calculated the **teacher entrant need** and fed this output into Part Two, which used it to estimate the **postgraduate ITT trainee need**.

The 2017/18 Teacher Supply Model (TSM) is not spread across two separate workbooks: it is completely contained within a single Excel workbook. This allows superior and more extensive user testing capabilities, as well as being more user-friendly. However, the 2017/18 model can be regarded as being a model of two 'sections', each being equivalent to one of the two 'parts' of the previous model. Hence, the functionality of both sections remains broadly the same as the functionality of the two parts in previous models:

- The first section (referred to as 'section one') of the model estimates the **teacher need**: the number of teachers required in the active stock[14] each year. From this, it then uses this teacher need to estimate the **entrant teacher need**: the number of teachers required to enter into the active stock each academic year by all entrance routes[15] into the profession. This estimation is made using assumptions as to the number of leavers[16] expected each academic year and how the population of teachers (the size of the active stock) will change over time. For more details on the first section of the 2017/18 TSM, see **Chapter 3**.

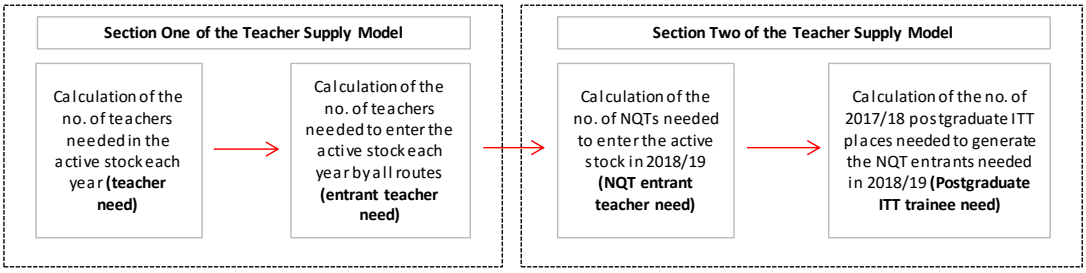
[14] The number of qualified regular teachers in active service within state-funded nursery, primary, and secondary schools (including academies and free schools).
[15] This includes entrants that are new to the state-funded schools sector and re-entrants as well as those that are newly qualified teachers.
[16] Teachers leaving the active stock as either: wastage, retirements, or deaths in service.

- The second section of the model (referred to as 'section two') takes the number of teachers needed to enter the active stock each academic year and estimates the **NQT entrant need** for the 2018/19 academic year[17]. This NQT entrant need is the number of newly qualified teachers (NQTs) required to join the active stock in 2018/19 to meet the estimated teacher need[18].

- The model then estimates the **postgraduate ITT trainee need for 2017/18**: the number of postgraduate ITT (initial teacher training) places required (in the 2017/18 academic year) to generate this number of NQTs entering into the active stock in 2018/19[19]. This conversion is made by making assumptions on the number of trainees that will <u>not</u> successfully gain employment in the state-funded schools sector post ITT or successfully complete their training courses to gain QTS[20]. For more details on the second section of the 2017/18 TSM, see **Chapter 4**.

  Figure 1(see below) provides an illustration of how the two sections of the Teacher Supply Model feed into one another and the key calculation steps made along the way. All calculation steps are made for each phase and subject independently.

Figure 1: Overall structure of the 2017/18 Teacher Supply Model.



[17] ITT trainees completing training in 2017/18 will only be able to enter the active stock as qualified teachers in 2018/19 at the earliest.
[18] Given the number of teachers expected to enter by non-NQT routes (e.g. as re-entrants).
[19] The TSM only calculates the number of ITT trainees required to both start and complete ITT in 2017/18.
[20] These trainees may not go into teaching at all, defer their entrance into the active stock, or enter into teaching in another sector (e.g. in Wales/Scotland, in a supply role, in an independent school, in a special school, etc.).

User testing capability is available for a large number of variables within the model (see the **USER TESTING TAB**). This capability allows users to test the impact (on the model outputs calculated) of altering some of the assumptions that feed into the model. The scenario testing available within the model is outlined below:

- Future teacher wastage rates by gender.
- Projections of pupil population by phase and key stage (in secondary phase).
- Projections of how the active teacher stock (via the pupil:teacher ratio) will change as pupil populations change:
- Altering the caps applied to future PTR values for primary and secondary phases.
- Changing the rate at which PTRs will change in future across the two phases.
- The proportions of newly qualified entrants expected among the entrants to the active stock by phase.
- The employment rate for students gaining QTS six months after they graduate (i.e. post-ITT employment rate), for primary and secondary phases separately.
- The proportion of unqualified teachers in active service by phase.
- The rate of take-up for academic subjects comprising the English Baccalaureate.

For more detail on the user testing made available within the 2017/18 TSM, see **Chapter 5.**

2.2 The scope of the 2017/18 Teacher Supply Model.

Table 1 (below) illustrates what is and is not included within the 2017/18 Teacher Supply Model.

Table 1: What is and is not included within the 2017/18 Teacher Supply Model.

Included	Excluded
England.	Scotland, Wales, and Northern Ireland.
Q*ualified* teachers (i.e. teachers with QTS) (*Unqualified* teachers are included within the stock and teacher need calculations but are not included in the final teacher need outputs, which cover qualified teachers only).	*Unqualified* teachers are excluded from all teacher flows calculations and rates[21]. Unqualified teachers are also excluded from all entrant teacher need, NQT entrant need, and postgraduate ITT trainee need calculations. Qualified teachers who are working as *supply* teachers are considered as teaching *outside* of the active stock.
State-funded primary (including maintained nurseries attached to schools) and secondary schools, academies and free schools.	Special schools, pupil referral units, early years, independent schools, and further education/sixth-form colleges. Qualified teachers who are teaching in such schools are considered as teaching *outside* of the active stock for the purposes of the TSM[22].
Teaching at key stage 5 in secondary schools.	Teaching at key stage 5 in standalone sixth-form colleges or FE colleges.

[21] The model assumes that the proportion of the active stock going forward that will be unqualified is constant, reflecting the most recent proportion in workforce data.

[22] The TSM assumes that some qualified teachers will do something other than teach in the state-funded schools sector. All such teachers are handled in the same way within the TSM irrespective of whether they are economically inactive, teach in Wales or Scotland, or teach in sectors other than state-funded primary and secondary schools.

Table 2 (below) illustrates the subject groupings as used in the 2017/18 Teacher Supply Model:

Table 2: The subject groupings used in the 2017/18 Teacher Supply Model.

Subject grouping.	Subjects included.
Art & Design	*Includes Applied Art & Design, Art & Design, and Art.*
Biology	*Includes Biology, Botany, Zoology, Ecology, Combined/General Science (Biology), and Environmental Science.*
Business Studies	*Includes Applied Business Studies, Accountancy, Commercial & Business Studies, Industrial Studies, other Business and Commercial subjects.*
Chemistry	*Includes Chemistry and Combined/General Science (Chemistry).*
Classics	*Includes Classics and Ancient Languages such as Ancient Greek, Ancient Hebrew, and Latin.*
Computing	*Includes Applied ICT, Computer Science, and Information & Communication Technology.*
Design & Technology	*Includes Design & Technology, Construction & Building, Craft and D & T, Electronics, Engineering, Graphics, Resistant Materials, Manufacturing, Systems & Control, and Textiles.*
Drama	*Includes Drama and Performing Arts.*
English	*Includes English Language and English Literature.*
Food	*Includes Food Technology plus Catering & Hospitality.*
Geography	*Includes Geography and Geology.*
History	*Includes History.*
Mathematics	*Includes Mathematics and Statistics.*
Modern Foreign Languages	*Includes French, German, Spanish, Arabic, Bengali, Chinese, Welsh, Modern Greek, Italian, and any other Modern Languages.*
Music	*Includes Music.*
Others	*Includes Child Development, Citizenship, Dance, Economics, Law, Media Studies, Other Social Studies, Other Technology, Politics, Psychology, Sociology, and Social Sciences among others.*
Physical Education	*Includes Physical Education and Sports.*
Physics	*Includes Physics and Combined/General Science (Physics).*
Religious Education	*Includes Religious Education and Philosophy.*

Source: 2017/18 Teacher Supply Model.

The model also aggregates subjects into ‘Group 1’, ‘Group 2’, or ‘Group 3’ subjects in some tabs for wastage rate projections purposes. For more details, see **Chapter 3.9**.

2.3 The structure of the 2017/18 Teacher Supply Model.

Overall, the 2017/18 TSM comprises 98 tabs, each one colour-coded[23] to reflect the type of information contained within it: blue tabs contain general modelling information and background; green tabs contain the data inputs to the calculations in the model; red tabs show the calculations the model makes; and yellow tabs show the outputs of the model. The ultimate output of the TSM (the **FINAL OUTPUTS OF ITT PLACES** tab) is in orange so it can be identified easily, as is a **SUMMARY OUTPUTS** tab that allows quick access to a large amount of information about outputs and any effects of user testing. In addition, each tab in the model workbook includes information at the top stating from where data are sourced and into which tabs the data feed.

Additionally, a model map is provided on the **Map of sheets** tab showing the flow of information around the model and how the overall model is structured. This map is presented in **Annex A.2** as Figure 23. Table 5 (see **Annex A.3**) provides a description of each tab within the 2017/18 TSM and what that tab does.

[23] In the ODS version of the model, it is not possible to colour-code the tabs. However, appropriate cells are coloured according to their function.

Chapter 3: How the 2017/18 Teacher Supply Model estimates the number of entrant teachers needed to go into the active stock of teachers.

Chapter 3 of this methodological annex describes:

- The first section of the 2017/18 Teacher Supply Model (TSM);
- The structure of the relevant information flow through the tabs in this section of the model;
- The data which feed into this section of the 2017/18 TSM;
- The assumptions used to produce these data; and
- The calculations used by the TSM to calculate the **teacher need** and **entrant teacher need** by both phase and subject, and the assumptions behind them.

3.1 What does this section of the 2017/18 Teacher Supply Model do?

As outlined in **Chapter 2**, the first section of the Teacher Supply Model estimates the **teacher need**: the number of teachers (as a headcount) required in the active stock each year. This is estimated for both the primary and secondary phases using projected pupil populations by phase and assumptions regarding how the PTR (pupil:teacher ratio) will change over time[24].

This *assumed* PTR is used to estimate how many teachers are required in the active stock each academic year going forward[25]. The assumption is *not* a departmental policy on future PTRs; it is only an *estimation* as to how the PTR will change given historical data and trends.

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[24] The pupil:teacher ratios used in the TSM may differ to those in the School Workforce Census SFR. Whilst both calculate PTRs by dividing the FTE pupil number by the FTE value for all teachers, the TSM includes centrally employed and occasional teachers and also includes both qualified and unqualified teachers.

[25] As the projected number of pupils going forward has already been calculated using the Pupil Projections Model.

The secondary active stock is then broken down by subject by using assumptions as to how much time (proportionately) is spent teaching the different subjects[26].

These teacher need values are then utilised to estimate the **entrant teacher need**. This is the number of teachers required to enter into the active stock each academic year by all entrance routes[27]. To do this, the model uses the following formula for year, *x*:

'Need' for entrant teachers in year *'X'* = Teacher need in year *'X'* –

(Entrant need) Stock of teachers at the end of previous year +

Number teachers expected to leave in year *'X'*

Therefore, the model assumes that the **entrant teacher need** for a particular academic year is equal to:

1. The number of additional/fewer teachers that might be required compared to the stock from the previous academic year (e.g. because pupil numbers have increased/decreased or there have been curriculum changes) *and* ,

2. The number of teachers that are expected to leave the active stock in that academic year (and require replacement).

As part of this calculation process, the model must make an estimation of the number of leavers from the active stock expected each academic year. This estimation is made using assumed projected wastage, retirements, and 'deaths in service' leaver rates. For more details, see **Chapters 3.8 – 3.11**.

Additionally, to reflect the effect of the ever-changing characteristics and size of the active stock (see **Chapter 3.7**), the model makes assumptions on:

1. How the size of the active stock changes over time, and

2. The number of those entering and leaving the active stock each academic year and their demographic characteristics.

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[26] For example, if the secondary teaching stock spends 10% of its total teaching time teaching English, 10% of the secondary teaching stock would need to be English teachers.
[27] This includes entrants that are new to the state-funded schools sector and re-entrants as well as those that are newly qualified.

The **entrant teacher need** output feeds directly into calculations of **ITT trainee need** in the second section of the model.

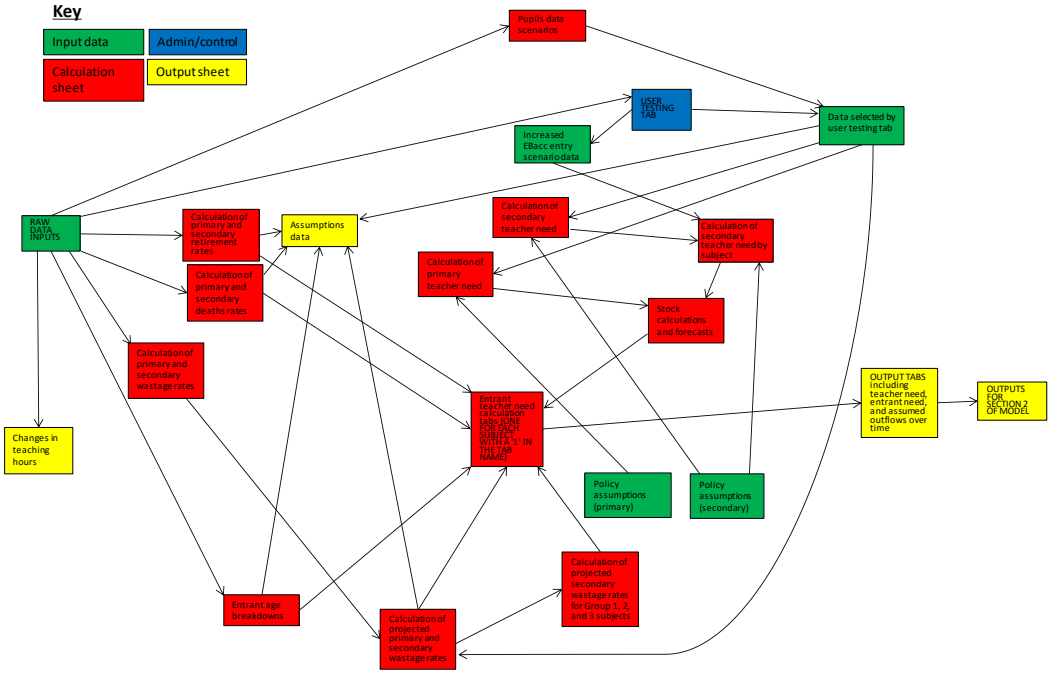
It should be noted that the entrant teacher need values are closely related to the estimated year-on-year growth in the qualified teacher stock. So, entrant teacher need (and therefore, ITT places) generally *go up* as the rate at which the stock (teacher need) is estimated to grow *increases*. Similarly, if the stock is forecast to grow at a *slower* rate, the entrant teacher need *falls*. Therefore, in the cases of some subjects such as English, Mathematics, and Primary, the entrant teacher need (and ITT place numbers) may *fall* beyond the next 3 - 4 years even though the teacher need (stock) is forecast to keep *growing*. In other words, the stock is still estimated to grow by the TSM, but is expected to grow at a *slower* rate, therefore fewer 'new' teachers (entrant need) are required each year as the stock isn't 'growing as much' each year.

The stocks of English and Mathematics are forecast to grow relatively quickly in the next 3 - 4 years because of the impact of the respective policy assumptions (e.g. the new Mathematics GCSE) and the growth in key stage 3 pupil numbers. Beyond this point, the year-on-year rate of growth starts to slow down. For primary, the growth in primary pupil numbers will fall over the next decade as primary pupil numbers 'level out'.

3.2 Structure of the first section of the 2017/18 Teacher Supply Model.

The section of the 2017/18 TSM that calculates the number of teachers needed to enter the active stock is reproduced in diagrammatic form in Figure 2 below. This section of the model uses raw data inputs and user scenario specifications (if selected) to calculate aspects of the active stock of teachers: teacher flow, effects of specific policy assumptions on subject requirements and, hence, the number of teachers needed to enter the stock to support the teaching requirements in the subsequent year(s).

Figure 2: Map of the first section of the 2017/18 Teacher Supply Model.



Source: 2017/18 Teacher Supply Model.

3.3 The data that feed into this section of the 2017/18 Teacher Supply Model.

The following data sources feed into the Teacher Supply Model:

- **Pupil population projections** from the **Pupil Projections Model** by key stage.
    - Pupils studying at key stage 5 in state-funded secondary schools are also included.
- **Teacher leavers and entrants data** from the **2015 matched School Workforce Census** (these data were previously provided by the **Database of Teacher Records** for the 2015/16 and previous Teacher Supply Models).
    - Teachers leaving the active stock as wastage[28], retirements, or deaths in service.

[28] Wastage covers teachers leaving the active stock to teach in supply roles, teach in sectors outside of the state-funded schools sector in England, work in other non-teaching sectors,

    - Data on the characteristics (age group and gender) of entrants to the active stock by all entrance routes[29].

- **Teacher stock data** from the **2015 matched School Workforce Census**, including data on:

    - Teachers' characteristics (age group and gender).

    - Secondary subject timetable information (what subjects secondary teachers are teaching at each key stage and for how many hours in a typical week).

    - Teachers' full-time equivalent (FTE) rates[30].

    - Teachers' qualification status[31].

- **Projected teacher wastage** rates from the Department's **Econometric Wastage Model**

    - Data projecting how teacher wastage rates[32] are likely to change going forward.

All data inputs into the model are provided in the **RAW DATA INPUTS** tab in the model workbook.

The department's standards for data suppression require that fields relating to fewer than five individuals should not be published[33]. In the department's statistical publications this is achieved by replacing figures based on fewer than five individuals with an "x". That approach does not work in the TSM as it would suppress the entire function within the model. To overcome this - and still apply the department's suppression rules - fields with fewer than 5 individuals have been aggregated either across gender or age bands. The effect of this is to increase the total ITT place requirements for 2017/18 by

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and those that become economically inactive. Teachers on maternity breaks are not classed as wastage. Teachers that are barred from service are now counted towards wastage in the 2017/18 model (they were previously included in a separate group along with those teachers that died in service).

[29] Including those entering as NQTs, new to the state-funded sector entrants, and re-entrants.

[30] A teacher who is employed full-time is classed as 1.0 FTE, a teacher who is employed part-time and works 50% hours is 0.5 FTE.

[31] Whether teachers are qualified (QTS) or unqualified.

[32] Proportion of the active stock leaving in a given academic year as wastage.

[33] For example, the model should not identify that there was just one male teacher aged 20-24 who taught a particular subject in November 2015.

two training places compared to the disaggregated data used within the department.

More information on the data sources used in the Teacher Supply Model can be found within **Chapter 6**.

3.4 Data and assumptions on the current stock of teachers.

Calculations relating to the current stock of teachers are made on the **Stock calculations** and **Stock ages breakdowns** tabs.

Matched School Workforce Census (SWC) 2015 data are used to provide information on the *current* stock of teachers[34] by headcount. The census provides a snapshot of the active teacher stock in state-funded schools in England on census day in November 2015. The Teacher Supply Model assumes that the active stock as of November 2015 will be the active stock that will end the 2015/16 academic year.

The census provides information on teachers' gender and age group, whether teachers are qualified or unqualified, and teachers' full-time equivalent rates.

Secondary teachers are also broken down by their **subject** specialism. Within the census, teachers are *not* identified as 'belonging' to a particular subject e.g. teacher X 'is' a Biology teacher. The census simply provides information on teachers' qualifications[35] and timetable[36] information. Additionally, the census does not provide any information on any additional training that teachers may have received to teach additional subjects, e.g. a training course to enable a Geography teacher to teach Mathematics effectively[37].

As teachers may teach subjects other than those that they are most highly qualified in or hold a PGCE in, teachers are assigned to subjects according to how much time they spend teaching particular subjects. This assumption is

[34] In the state-funded schools sector only.

[35] The highest post A-level qualification that a teacher holds in that particular subject.

[36] The number of hours that an individual secondary teacher teaches in each subject at key stage 3, 4, and 5 respectively.

[37] A teacher could also have extensive *experience* of teaching a subject outside of their subject specialism that would not be picked up within the census. For example, a Geography teacher may have taught Geography for 30 years but have no post A-level 'Geography' qualifications.

designed to reflect what is happening within schools and how teachers are actually being utilised.

> For example, if a teacher teaches Mathematics 100% of the time, they are assumed to be 1.0 of a Mathematics teacher. If they teach Mathematics 50% of the time and Physics 50% of the time, they are assumed to be 0.5 of a Mathematics teacher and 0.5 of a Physics teacher. These values are not adjusted to account for teachers' full-time equivalent rates (the differences in FTE rates between subjects are accounted for elsewhere within the TSM stock derivation calculations).

Data from the matched School Workforce Census are published as part of the School Workforce Census Statistical First Release[38]. Some headcount figures may appear to differ slightly to those used within the Teacher Supply Model. These differences are the result of the active stocks used in the Teacher Supply Model having different selection criteria to those presented within the SFR because of modelling reasons (for example, different subject groupings and coverage).

3.5 Data and assumptions on the number of teaching hours by subject.

The matched School Workforce Census is used to provide data on how many hours are being taught in which subjects at key stage 3, 4, and 5 in secondary schools by both the *total* secondary active stock and *individual* secondary teachers. The subjects are defined as illustrated in Table 2 in **Chapter 2.2**.

Data that are similar to this on the *total* number of hours taught for particular subjects in secondary schools are included within the School Workforce Census Statistical First Release and may show some slight differences to those figures used within the TSM (see **Chapter 3.4**).

Additionally, it is worth noting that the TSM completely *excludes* hours spent teaching PSHE (Personal Social and Health Education). This assumption is made to prevent the model overestimating the number of PSHE teachers required (and therefore the number of trainees requiring PSHE ITT). This assumption was made to reflect the fact that the overwhelming majority of PSHE teaching is carried out by non-PSHE specialists, e.g. teachers of other

[38] Read the latest School Workforce Census SFR (2015).

subjects teaching PSHE to their tutor groups for one or two hours a week. The same approach is used for the teachers and teaching of General Studies.

3.6 Data and assumptions on pupil projections.

Calculations relating to pupil projections inputs are performed on the **Pupils data scenarios** tab.

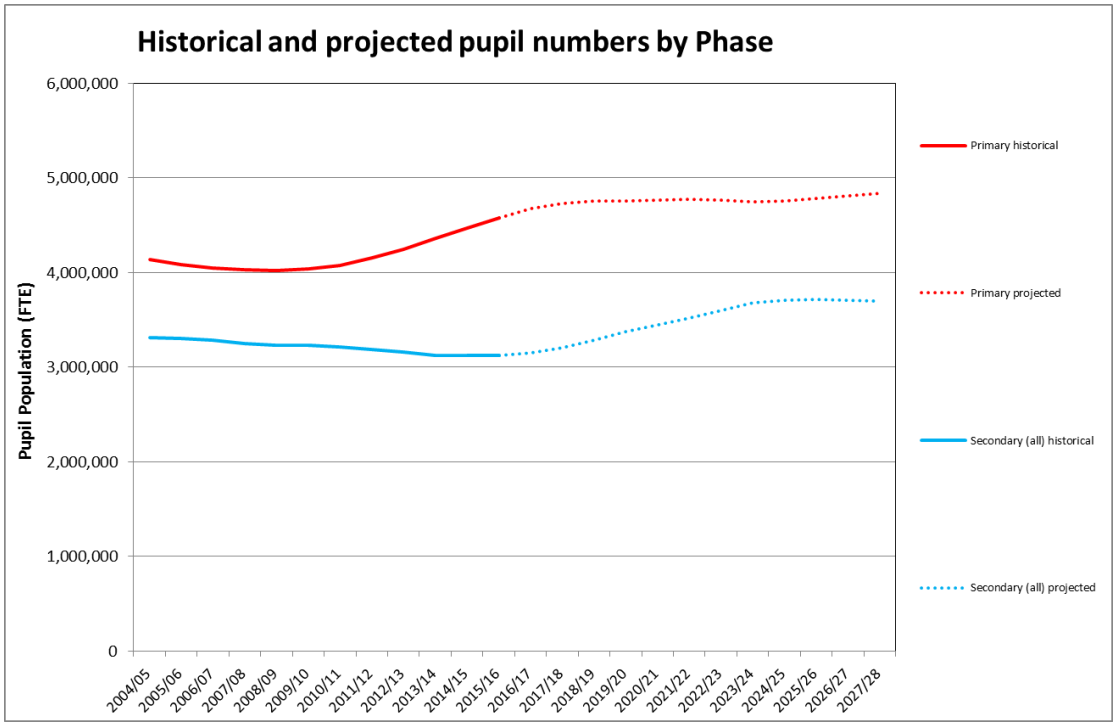
The change in the size of the pupil population going forward at each key stage is estimated using the outputs derived by the Pupil Projections Model which are used in the Department's published national pupil projections[39]. High, central, and low scenarios of projected pupil populations are derived for use in the TSM using variations of birth rate and migration projections.

The Pupil Projections Model does not currently forecast how the number of key stage 5 pupils in state-funded schools will change over time. Because these projections *are* required by the Teacher Supply Model, for simplicity the TSM assumes over the longer term that the number of key stage 5 pupils in secondary schools will change at the *same* year-on-year rate as the national 16-19 population (projections on changes to the national 16-19 population *are* provided within the Pupil Projections Model). In the shorter term (for the years 2016/17, 2017/18, and 2018/19), the model assumes that the post-16 participation rate will change based on the participation rate change of the three previous years.

Pupil population projections data for the total primary and secondary phases as used by the TSM are illustrated in Figure 3 (see below).

[39] These were last published in July 2016. Detailed figures and background information here.

Figure 3: Pupil population projections data as used in the 2017/18 Teacher Supply Model broken down by phase.



Source: 2017/18 Teacher Supply Model and Pupil Projections Model.

3.7 Teacher flow data from the matched School Workforce Census.

Data from the matched School Workforce Census (SWC) are used in the Teacher Supply Model to provide information on *historical* teacher flows, i.e. teachers leaving and entering the stock in previous years. Previously, in the 2015/16 Teacher Supply Model and earlier models, these data were supplied from the Database of Teacher Records (DTR).

Matched School Workforce Census flow data provide information about:

- The *characteristics* of leavers and entrants (gender and age group).
    - The SWC also provides information on the phase of school that teachers teach in and the subjects secondary teachers teach or have qualifications in. The DTR, by contrast, does not provide this subject-level information.
- The *origin* of entrants.
    - For example, whether entrants are NQTs, new to the state-funded sector entrants, or re-entrants.

- The *destination* of leavers.
    - For example, whether leavers have left through retirement, wastage[40], or death in service.
- All SWC flow data used in the 2017/18 TSM are in headcount form (rather than FTE).
- As well as information on what subjects teachers are qualified in (and teach for secondary phase teachers), the SWC provides a greater coverage of the teaching workforce than the DTR which underreports teachers that are unqualified or employed part-time.
    - The DTR is derived from teacher pensions data. As a result, the coverage of the DTR across the state-funded sector workforce is strongly linked to the take-up and eligibility of the Teacher Pension Scheme (TPS)[41].

Data on historical teacher flows are available up to 2014/15 (however, data for 2013/14 and 2014/15 remain provisional). In light of SWC flow data post-2012/13 being provisional, the model uses weighted[42] averages of the four most recent years of data for *all teacher flow rates calculations*.

SWC data are a 'snapshot' of the teacher workforce taken on census day in November of each year. As a result, historical flow rates (e.g. the wastage rate) are calculated as being the proportion of the active stock of qualified teachers that leave between November of a particular year and November of the subsequent year.

> For example, the wastage rate for the 2014/15 academic year is the proportion of the active stock in November 2014 that leaves as wastage between November 2014 and November 2015.

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[40] Wastage covers teachers leaving the active stock to teach in supply roles, teach in sectors outside of the state-funded schools sector in England, work in other non-teaching sectors, and those that become economically inactive. Teachers on maternity breaks are not classed as wastage.

[41] Prior to January 2007, part-time teachers had to opt-in to (rather than opt-out of) the Teachers' Pension Scheme which affected the number of part-time teachers who were covered by the DTR.

[42] A weighted average is used to account for the fact that the two most recent years of SWC data are provisional and subject to change. The model uses data from 2011/12, 2012/13, 2013/14, and 2014/15 with an average value being calculated which is weighted towards 2014/15 (weights are 0.1, 0.2, 0.3 and 0.4 respectively).

Rates are calculated for all age groups and for both genders.

For consistency, the stock figures used to calculate such historical flow rates also come from the SWC. These stock figures may differ to those stock figures provided from the matched School Workforce Census elsewhere for the reasons outlined previously in **Chapter 3.4**.

The wastage numbers in the TSM may differ from those published in the matched School Workforce Census Statistical First Release (SFR) and are not directly comparable[43]. These differences are the result of different criteria: for example, the SFR and TSM have slightly different criteria of what is classed as the state-funded schools sector.

All wastage, retirements, and deaths in service figures used in the TSM have been estimated separately[44] from fields in the matched SWC for modelling purposes in order to apply economic wastage estimates going forward (from the Econometric Wastage Model, see **Chapters 3.8 and 3.9**). The figures used by the TSM on future retirements or deaths in service are not designed to be definitive estimates of retirements or deaths from service.

3.8 Data and assumptions on historical and current wastage rates.

Data on 'current' wastage rates (data from 2014/15 and the three prior years) are calculated on the **Calculation PRIM wastage rates** and **Calculation SEC wastage rates** tabs for the primary and secondary phase respectively.

Data on historical wastage rates come from the matched School Workforce Census (SWC).

The Teacher Supply Model estimates the proportion of the stock of teachers that will have left as wastage[45] (for each age group and gender) using a weighted[46] average of wastage rates from the previous four years of historical data. Values are calculated for the primary and secondary phases *separately*.

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43 For more information, see School Workforce Census here.

44 The TSM uses projected wastage rates from the Econometric Wastage Model, which does not include deaths in service or retirements as wastage.

45 In the most recent year for which we have data (2014/15).

46 A weighted average is used to account for the fact that the two most recent years of SWC data are provisional and subject to change.

Whilst the model calculates separate rates for the two genders[47], the model does *not* calculate different wastage rates for individual subjects. This is a result of:

- The **Econometric Wastage Model**[48] (EWM) historically using wastage data broken down by gender but not by phase/subject.
    - As a consequence, the EWM assumes that wastage rate changes for each gender are consistent across the phases.
- Subject-specific wastage data being unavailable from the matched SWC broken down by both age group and gender.
    - Whilst these rates *could* be derived, the numbers of teachers of each subject within each age group and gender would be too small to make the rates meaningful for modelling purposes.
    - They would also be unsuitable for use in a published model due to data suppression reasons as most figures (number of leavers within a particular gender, age group, and subject specialism) would relate to less than five teachers.
- However, the model *does* account for variation in wastage rates for three *groups of* subjects and ages in its projections (see **Chapter 3.9**).

The stock data in the model also take into account that subjects have different proportions of teachers who are male/female and within different age groups. Therefore, as the estimated wastage rates are different for each demographic group, the model estimates that different proportions of the stock will leave as wastage for the individual subjects, and the overall wastage rate will change as the age and gender profile of the stock changes[49].

3.9 Data and assumptions on projected wastage.

Having calculated baseline wastage rates for 2014/15, the model then calculates *projected* wastage rates on the '**Projected PRIM wastage rates**' and '**Projected SEC wastage rates**' tabs.

In previous years the model has used forecasts from the **Econometric Wastage Model** to scale the wastage rates for each subset of gender, age and subject. The EWM uses measures of economic growth and

[47] There are noticeable differences in the likelihood of leaving the active stock as wastage between the two genders.

[48] Used to estimate projected wastage rates.

[49] For example, if the stock of Mathematics teachers had fewer female teachers than the stock of Drama teachers, a greater proportion of the Mathematics stock might be expected to leave as wastage than from within the Drama stock.

unemployment data to estimate the teacher wastage rate[50] based on time series analysis of teacher wastage and economic factors from 1974[51] to 2015.

The model uses the historic relationships between teacher wastage for each gender and the economic explanatory factors to estimate how each factor independently impacts on wastage. In previous TSM rounds this relationship, coupled with economic forecasts, has been used to project how the teacher wastage rate will change in future years based upon historical relationships between wastage and these, and other, variables.

Using the matched SWC data, the department holds wastage data that provide information on the subjects that were taught by leavers before their departure. These data can be used to assess the difference in wastage rates between subjects. As the individual subject 'cohorts' are of small size and the TSM uses average rates calculated for each demographic group, subjects are aggregated into three *a priori* 'subject groups' (to get meaningful sample sizes for analysis[52]). The subject groups used are as follows:

- **Group 1** – EBacc 'Science and Mathematics' subjects - including Biology, Chemistry, Computing, Mathematics, and Physics.
- **Group 2** – EBacc non-'Science and Mathematics' subjects - including Classics, English, Geography, History, and Modern Foreign Languages.
- **Group 3** – All other subjects - including Drama, Music, Physical Education, and Religious Education among others.

Group 1 subjects generally have higher wastage rates than group 2 subjects for the younger demographic groups. Group 2 subjects in turn generally have higher wastage rates than group 3. This analysis makes like-for-like comparisons between age groups and gender (only the subject that the teachers teach differs). Overall, this analysis may be an indication that teachers of group 1 subjects are more likely to leave the active stock (as wastage) than their group 2 and 3 subject colleagues are.

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[50] The Econometric Wastage Model uses data including:

- Teacher pay data from the DTR (pre-2011) and the SWC (post-2011 up to 2013). Professional pay data from ASHE. Relative pay is the ratio between these.
- Historic GDP data from the ONS IHYP series.
- Historic unemployment rate data from the ONS MGSX.

[51] The data used go back to 1972, but lags introduced into the EWM mean the earliest year for wastage estimation is 1974.

[52] Especially when broken down by age group and gender.

The 2017/18 TSM applies wastage rate conversion rates (see Table 3 below) to the overall secondary projected wastage rates (for each demographic group) in order to estimate likely differences in projected wastage rates between subject groups on the **Group 1 rates**, **Group 2 rates**, and **Group 3 rates** tabs.

> For example, the projected wastage rate of male teachers for year 'X' that are aged 20-24 who teach a group 1 subject will be 1.11 times that of the overall secondary projected wastage rate of male teachers aged 20-24 for year 'X'.

Table 3: Assumed wastage rate conversion rates used in the 2017/18 Teacher Supply Model for group 1, 2, and 3 subjects.

	Assumed wastage conversion rates					
	Male			Female		
Age group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
20-24	1.11	0.97	0.85	1.10	0.94	0.96
25-29	1.07	1.10	0.86	1.07	1.02	0.94
30-34	1.07	1.04	0.91	1.03	1.02	0.96
35-39	1.11	0.92	0.94	0.98	1.02	1.00
40-44	1.03	0.94	1.00	1.02	0.99	1.00
45-49	1.07	0.92	0.96	1.04	1.00	0.97
50-54	1.02	0.94	1.01	0.96	0.98	1.06
55-59	0.95	1.08	1.01	0.91	0.98	1.08
60-64	0.94	1.01	1.07	0.94	0.98	1.07
65 plus	0.89	1.11	1.11	0.94	1.03	1.02
Total	1.04	1.00	0.95	1.00	1.01	1.00

Source: 2017/18 Teacher Supply Model.

However, there has been a large increase in the ranges of economic forecasts due to the level of uncertainty created by the outcome of the 2016 referendum on the United Kingdom's membership of the European Union (see Figures 4 and 5 below). The development of the Econometric Wastage Model was conducted over the summer of 2016, so pre-dated any more recent figures showing the economic impact of the referendum vote. Because of this uncertainty in economics forecasts, we have taken the decision **not** to use the Econometric Wastage Model to forecast wastage in future years for this year's TSM. Instead, the model will use a weighted four-year average for wastage from the latest historical SWC data and assume that wastage remains at this level over the next few years. Therefore, all wastage scalars in the '**Projected PRIM wastage rates**' and '**Projected SEC wastage rates**' tabs are set to 1.00.

(It is worth noting that the model allows users to set their own econometric wastage scalars via the **USER TESTING TAB**, and econometric wastage scalars from the 2016/17 TSM have been provided for context and background information on this tab.)

We will review the approach to modelling wastage for next year's TSM, depending on the range of forecasts at that point. The economic forecasts affecting the current round of modelling are given below.

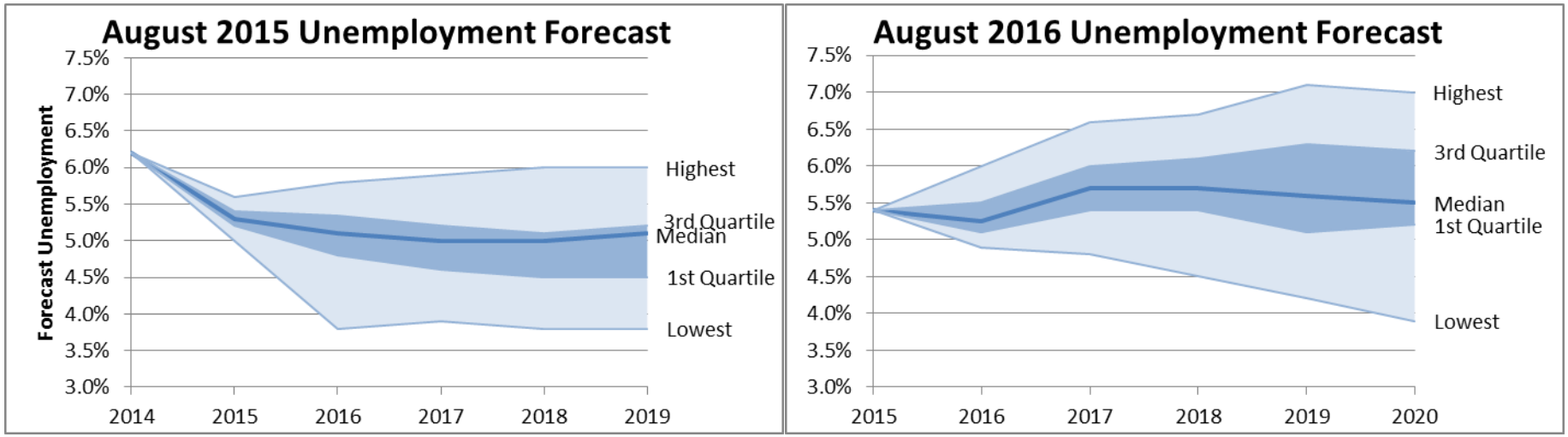
Figure 4 below shows the range of independent unemployment forecasts collated by Her Majesty's Treasury. Each forecast represents a central estimate of the unemployment rate in that year. The range in forecasts is approximately 30% larger for the August 2016[53] forecast than for the equivalent forecast from August 2015[54].

Similarly, Figure 5 shows the range of GDP forecasts from the same publication. Each forecast represents a central estimate of the GDP growth rate in that year. The range in forecasts is approximately 80% larger for the August 2016 forecast than for the equivalent forecast from August 2015.

53 Forecasts from August 2016 only.

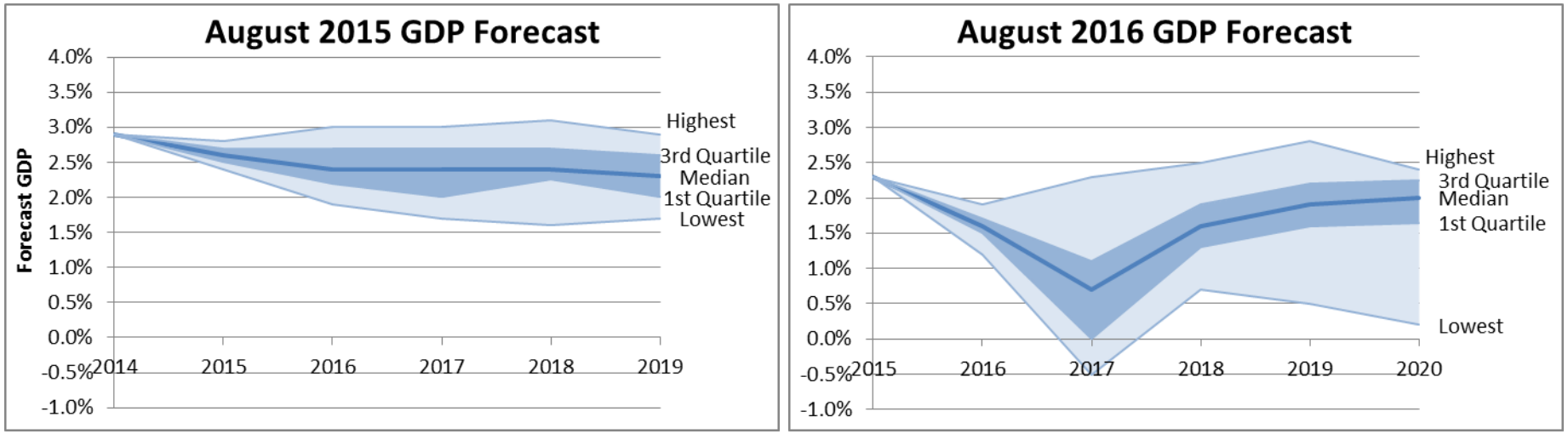
54 Forecasts from August 2015 only.

Figure 4: Range of unemployment forecasts from August 2015 and August 2016.



Source: Forecasts for the UK economy August 2015 & Forecasts for the UK economy August 2016.

Figure 5: Range of GDP forecasts from August 2015 and August 2016.



Source: Forecasts for the UK economy August 2015 & Forecasts for the UK economy August 2016.

3.10 Data and assumptions on retirements.

Calculations of retirement rates by phase are carried out on the **Calc PRIM retirement rates** and **Calc SEC retirement rates** tabs.

The model calculates retirement rates as being the proportion of the active stock of qualified teachers that leaves the active stock (as retirements only) between census day in November of a particular year and November of the subsequent year[55].

> For example, the retirement rate for the 2014/15 academic year is the proportion of the active stock in November 2014 that leaves as retirements between November 2014 and November 2015.

Rates are calculated for all age groups for both genders using four years of data, weighted towards the most recent years. This retirement rate by age group and gender is then applied to the stock to estimate the number of teachers leaving by retirement for each phase and subject.

> For example, if the projected retirement rate for the overall secondary stock for female teachers aged 50-54 is 2%, the model assumes that 2% of female Mathematics teachers aged 50-54 will leave as retirements each year.

The model assumes that the secondary retirement rates are consistent across all subjects e.g. if the retirement rate for female Mathematics teachers aged 50-54 is 2%, it is also 2% for female Physics teachers aged 50-54. However, the current stocks data take into account that some subjects have higher or lower proportions of teachers over the age of 50 which results in higher or lower proportions leaving by retirement.

The model also assumes that the primary and secondary retirement rates remain constant over time. However, as the model assumes that the proportion of teachers within different age groups will change over time, it also assumes that the proportion of the stock that will retire will change over time.

The retirement rates are fed into the tabs for each individual phase and subject to estimate future retirement numbers for each phase and subject.

3.11 Data and assumptions on deaths in service.

Calculations of ‘death in service’ rates by phase are carried out on the **Calc PRIM death rates** and **Calc SEC death rates** tabs.

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[55] The SWC is a snapshot from census day in November of a given year.

The model calculates death in service rates as being the proportion of the active stock of qualified teachers that dies in service between November of a particular year and November of the subsequent year.

> For example, the ‘death in service’ rate for the 2014/15 academic year is the proportion of the active stock in November 2014 that dies in service between November 2014 and November 2015.

Rates are calculated for all age groups for both genders using four years of data and are weighted towards the most recent years. This ‘death in service’ rate by age group and gender is then applied to the stock to estimate the number of teachers that will die in service for each phase and subject.

> For example, if the projected ‘death in service’ rate for the overall secondary stock for female teachers aged 50-54 is 0.1%, the model assumes that 0.1% of female Mathematics teachers aged 50-54 will die in service each year.

The model assumes that the secondary ‘death in service’ rates are consistent across the subjects e.g. if the ‘death in service’ rate for female Mathematics teachers aged 50-54 is 0.1%, it is also 0.1% for female Physics teachers aged 50-54.

The model also assumes that the primary and secondary ‘death in service’ rates remain constant over time.

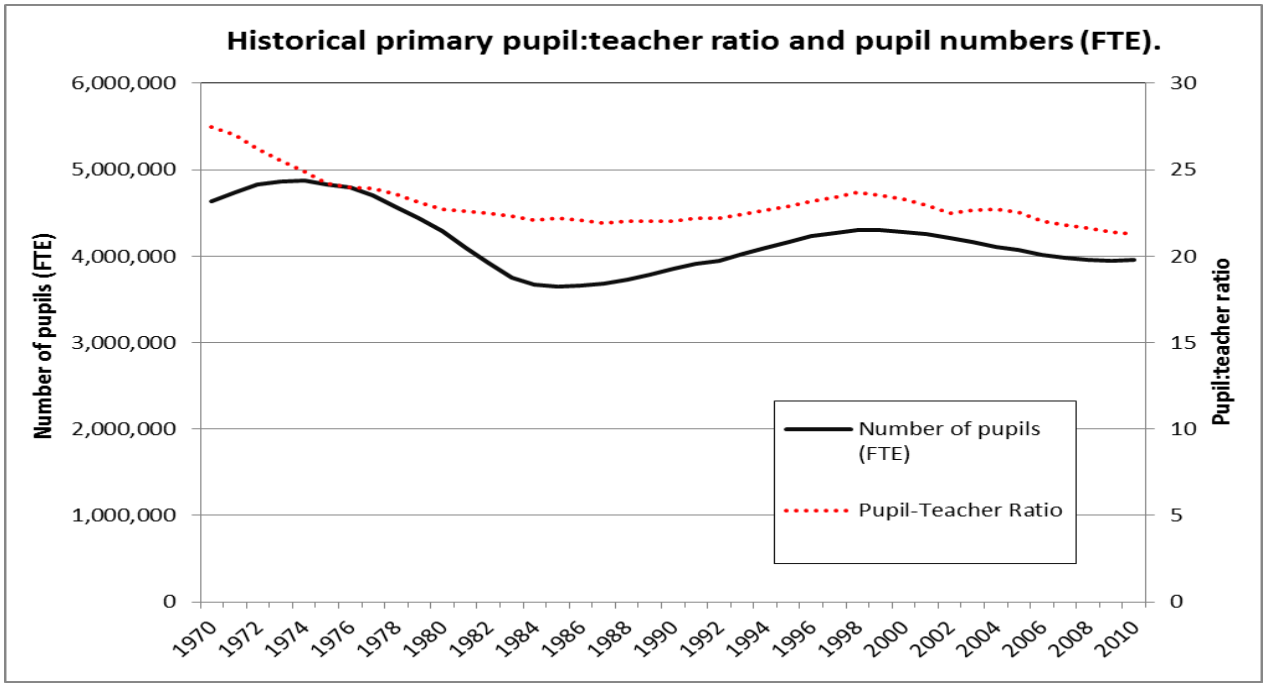
These ‘death in service’ rates are fed into the tabs for each individual phase and subject to estimate future ‘death in service’ numbers for each phase and subject.

3.12 How does the model estimate the required future stocks of teachers (the teacher need) by phase?

The Teacher Supply Model calculates the teacher need by phase on the **Calc Primary teacher need** and **Calc overall Sec teacher need** tabs respectively.

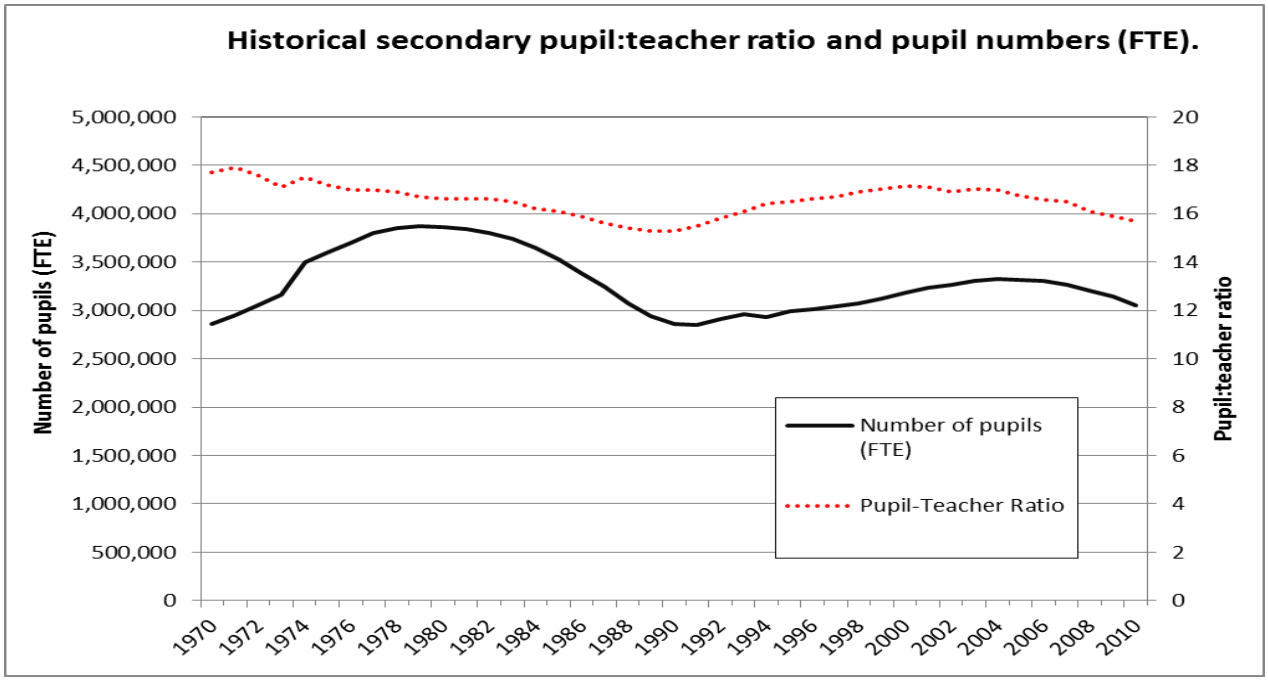
The model does this by estimating how the pupil:teacher ratio (PTR) will change going forward (from the current PTR) as pupil numbers change (these are projected by the Pupil Projections Model). From this estimated PTR, given that the future number of pupils is known, the overall number of teachers required to provide this PTR can be calculated (this overall number of teachers includes teachers that are unqualified, centrally employed, or occasional).

Figure 6: Changes in pupil numbers (FTE) and pupil:teacher ratio (PTR) in primary schools 1970-2010.



Source: School Census and 618g survey.

Figure 7: Changes in pupil (FTE) numbers and pupil:teacher ratio (PTR) in secondary schools 1970-2010.



Source: School Census and 618g survey.[56]

[56] The 618g survey was the precursor to the SWC. It relied on local authorities returning data on teachers and was returned every January.

Historical trends of pupil:teacher ratio with changes in pupil FTE numbers from 1970-2010[57] can be seen in Figures 6 and 7 above for the primary and secondary phases respectively. These trends illustrate that as the pupil population has increased in the past, part of the additional need for teachers has been met by increasing class sizes (and therefore, PTRs).

These historical figures (from between late 1980s to early 2000s when pupil numbers were rising as they are currently) are used for making assumptions in the TSM (as opposed to more recent data that may be available) as they provide evidence on how the state-funded schools sector has adapted most recently to, and managed, an increase in pupil numbers over a prolonged period of time[58].

Using rates of PTR change from the historical data above, the model assumes that, for an increase in pupil population of **1%**, the PTR will increase by **0.5 percentage points**[59] for the primary phase and **0.6 percentage points** for the secondary phase up to a maximum cap[60]. Should pupil numbers increase such that the PTR would exceed this cap, teacher need increases such that the PTR will remain constant (at this cap).

This estimated future PTR for the system is used to calculate the number of full-time equivalent (FTE) teachers required (the '**teacher need**').

The PTR caps to be used in the model are **22** for the primary phase and **16** for the secondary phase (relating to the maximum PTR levels observed around the year 2000[61], this being the end of the time series section that relates to current conditions of rising pupil numbers).

The current (November 2015) **ratio of unqualified to qualified teachers** is estimated by the TSM using the latest SWC data (by both phase and subject). This ratio is then applied to the FTE teacher need (by both phase and subject[62]) to subtract the proportion of the teacher need that is assumed will be met by *unqualified* teachers in the future[63]. It is assumed that this rate will remain constant going forward to reflect the stability of the unqualified teacher rate in the SWC and the approach used in the TSM historically.

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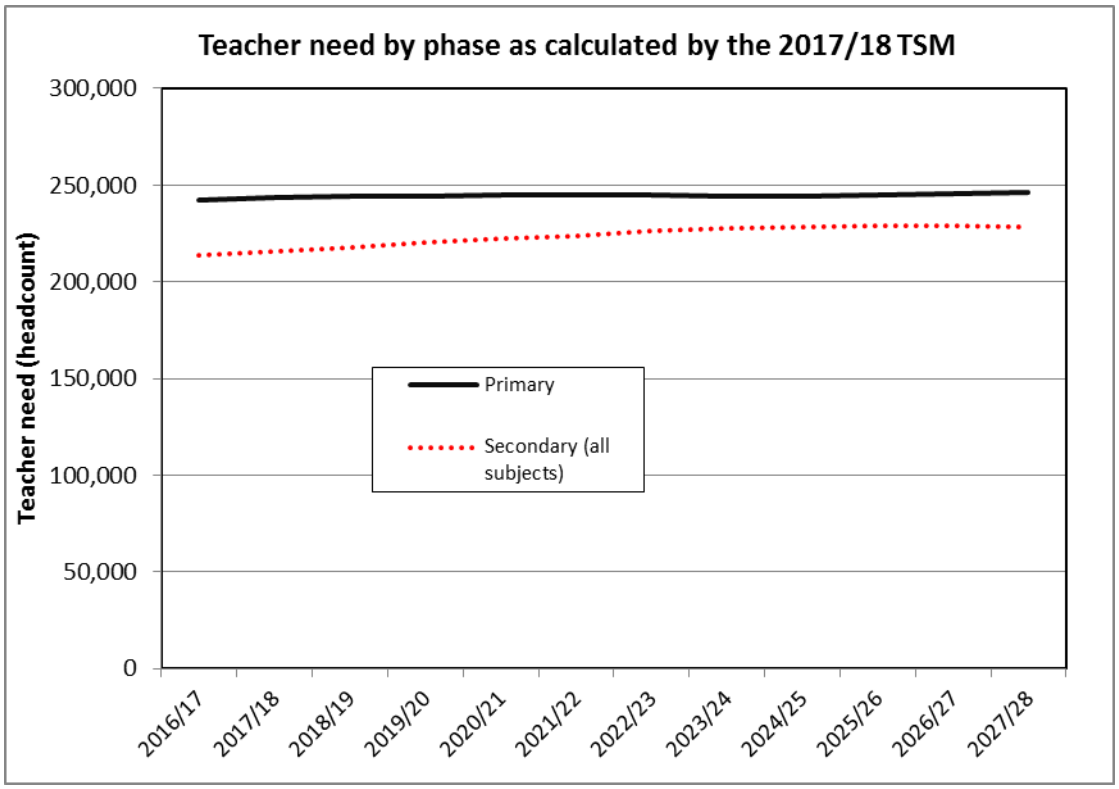
57 Read the relevant report information here.
58 More recent data (up to 2015) on pupil:teacher ratios are available within the School Workforce Census SFR. PTRs calculated for years pre-2010 use teacher numbers from a now discontinued data source. Therefore, as the 1970-2015 PTR time series is not consistent in the data sources used, PTR values post-2010 have not been presented in Figures 6 and 7.
59 Based on the rates of PTR increase observed in the late 1990s when pupil numbers were increasing noticeably.
60 This is the approach that has been used in previous versions of the TSM and is based on historical increases of PTR with increasing pupil numbers.
61 The figures differ slightly to those presented in Figures 6 and 7 as they have been *adjusted* to account for unqualified teachers.
62 This calculation is performed on the **Teacher need by subject** tab for the secondary phase and takes into account that different subjects have proportionately more or less unqualified teachers than others.
63 A similar approach is used to estimate the proportion of teacher need that will be met by centrally employed teachers.

This year, if the percentage of teachers that are unqualified has increased, the model uses the lower value from the 2014 School Workforce Census rather than the higher value from the 2015 School Workforce Census. The model accounts for increases in the proportion of teachers that are unqualified in LA maintained schools only, changes that do not relate to increases in the number of School Direct (salaried) and Teach First trainees which are both considered as being unqualified teachers within the School Workforce Census. Another reason for this data selection assumption is to prevent the model producing a 'self-fulfilling prophecy' by underestimating teacher need, as explained in **Chapter 1.2**.

The FTE teacher need is then converted into *headcount* teacher need by dividing the FTE teacher need by the *FTE rate* for teachers. Values for the primary and secondary phase are calculated separately from the SWC. It is assumed that these FTE rates will remain constant going forward: for example, if the current FTE rate of the primary teacher stock is 0.93 (reflecting the current balance of full-time to part-time teachers, and the average FTE rate of part-time teachers), the model assumes that the FTE rate of the primary teacher stock will be 0.93 going forward.

The **teacher need** values by phase as calculated by the TSM are illustrated in Figure 8 below. All figures are calculated using the central (default) scenarios.

Figure 8: Teacher need values by phase as calculated by the 2017/18 Teacher Supply Model.



Source: 2017/18 Teacher Supply Model.

3.13 How does the 2017/18 TSM estimate the future stocks of secondary teachers by subject (i.e. the secondary teacher need by subject)?

Once the FTE teacher need for the *overall* secondary phase has been calculated, this figure can then be divided into the teacher need for individual subjects on the **Teacher need by subject** tab.

At a high level, this works on the assumption that if 10% of the total teaching time of the secondary workforce is spent teaching English (for example), then 10% of the FTE secondary workforce needs to be English teachers. In other words, 10% of the secondary lessons are currently English lessons.

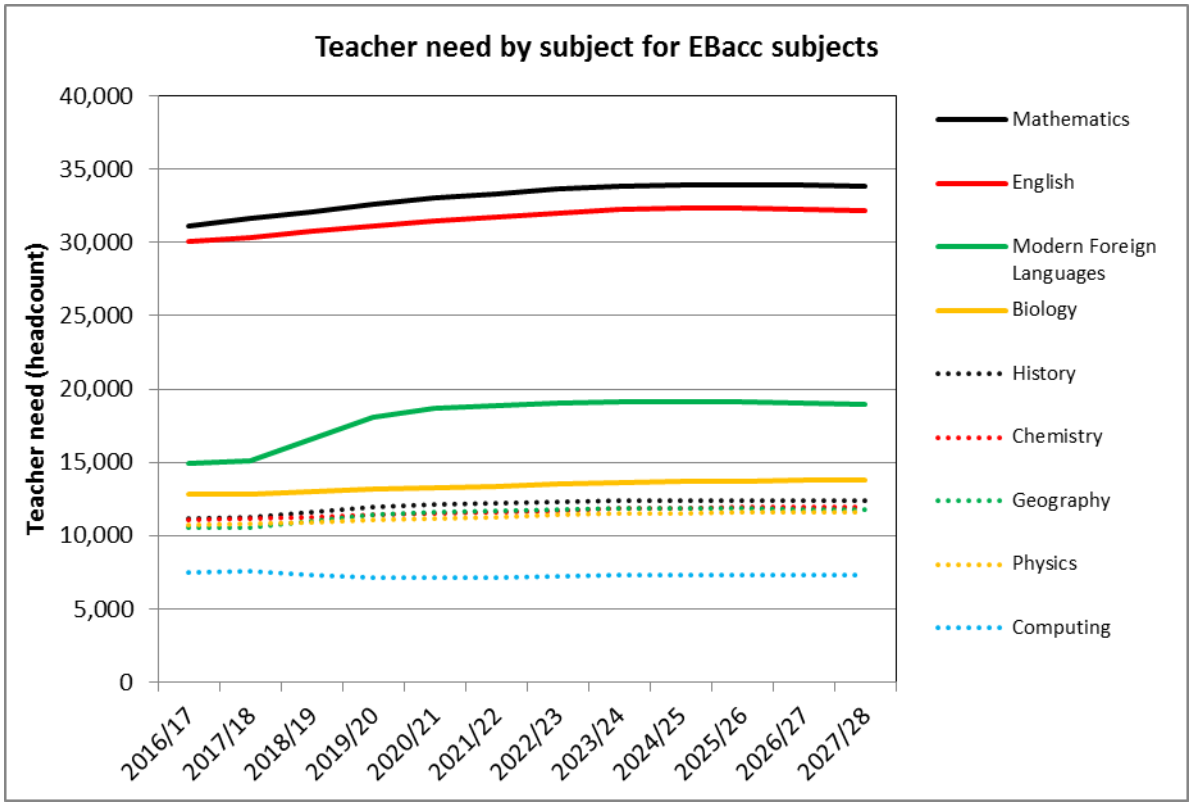
To reflect that different subjects are more/less popular at the different key stages, and that the proportion of the secondary pupil population at the different key stages is in flux, the model estimates the average quantity of teaching time required per pupil for each subject at KS3, KS4 and KS5 which is then multiplied upwards using projected pupil numbers to take into account the changing teacher need for subjects as the pupil demographics change[64]. If secondary pupil numbers increase through increased numbers of pupils leaving primary school and moving up to secondary, any increase in secondary pupil numbers will be experienced at key stage 3 *before* key stage 4 and then key stage 5.

All secondary teacher need values are adjusted to account for the FTE rates of the secondary workforce and the proportion of teachers that is expected to be unqualified.

The **teacher need** values as calculated by the TSM for subjects that form the English Baccalaureate are illustrated in Figure 9 (below). All figures are calculated using the central (default) scenarios. Graphical representations of teacher need for all subjects as calculated by the model are available on the **Teacher need charts over time** tab.

[64] Different subjects require different amounts of average teaching time per pupil at KS3, KS4 and KS5.This is a result of different subjects being more/less popular at the different key stages and differences in curriculum time. For example, Business Studies is far more popular at KS4 than KS3. Additionally, subjects such as Social Studies and Psychology (within the 'Others' subject group) are considerably more popular at KS4 and KS5 than at KS3.

Figure 9: Teacher need values for EBacc subjects as calculated by the 2017/18 Teacher Supply Model.



Source: 2017/18 Teacher Supply Model.

3.14 How does the 2017/18 TSM account for any additional need for teachers resulting from new teacher-related policies?

If a teacher-related policy is expected to *increase* the future need for teachers (**teacher need**) by **more than 100 FTE teachers in 2017/18 or beyond**, a *policy assumption* (based on evidence) to increase teacher need could be added to the model[65]. The specific policy assumptions for the TSM are reviewed annually.

Where government policy is confirmed, then the model assumes the expected direction from announced government policy. Where the government position has yet to be announced, a range of scenarios are modelled in line with government policy and the central scenario is presented, therefore, some policy assumptions have been made ahead of a final policy decision being reached.

If a policy relates to the *training* of teachers, e.g., 100 teachers are to be trained by a new training route, an assumption in the TSM is *not* required as this policy does not affect the number of teachers required in the active stock.

[65] This assumption could be made at either phase or individual subject level.

There are no current policies relating to the *overall need* for primary teachers or an additional requirement for more primary teachers within the active stock.

There are **nine** secondary teacher-related policies that would result in an increase in the number of teachers of more than 100[66] in particular subjects.

These assumptions are summarised on the **Policy assumptions SEC** tab within the TSM. **Five** of the ten policies are expected to affect the popularity of particular subjects at particular points within the secondary education process (e.g. the assumed increases in uptake of EBacc will make some subjects more popular at key stage 4 than they were in the previous SWC data). Using this information, assumptions are made by the model as to how the proportion of the overall secondary teacher requirement at key stages 3, 4, or 5 might increase (and in what academic year those increases would occur) and are added into the **Teacher need by subject** tab.

The policy assumptions included in the 2017/18 TSM are listed in Table 4 below in abbreviated form. For full details, including important caveats and subject-specific issues, please see the **Policy assumptions SEC** tab in the 2017/18 TSM. Additional information on the EBacc take-up rate testing capability within the TSM, and how the different scenarios have been derived, can be found in **Chapter 5.1 (h)** of this methodological annex.

Table 4: Policy assumptions used in the 2017/18 Teacher Supply Model.

Number	Policy area	Name	Brief description	Assumption to be used	Into which sheet is the assumption added?
1	Curriculum changes	EBacc policy	From 2018/19, we expect to see increases in the entry rate of EBacc. We have modelled additional future teaching time requirements in EBacc subjects based on an analysis of teaching time in existing schools with higher EBacc entry to provide a guide of what future teacher need might be. We anticipate that individual schools will implement this policy differently, dependent on their individual circumstances, and therefore this assumption is used to provide a starting estimate of what might be needed. We will review this assumption next year as more information becomes available. To reflect the continued focus on EBacc subjects, we have held demand for new trainees through ITT at the level in the previous (2016/17) TSM where the underlying data would otherwise lead to a fall. This mainly affects Mathematics where we protect 219 places and Computing where we protect 272 places.	The balance of teaching across secondary subjects is adjusted using internal modelling on the impact of increased EBacc entry on the number of hours taught in each secondary subject. This modelling estimates how teaching hours will be adjusted across subjects. The total number of teaching hours is not changed, only the balance between	'Teacher need by subject' tab and 'FINAL OUTPUTS OF ITT PLACES' tab.

[66] Following internal analysis carried out by the department to assess the effects of policy assumptions.

Number	Policy area	Name	Brief description	Assumption to be used	Into which sheet is the assumption added?
			For Mathematics we have seen more rapid increase in teaching time, such as the new GCSE, than we assumed last year, so we estimate there is less further change needed - we do not have causal evidence that the change relates to the policy assumption, but for planning purposes we are assuming these are linked. By itself, this would reduce ITT place need, but we protect at last year's level to reflect the ongoing focus on Mathematics.	subjects. The precise assumptions used can be changed using scenario testing on the 'USER TESTING' tab. We then maintain ITT place numbers at last year's (2016/17 TSM) level for any EBacc subject where it would otherwise fall.	
			Computing ITT places have been protected despite a fall in the number of teaching hours spent teaching Computing between November 2014 and 2015 (see 'Changes_in_subject_teaching_hrs' tab), largely driven by a fall in ICT teaching hours. The SWC Statistical First Release (and therefore TSM) does not isolate 'ICT' (which is not included within the EBacc) and 'Computer Science' (which is included within the EBacc) from within the data collated on the overall 'Computing' subject.		
2	Sources of new teachers	Modern Foreign Languages (EBacc) - Adjusting for different sources of new teachers	As outlined above we expect to see an increase in the entry rate of EBacc and as part of this, a significant increase in the take-up of Modern Foreign Languages (MFL). To meet this additional teacher need, the model would assume that entrant numbers via all entry routes would rise (NQTs, 'new to state-funded sector', and re-entrants). However, as the numbers of 'new to state-funded entrants' and re-entrants is likely to be limited by the existing pool of such teachers, we have assumed that their numbers can only increase up to the previous year's (2016/17 TSM) estimates, with an additional number added to estimate the impact of the MFL 'returners package'. Alongside this, there are some new programmes to get more MFL teachers to meet this demand, which have not traditionally been modelled in the TSM – therefore to avoid the model assuming that all the additional, new demand will be met by NQTs, we have included a starting point for the number we expect to get through this process (1,514 ITT trainees), and added a new category of 'MFL teachers to be sourced in 2018/19 via ITT and other, new initiatives' which are intended to provide the balance of teachers needed.	As the numbers of 'new to state-funded entrants' and re-entrants is likely to be limited by the existing pool of such teachers, figures can only increase up to the previous year's (2016/17 TSM) estimates with an additional number added to estimate the impact of the MFL 'returners package'. A new category is added for MFL on the 'FINAL OUTPUTS OF ITT PLACES' tab covering the number of MFL teachers that will be sourced 'via ITT and other, new initiatives' in 2018/19, alongside a starting point ITT target for MFL in 2017/18.	'Modern Foreign Languages 2' and 'FINAL OUTPUTS OF ITT PLACES' tabs.
3	Sources of new teachers	Geography and History (EBacc) - Adjusting for different sources of new teachers	As outlined above, we expect to see an increase in the entry rate of EBacc and as part of this, a significant increase in the take-up of Geography and History. To meet this additional teacher need, the model	Re-entrant and 'new to the state-funded sector' entrants for Geography and History can	'Geography 2' and 'History 2' tabs.

Number	Policy area	Name	Brief description	Assumption to be used	Into which sheet is the assumption added?
			would assume that entrant numbers via all entry routes would rise (NQTs, 'new to state-funded sector', and re-entrants). However, as the numbers of 'new to state-funded entrants' and re-entrants is likely to be limited by the existing pool of such teachers, we have limited these figures to the previous year's (2016/17 TSM) estimates. We are assuming that all the remaining additional Geography and History teachers will be sourced via ITT (the increase in future teacher requirements for Geography and History relating to EBacc changes is of smaller magnitude than that for MFL).	only increase up to the figures estimated in the 2016/17 TSM for the respective subjects.	
4	Curriculum changes	Mathematics policy assumptions	The TSM takes all the underlying data and teacher need requirements from the policy assumptions to arrive at an overall teacher need estimate for Mathematics teachers. Overall, this meant a lower number of ITT places would be needed in 2017/18 than estimated for 2016/17 ITT by the 2016/17 TSM. This difference reflects a revised assessment of the profile of Core Maths take-up and a quicker than originally profiled change to the teaching hours for the new Mathematics GCSE, which means the increase in additional Mathematics teachers needed in this year's model is lower. However, given the focus on Mathematics teaching and the uncertainty around some of these assumptions, we have protected Mathematics places to last year's total.	Three individual curriculum-related Mathematics policies are outlined in the cells below. Additionally, as outlined in the 'EBacc policy', Mathematics 2017/18 ITT places are protected at the value from last year's model.	'Teacher need by subject' tab.
5	Curriculum changes	Core Maths	We estimated the potential take-up of Core Maths by 2020/21 within the 2016/17 TSM without any take-up data to build a model of how entry would grow over time. Given the latest data on take-up, and survey data on school entry plans for Core Maths, we have revised down the take-up rate and profile. This means that this year's model assumes a lower impact on teaching time – which is one of the reasons as noted in the Mathematics section above that the overall unprotected number of Mathematics places are lower than the number estimated in last year's TSM.	The additional Mathematics teacher requirements estimated by internal analysis are added on to the secondary Mathematics teacher need forecasts estimated in the 'teacher need by subject' calculations.	'Teacher need by subject' tab.
6	Curriculum changes	Enhanced Further Mathematics Support Programme	The Enhanced Further Mathematics Support Programme has been active from March 2014 for 3 years. The department expects that this policy will result in continuing increases in the uptake of Further Mathematics and Mathematics A level at roughly the same rate as currently, which will require more Advanced level Mathematics teachers. There has been a year-on-year increase in Mathematics hours taught at key stage 5 in state-funded schools since Sept 2012. We predict that the system will observe similar increases to last year (1.35%) year-on-year until 2017/18. Note - the increases in	The number of KS5 Mathematics teaching hours estimated as being required in future is increased year-on-year until 2017/18 to reflect additional policy requirements.	'Teacher need by subject' tab.

Number	Policy area	Name	Brief description	Assumption to be used	Into which sheet is the assumption added?
			teaching time were observed within the SWC.		
7	Curriculum changes	New Mathematics GCSE	The new, expanded Mathematics GCSE will require a greater amount of Mathematics teaching per pupil at both key stage 3 and 4. The model assumes that the number of hours spent teaching Mathematics at both key stage 3 and key stage 4 will increase in future. For key stage 3, there will be an increase between 2015/16 & 2016/17 which will be the average of the increase observed between 2013/14 & 2014/15 and that observed between 2014/15 & 2015/16. For key stage 4, there will be an increase between 2015/16 & 2016/17, and a further one between 2016/17 & 2017/18, both of which will be of similar magnitude to the increase observed between 2014/15 & 2015/16. Note - the increases in teaching time were observed within the SWC.	The number of key stage 3 and key stage 4 Mathematics teaching hours estimated as being required in future is increased to provide additional teachers to deliver the expanded Mathematics GCSE in the next year and two years respectively.	'Teacher need by subject' tab.
8	Curriculum changes	Increases in English teaching requirements at key stage 4	The model assumes that the number of hours spent teaching English at key stage 4 will increase by 1.30% between 2015/16 and 2016/17. This increase is consistent with the increase observed in the year before within the School Workforce Census and reflects the increased focus of schools towards the provision of English and Mathematics.	The number of key stage 4 English teaching hours estimated as being required in future is increased between 2015/16 and 2016/17 to provide additional teachers to deliver English at key stage 4.	'Teacher need by subject' tab.
9	Curriculum changes	Removal of option to take Core Science GCSE	The introduction of the new Combined Science GCSE, which will be equivalent to the current Core and Additional Science GCSEs, will remove the option to take the Core Science GCSE. We are expecting that for 10% of key stage 4 students, their Science teaching time will double from Sept 2016 onwards (as they move to the Combined Science GCSE - which requires more teaching time). An assumption is added into the model that from Sept 2016, 10% of key stage 4 students will have their Science teaching time doubled.	The number of key stage 4 teaching hours estimated as being required in future for Biology, Chemistry, and Physics is increased to reflect additional teaching requirements resulting from the removal of the Core Science GCSE.	'Teacher need by subject' tab.
10	Curriculum changes	The obesity strategy	Having a good supply of Physical Education teachers will help ensure that the government is able to deliver on its commitment to improve the quality and breadth of Physical Education provision in schools, and to take action to help reduce levels of childhood obesity. To assist in the	The number of Physical Education ITT places is maintained at last year's (2016/17 TSM)	'FINAL OUTPUTS OF ITT PLACES' tab.

Number	Policy area	Name	Brief description	Assumption to be used	Into which sheet is the assumption added?
			delivery of the obesity strategy, 2017/18 postgraduate ITT places for Physical Education cannot fall below 100% of the 2016/17 TSM levels (if higher).	level if it would otherwise fall.	

Source: 2017/18 Teacher Supply Model.

These policy assumptions have particular effects on the estimated outputs for the relevant subjects. In particular, the stocks of English and Mathematics are forecast to grow relatively quickly in the next 3 - 4 years because of the impact of the respective policy assumptions as well as the growth in key stage 3 pupil numbers. Similarly, the entrant need for Science teachers noticeably increased in 2016/17 because of the assumptions made in response to the removal of Core Science policy.

3.15 How does the 2017/18 TSM estimate the number of teachers needed to enter the stock each year (the entrant teacher need)?

The TSM models the 'need' for entrant teachers by assuming that:

'Need' for entrant teachers in year *'X'* (entrant need) = Teacher need in year *'X'* –

Stock of teachers at the end of previous year +

Number teachers expected to leave in year *'X'*

Therefore, the model assumes that the need for entrant teachers in a particular year is equal to:

1. The number of additional/fewer teachers that might be required compared to the stock from the previous year (e.g. because pupil numbers have increased/decreased or there have been curriculum changes) *and*

2. The number of teachers that are expected to leave (and require replacement).

The **entrant teacher need** (by headcount) is calculated individually for each phase/subject on the relevant phase/subject tab. For example, the calculations for Mathematics are on the **Mathematics 1** tab. The individual steps required in this calculation are summarised in **Chapter 3.16**.

It should be noted that the entrant teacher need values are closely related to the estimated year-on-year growth in the qualified teacher stock. So, entrant teacher need (and therefore, ITT places) generally *go up* as the rate at which the stock (teacher need) is estimated to grow *increases*. Similarly, if the stock is forecast to grow at a *slower* rate, the entrant teacher need *falls*. Therefore, in the cases of some subjects such as English, Mathematics, and Primary, the entrant teacher need (and ITT place numbers) may *fall* beyond the next 3 - 4 years even though the teacher need (stock) is forecast to keep *growing*. In other words, the stock is still estimated to grow by the TSM, but is expected to grow at a *slower* rate, therefore fewer 'new' teachers (entrant need) are required each year as the stock isn't 'growing as much' each year.

The stocks of English and Mathematics are forecast to grow relatively quickly in the next 3 - 4 years because of the impact of the respective policy assumptions (e.g. the new

Mathematics GCSE) and the growth in key stage 3 pupil numbers. Beyond this point, the year-on-year rate of growth starts to slow down. For primary, the growth in primary pupil numbers will fall over the next decade as primary pupil numbers 'level out'.

3.16 The individual steps of calculating the entrant teacher need for each phase and subject.

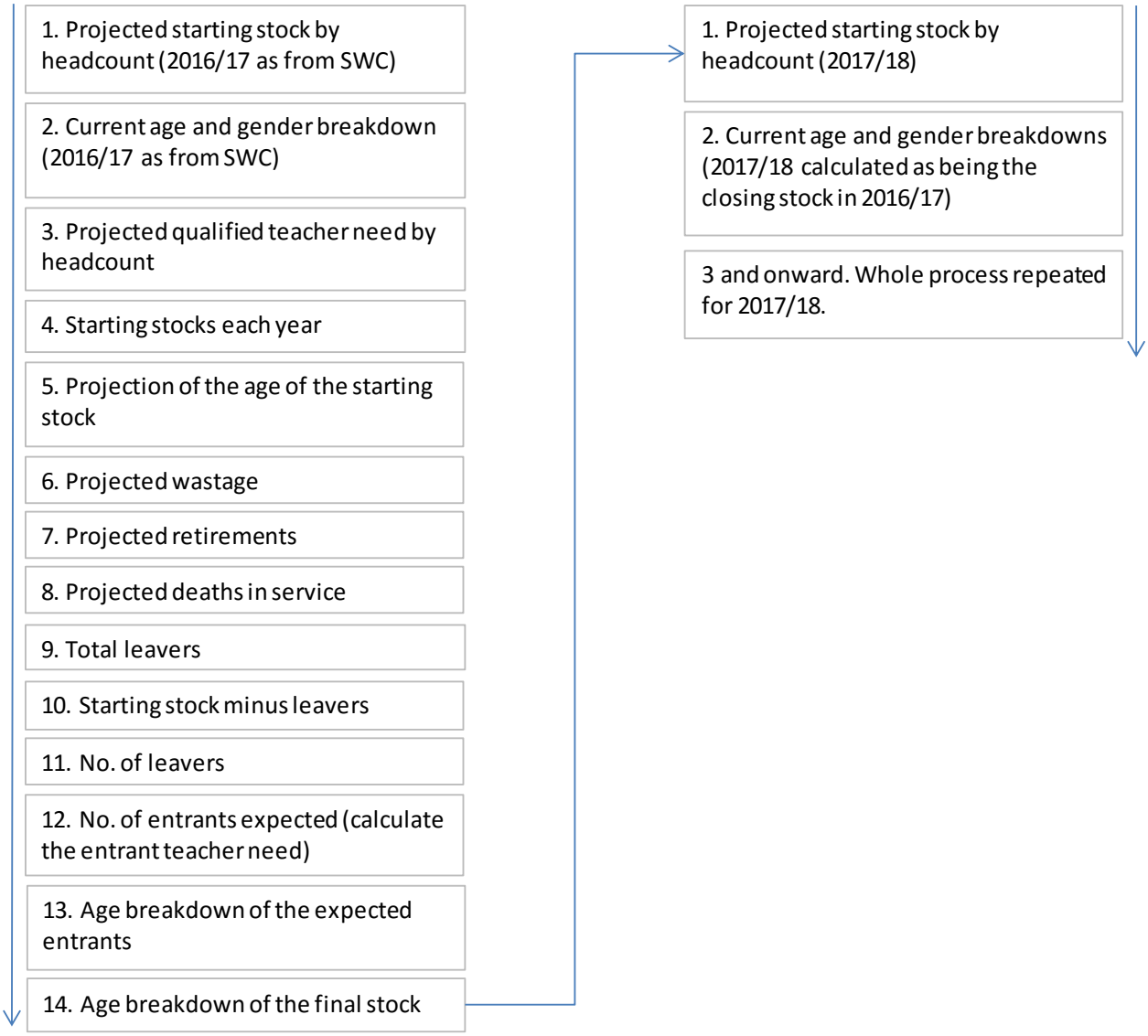
Collated on the yellow output tabs (for all the different subjects and phases together) are both the **entrant teacher need** values plus any other values that are calculated by the model (e.g. the number of retirements as estimated and assumed by the model are collated on the **Retirements over time** tab).

The entrant teacher need as provided on the **OUTPUTS FOR SECTION 2 OF MODEL** tab is the output from the first section of the TSM and feeds directly into the second section of the model.

Figure 10 below illustrates the process of calculating the **entrant teacher need** for each phase and subject (using the 2016/17 academic year as an example). This process is carried out on an individual tab for each subject and phase (for example, all the Mathematics calculations are performed on the **Mathematics 1** tab, the primary on the **Primary 1** tab, etc.). All figures calculated are in headcount form.

The calculation process is carried out for one academic year at a time. This is a result of the calculation of values for the 2017/18 academic year being dependent on all the values being calculated for the 2016/17 academic year first (and so on).

Figure 10: The process of calculating the entrant teacher need values for each phase and subject within the 2017/18 Teacher Supply Model.



Source: 2017/18 Teacher Supply Model.

1. Projected starting stock by headcount

The **starting stock for 2016/17** is the assumed closing stock from 2015/16, i.e. the *current* stock figures as provided by the 2015 SWC (see **Chapter 3.4** for more details).

Going forward, the model needs to make an assumption as to how the size of the starting stock will change. It does this by making a high-level assumption that the state-funded schools system adapts to changing numbers of pupils over time by meeting the required *need* for teachers in each year (and thus achieving the desired/expected PTR of the state-funded schools system). The projected stock figures are calculated on the **Forecast stock figures** tab.

For example, if the system requires 10,000 Mathematics teachers in 2016/17, the system *will* recruit enough teachers to meet that teacher need. Therefore, the stock of Mathematics teachers at the end of 2016/17 will be 10,000. *This* will be the starting stock for 2017/18.

In other words, the model assumes that the **starting stock of a given year will be equal to the need of the year before**.

However, in order to calculate the future entrant teacher need, the model needs to make assumptions as to how the number of leavers will change over time (i.e. how many replacements will be required each year[67]) and therefore how the characteristics of the active stock will change in future.

2. Current age and gender breakdowns

The model assumes that the 'current' age and gender breakdowns (for 2016/17) will be the same as those in the closing stock for 2015/16. The model assumes that these stock figures are those given from the SWC for the relevant subject/phase.

3. Projected qualified teacher need by headcount

These values are calculated by the model already by subject/phase projected into the long-term future (see **Chapters 3.12** and **3.13**).

4. Starting stocks each year

The model assumes that the starting stock for 2015/16 is as the current age group and gender breakdowns.

5. Projection of the age of the starting stock

Demographic breakdowns of the *current* active stock are produced from the SWC.

The active stock is broken down into age groups, each with a range of five years, for each gender- for example, male teachers aged 30-34; female teachers aged 25-29, etc.

The model then makes an assumption as to how the stock naturally ages year-on-year[68].

[67] As the demographics of the stock changes, so does the proportion that will leave, as there are differences in the leaver rates of different age groups and genders.
[68] Each year one fifth of each five-year age group 'moves up' to the age group above.

6. Projected wastage

The model takes the stock from stage 5 and assumes that a certain number of teachers will leave as wastage in 2016/17 using the assumed projected wastage rates for each academic year (see **Chapter 3.9**).

Different wastage rates are applied to the different genders and age groups.

7. Projected retirements

The model takes the stock from stage 5 and assumes that a certain number of teachers will leave as retirements in 2016/17 using the assumed projected retirement rates for each academic year (see **Chapter 3.10**).

Different retirement rates are applied to the different genders and age groups.

8. Projected deaths in service

The model takes the stock from stage 5 and assumes that a certain number of teachers will leave as 'deaths in service' in 2016/17 using the assumed projected 'death in service' rates for each academic year (see **Chapter 3.11**).

Different 'death in service' rates are applied to the different genders and age groups.

9. Total leavers

The total number of leavers in 2016/17 (as assumed by the model) are added together (i.e. the results of stages 6, 7 and 8 are summed) and then broken down by their gender and age group. The model has now calculated the numbers of teachers for that phase or subject that is expected to leave in 2016/17.

10. Starting stock minus leavers

The stock that *started* the academic year 2016/17 now has the teachers expected to leave in 2016/17 subtracted from it.

11. No of leavers expected

The numbers of leavers in 2016/17 by all leaver routes are added together to create the total number of leavers expected. This provides the total figures from 9 above without the further categorisation into demographic subsets.

12. The number of entrants needed

The model now calculates the number of entrants required in 2016/17 (the **entrant teacher need** for 2016/17).

This value is equal to the number of additional or future teachers needed in 2016/17 due to greater/fewer numbers of pupils *plus* the number of teachers expected to leave the stock in 2016/17.

13. Age breakdown of required entrants

The model then assumes that this number of teachers will enter into the stock in 2016/17. In other words, the number of entrants in 2016/17 will be equal to the **entrant teacher need** 2016/17.

High-level assumptions are then made on the 2016/17 entrants' characteristics:

- The model assumes that the age group breakdown of entrants coming in is equal to the historical age group breakdowns of entrants (from all entrance routes combined) from the four previous years[69] of SWC data (for each phase). These are calculated on the **Entrant age breakdowns** tab.

- The gender balance of entrants is assumed to be the same as the current stock. For example, if 40% of Physics teachers in the current stock are female, the model assumes that 40% of Physics entrants will also be female.

14. Age breakdown of the final stocks

These entrants broken down by gender and age group for 2016/17 are then added to the stock calculated in stage 10 to give the *closing* stock for the 2016/17 academic year.

The model assumes that this stock breakdown will be the *starting* stock breakdown for the subsequent year, 2017/18. **The whole process now repeats itself.**

[69] The data from the previous four years are weighted towards the most recent year. Data are available up to 2014/15, although data for 2013/14 and 2014/15 remain provisional. Data on the age of entrants are not used for individual subjects.

The Teacher Supply Model in future years

Each year, *new* SWC current stock data will become available and will be added to the model[70]. These data will update the:

- PTR-led teacher need calculations and how the ratios of pupils and teachers are actually changing over time, given funding and accommodation capacity issues.
- FTE rates of the stock.
- The unqualified rates of the stock.
- Secondary timetable information and demographic breakdowns of the stock to reflect how they will change over time.

[70] For this reason, amongst others, projections for a particular academic year in the future are not the same in successive TSMs.

Chapter 4: How the 2017/18 TSM calculates ITT trainee need from entrant teacher need.

Chapter 4 of this methodological annex describes:

- What the second section of the 2017/18 Teacher Supply Model (TSM) does;
- The structure of the second section of the 2017/18 TSM;
- The data which feed into this section of the model;
- The assumptions used to produce these data; and
- The calculations used by the TSM (at a high level) to calculate the 2018/19 NQT[71] **entrant teacher need** and the 2017/18 **postgraduate ITT[72] trainee need** by both phase and subject, and the assumptions behind them.

4.1 What does the second section of the 2017/18 Teacher Supply Model do?

This section of the Teacher Supply Model takes the numbers of teachers (as a headcount) needed to enter the stock each year calculated from the first section of the model and estimates the **NQT entrant need** for 2018/19.

The model calculates the number of NQT entrants required in a particular academic year using the following formula:

Number NQT entrants required in year *'X' (NQT entrant need)* = **'Need' for entrant teachers in year *'X' (entrant need)* -**

Number 'new to state-funded sector' entrants expected in year *'X' (new to SF sector entrant need)* -

Number re-entrants expected in year *'X' (re-entrant need)*

To do this, the model needs to estimate the number of teachers expected to enter the active stock as **entrants that are new to the state-funded schools sector** or **re-entrants** in 2018/19.

[71] Newly qualified teacher.
[72] Initial teacher training.

- Entrants that are new to the state-funded schools sector are qualified entrant teachers who did not qualify in the year before they entered into the active stock. They are not recorded on the department's databases as having previously held a regular teaching role within a state-funded primary/secondary/academy school in England. However, they may have taught previously within a PRU, special school, independent school, or school in Wales/Scotland etc.

- Re-entrants are entrant teachers who did not qualify in the year before they entered into the stock and *are* recorded on the department's databases as having previously held a regular teaching role within a state-funded primary/secondary/academy school in England at an earlier point in their career.

The **NQT entrant need** is the number of NQTs required to enter into the active stock in the 2018/19 academic year to meet the teacher need estimated in the first section of the model.

The TSM estimates the proportions of entrants entering the active stock via the different entrant routes (NQT, new to state-funded sector, and re-entrant) using historical entrants data from the matched School Workforce Census (SWC).

Entrant teachers are *not* all employed as full-time teachers - with a fulltime equivalent (FTE) value that is equal to 1.0 FTE. Additionally, the FTE values of entrant teachers may be lower/higher than that of the overall active stock. To account for this, the model calculates the total FTE number of teachers entering by each entrance route (e.g. as NQTs, re-entrants etc.) and adjusts these numbers to ensure that the total FTE value for entrants by all routes[73] is *equal* to the total FTE number of entrant teachers required.

Using the **NQT entrant need** values, the second section of the model then estimates the **postgraduate ITT trainee need**. This is the number of postgraduate ITT places in 2017/18 required to generate this number of NQTs entering into the active stock in 2018/19. This conversion is made by making assumptions as to how many trainees are likely to complete their courses and go into employment in the state funded schools sector post ITT.

The postgraduate ITT trainee need calculated only covers those trainees both starting and completing ITT in 2017/18.

*The **postgraduate ITT trainee need** is the **final output** of the 2017/18 Teacher Supply Model and feeds into the NCTL 2017/18 ITT recruitment process[74]. The outputs of the*

[73] Whilst *maintaining* the expected ratio of entrants by different entrant routes by headcount.

[74] The postgraduate ITT trainee need as calculated by the TSM *includes* any places that are to be assigned to Teach First.

TSM directly inform the phase/subject-level ITT place allocation process and the amount of funding made available to support trainees.

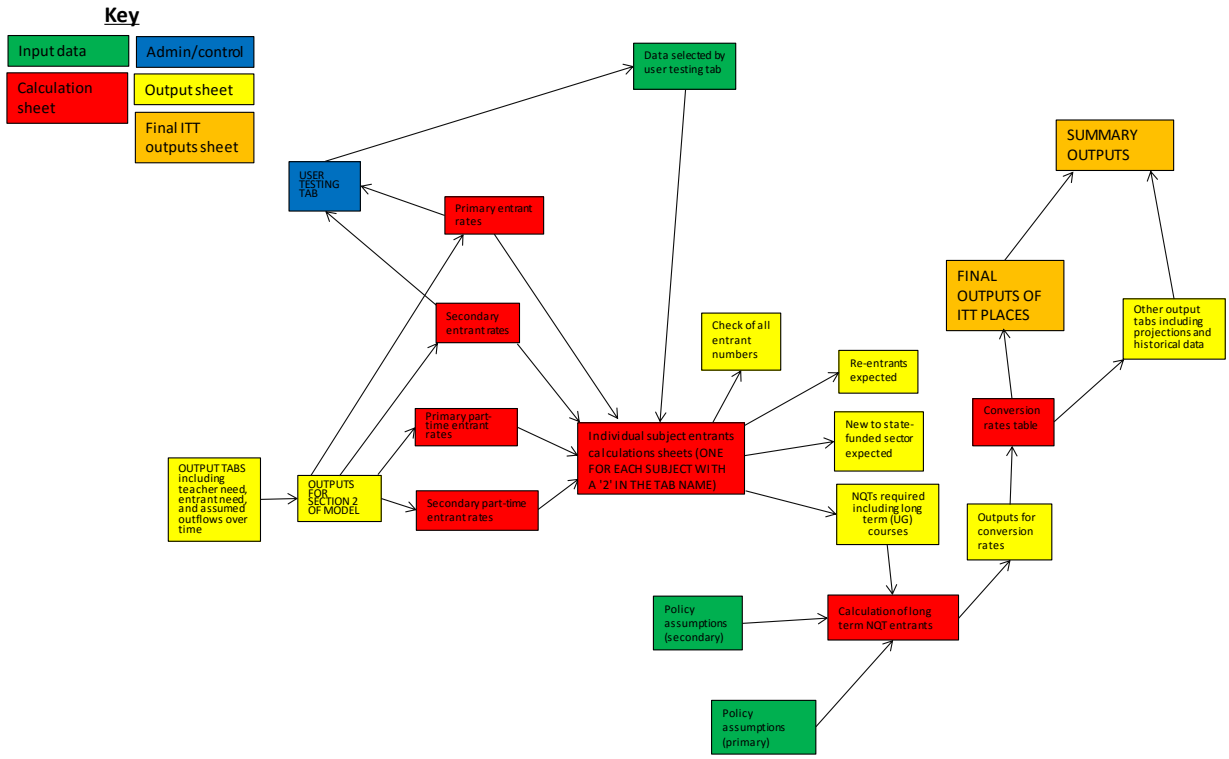
4.2 Structure of the second section of the 2017/18 Teacher Supply Model.

Each tab in the model workbook includes information at the top showing from where data are sourced and into which tabs the data may feed.

Additionally, a model map is provided on the **Map of sheets** tab showing which tabs feed into which and how the overall model is structured. The portion of that map relevant to the second section of the model is presented below as Figure 11. The tabs in this section of the model take the projected **entrant teacher need** for 2017/18 and use information from other sources (especially the ITT censuses held by the department) to convert these figures into **NQT entrant need** figures for each subjects and phase, and then **ITT places needed** for each subject and phase.

Table 5 (see **Annex A.3**) provides a description of each tab within the 2017/18 TSM and what that tab does.

Figure 11: Map of the second section of the 2017/18 Teacher Supply Model.



Source: 2017/18 Teacher Supply Model.

4.3 The data that feed into this section of the 2017/18 Teacher Supply Model.

The following data sources feed into the second section of the Teacher Supply Model:

- **Entrant teacher need** values (as a headcount) for all subjects and phases from the first section of the model.
- **Teacher entrants data** from the **matched School Workforce Census (SWC)**. See **Chapter 3.7** for more details on the SWC.
- **Teacher stocks data** from the **matched School Workforce Census 2015**.
    - Data on the full-time equivalent (FTE) rates of part-time teachers and proportion of entrants that are part-time for each of the different entrant routes.
- Data from the **National College for Teaching and Leadership**[75] on:
    - The **number of trainees completing ITT** from the **NCTL Performance Profiles**. These data comprise a weighted average from the four most recent years of data.
    - The **number of trainees gaining employment** in the state-funded sector on completion of ITT from the **Destination of Leavers from Higher Education (DLHE) survey**. These data comprise a weighted average from the four most recent years of data.
    - Data on the number of trainees on longer term courses (e.g. undergraduate teacher training courses) from the **2015/16 NCTL ITT census**[76]**.** An assumption is made that the published figure on such trainees includes the net number deferring and re-entering ITT in 3 years' time.

All data inputs into the model are provided in the **RAW DATA INPUTS** tab in the model workbook.

The department's standards for data suppression require that fields relating to fewer than five individuals should not be published. In the department's statistical publications this is achieved by replacing figures based on fewer than 5 individuals with an "x". That approach does not work in the TSM, as it would suppress the entire function within the model. To overcome this - and still apply the department's suppression rules - fields with

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75 Initial teacher training statistics here.

76 The 2017/18 TSM model uses the 2015/16 ITT Census, as this was the most recent data available during the modelling phase. However, the 2016/17 ITT Census was published on 24th November 2016 and provides the most up-to-date figures.

fewer than 5 individuals have been aggregated either across gender or age bands. These amendments increase the overall **postgraduate ITT trainee need** total by **two training places** compared to the model without data suppression.

More information on the data sources used in the Teacher Supply Model can be found within **Chapter 6**.

4.4 How does the 2017/18 TSM estimate the numbers of entrants needed via NQT and non-NQT (e.g. re-entrants) routes?

The second section of the TSM calculates the number of NQT entrants required in a particular year (2017/18) using the following formula:

Number NQT entrants required in year *'X' (NQT entrant need)* = **'Need' for entrant teachers in year *'X' (entrant need)* -**

Number 'new to state-funded sector' entrants expected in year *'X' (new to SF sector entrant need)* -

Number re-entrants expected in year *'X' (re-entrant need)*

Therefore, the model is assuming that the number of NQT entrant teachers required in 2018/19 is equal to the overall entrant need for 2018/19 minus the number that will enter via the other entrant routes in that year.

Values are estimated using the high, central, and low scenarios as determined by scenario testing in the model.

Unless otherwise stated in subject specific policy assumptions (see section 3.14), the proportion of the 'entrant need' that will be met by re-entrants or those who are new to the state-funded sector is assumed using a weighted[77] average of re-entrant and 'new to the state-funded sector' rates from the previous four years of data[78].

Values are calculated separately for the primary and secondary phases. Values are calculated for the primary phase on the **Calc PRIM entrant rates** tab and on the **Calc SEC entrant rates** for the secondary phase.

> For example, if the weighted historical re-entrant rate is 40%, the model assumes that 40% of entrants will be re-entrants. If the entrant need for Mathematics teachers in 2018/19 is 1,000, the model will assume that 400 (40%) of the Mathematics entrants in 2018/19 will be re-entrants.

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[77] A weighted average is used to account for the fact that the two most recent years of data are provisional and subject to change.

[78] Data are from the matched SWC.

4.5 How does the 2017/18 TSM account for different working patterns among the entrants?

Not all entrants will be employed as teachers full-time, with a full-time equivalent (FTE) value of 1.0. In particular, NQTs are more likely to be employed full-time than entrants via other entrant routes, such as re-entrants, are. As a consequence, one entrant teacher does not necessarily equal 1.0 FTE teacher.

To ensure that the number of entrants *will* provide the number of FTE teachers required (as identified by the first section of the model[79]), the TSM has to ensure that the FTE 'quantity of teachers' entering the stock via each route is equal to the FTE quantity needed.

The TSM assumes that full-time entrants are 1.0 FTE and part-time entrants have an FTE value equal to the average FTE of part-time teachers[80] as calculated within the current stock (from the SWC).

The expected FTE rates of the entrants via the different routes are estimated by the model using historical weighted averages of SWC entrants data, e.g. 10% of returners are part-time, 2% of NQTs are part-time etc. Values are estimated on the **Calc PRIM part-time entrants** and **Calc SEC part-time entrants** tabs for the two phases respectively.

Using these assumptions, the model then calculates the *actual* FTE value of teachers supplied by each route for each phase and subject on the relevant phase/subject tab. For example, all Mathematics calculations are performed on the **Mathematics 2** tab, the primary on the **Primary 2** tab, etc.

The model scales the numbers of entrants via each route accordingly to provide enough FTE teachers to meet the **entrant teacher need** whilst retaining the rates of entrant teachers via the different routes as expected[81].

In general, the model assumes that the rates of 'new to the state-funded sector' entrants and re-entrants needed are equivalent across secondary subjects. However, policy assumptions on 'increased EBacc entry' require the model to adjust the levels of 'new to sector' entrants and re-entrants for Modern Foreign Languages and humanities (Geography and History).[82] The number of 'new to the state-funded sector' entrants and re-entrants expected by phase and subject are collated on the **New to SF sector expected** and **Re-entrants expected** tabs respectively.

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[79] The entrant teacher need.

[80] For the relevant phase.

[81] As calculated and assumed from the historical SWC data on the proportion of entrants via different routes.

[82] For more details on policy assumptions, please see **Chapter 3.14**.

The model assumes that any remaining entrants will be NQTs.

4.6 How does the 2017/18 TSM estimate the numbers of entrants via NQT routes who studied on courses lasting longer than a year?

The model has now calculated the number of entrants expected who are NQTs by both subject and phase (the **NQT entrant need** for 2017/18). These values are collated on the **NQT entrants required inc UGs** tab.

However, some of these NQTs will be those who have studied on courses lasting more than one year[83]. These trainees would *not* require recruitment to ITT beginning in 2017/18, as they are already 'in the ITT system'.

To reduce the 2018/19 **NQT entrant need** accordingly by removing these trainees on longer courses, the model uses NCTL ITT census data to identify the number of trainees on longer training courses by phase and subject who are expected to graduate in 2017/18.

Using subject/phase ITT specific drop-out rates and rates of employment on the completion of ITT, the model estimates (on the **Calc long term NQT entrants** tab) the number of these trainees who are expected to complete their ITT courses *and* enter into the active stock in 2018/19 (using historical performance profiles data from NCTL). These numbers are calculated for all phases and subjects.

This number of NQT entrants who studied on longer courses that will meet part of the 2018/19 NQT entrant need is subtracted from the overall NQT entrant need accordingly.

This provides the 2018/19 **NQT entrant need** values by phase and subject for those NQTs who will both start and complete ITT in 2017/18 to enter the active stock in 2018/19. These are then fed into the **Outputs for conversion rates** tab.

4.7 How does the 2017/18 TSM convert the number of trainees into the number needed to start ITT?

The model uses subject/phase specific ITT drop-out rates and rates of employment on the completion of ITT to convert the 2018/19 **NQT entrant need** into the number of trainees required to both begin and complete ITT in 2017/18 (the 2017/18 **postgraduate ITT trainee need**). This postgraduate ITT trainee need *includes* School Direct and Teach First trainees. These calculations take place on the **Conversion rates table** tab.

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[83] Their courses would begin before 2017/18.

When using the ITT drop-out rates and rates of employment, the model assumes that the distribution of places to different routes (e.g. HEI, School/employment based etc.) will be the same as for the most recent years.

The final outputs of the TSM to feed into the allocations model are summarised on the **FINAL OUTPUTS OF ITT PLACES** and **SUMMARY OUTPUTS** tabs.

4.8 How does the 2017/18 TSM calculate the number of trainees starting ITT in 2017/18 on longer courses?

The TSM does *not* calculate the number of trainees required who will start ITT courses of more than one year in length in 2017/18.

Such trainees would not be able to meet part of the teacher need or join the active qualified teacher stock until *after* 2018/19.

If NCTL wished to allocate additional ITT places to longer ITT courses (e.g. places on primary undergraduate courses), these would simply be accounted for in future versions of the model as described in **Chapter 4.6**.

Chapter 5: User testing the 2017/18 Teacher Supply Model.

Chapter 5 of this methodological annex describes:

- How to implement user/scenario testing in the 2017/18 Teacher Supply Model; and
- How to examine the outputs derived from such scenario testing.

The 2017/18 TSM offers a range of user testing options on the **USER TESTING TAB**. This range of user scenario testing is considerably expanded from last year's model due to the amalgamation of both parts of the model into one spreadsheet. Users can now test the effects of a variety of input changes on a variety of the outputs of the model. Some of these changes are pre-set scenarios; however, it is also possible for the user to enter their own values for different input variables into the model. *We welcome feedback from users of the model on this new set of scenario testing features.*

Caveats:

Whilst model users are free to input their own values for a number of variables, caution must be employed if these values lie outside of the pre-set values in the model. Any model of this nature integrally has a range of values that can be considered within the 'scope' of the model. Values outside of this range may result in 'extreme' estimations and potentially extremely unrealistic outcomes. For example, model users may select econometric wastage scalar values in excess of 1.30. Given previous outputs of the Econometric Wastage Model such a change in future wastage rates is extremely unrealistic.

A further caveat is also worth expressing here. The model testing feature provides pre-set testing scenarios, which are based either on modelling using high/low inputs from published data sources (e.g. the Pupil Projections Model) or on data from the previous TSM/SWC. Any values derived by scenario testing should **not** be interpreted as a measure of accuracy of the TSM itself or an accuracy of the model workings.

5.1 How to use scenario testing in the 2017/18 TSM: inputting changes.

There are **eight** separate inputs that can be altered by the user to test the effects of changed input on the model outputs. For each of these input variables, the user is able to select pre-set scenarios (e.g. low; high; values from a previous years' TSM) other than the default (or central) scenario used by the model. In addition, some user testing allows the user to input their own values for the variables (manual selection). The user testing comprises changing scenarios for:

a) econometric wastage scalars;

b) pupil population projections;

c) PTR cap levels;

d) PTR rates of change;

e) NQT entrant rates;

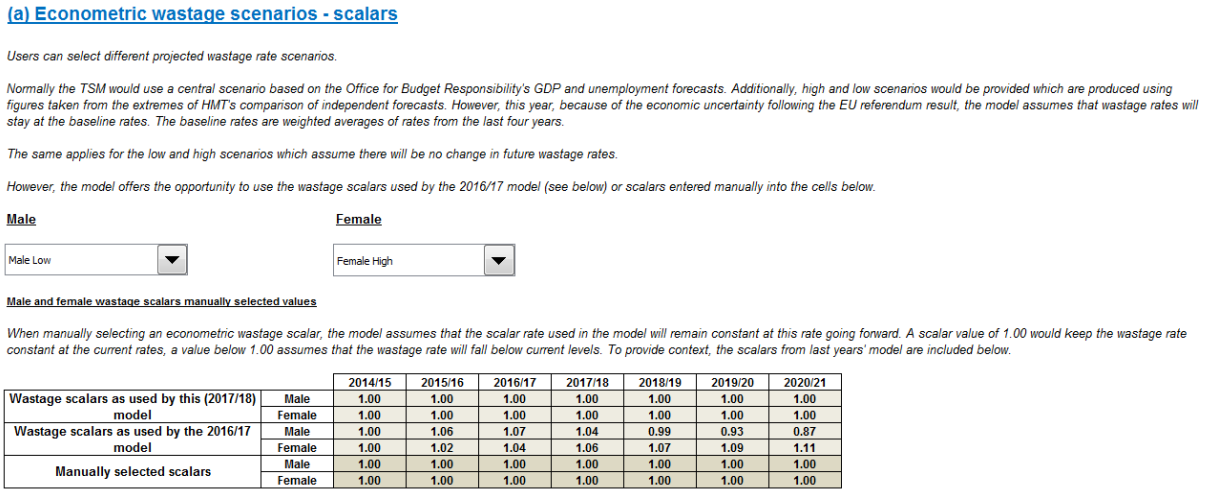
f) post-ITT employment rates;

g) unqualified teacher rates;

h) rate of uptake of the EBacc subjects.

a) Figure 12 below shows the section of the **USER TESTING TAB** related to user testing of the econometric wastage scalars. There are two pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these *normally* alter the wastage rates for males and females respectively. However, **in the 2017/18 TSM, these pre-sets are set to the same value as the scenario the model actually used to calculate its outputs (the 'central' scenario)**. This is because of the economic uncertainty caused by the outcome of the 2016 EU Referendum (see **Chapter 3.9** for more details). However, it is possible to select the wastage scalars from the previous model (2016/17 TSM) or type in values manually. **If the user applies manual values for the econometric scalars, the caveats given at the start of this chapter must be carefully considered.**

Figure 12: Screenshot of the 'econometric wastage scalars' scenario testing in the 2017/18 Teacher Supply Model.



(a) Econometric wastage scenarios - scalars

Users can select different projected wastage rate scenarios.

Normally the TSM would use a central scenario based on the Office for Budget Responsibility's GDP and unemployment forecasts. Additionally, high and low scenarios would be provided which are produced using figures taken from the extremes of HMT's comparison of independent forecasts. However, this year, because of the economic uncertainty following the EU referendum result, the model assumes that wastage rates will stay at the baseline rates. The baseline rates are weighted averages of rates from the last four years.

The same applies for the low and high scenarios which assume there will be no change in future wastage rates.

However, the model offers the opportunity to use the wastage scalars used by the 2016/17 model (see below) or scalars entered manually into the cells below.

Male: Male Low

Female: Female High

Male and female wastage scalars manually selected values

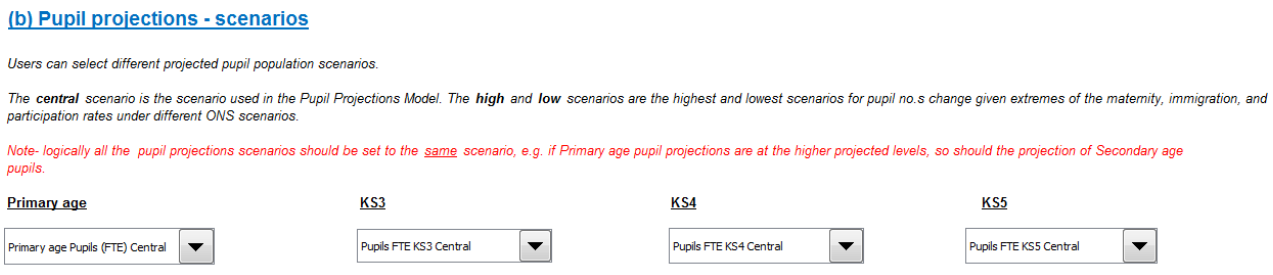
When manually selecting an econometric wastage scalar, the model assumes that the scalar rate used in the model will remain constant at this rate going forward. A scalar value of 1.00 would keep the wastage rate constant at the current rates, a value below 1.00 assumes that the wastage rate will fall below current levels. To provide context, the scalars from last years' model are included below.

		2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Wastage scalars as used by this (2017/18) model	Male	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Female	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wastage scalars as used by the 2016/17 model	Male	1.00	1.06	1.07	1.04	0.99	0.93	0.87
	Female	1.00	1.02	1.04	1.06	1.07	1.09	1.11
Manually selected scalars	Male	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Female	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: 2017/18 Teacher Supply Model.

b) Figure 13 below shows the section of the **USER TESTING TAB** related to scenario testing of the pupil population projections. There are four pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these alter the pupil projections for the primary phase, key stage 3, key stage 4 and key stage 5 respectively. For each of these, the user can select a "low" or a "high" pre-set on top of the "central" scenario used by the model.

Figure 13: Screenshot of the 'pupil projections' scenario testing in the 2017/18 Teacher Supply Model.



(b) Pupil projections - scenarios

Users can select different projected pupil population scenarios.

*The **central** scenario is the scenario used in the Pupil Projections Model. The **high** and **low** scenarios are the highest and lowest scenarios for pupil no.s change given extremes of the maternity, immigration, and participation rates under different ONS scenarios.*

Note- logically all the pupil projections scenarios should be set to the same scenario, e.g. if Primary age pupil projections are at the higher projected levels, so should the projection of Secondary age pupils.

Primary age: Primary age Pupils (FTE) Central

KS3: Pupils FTE KS3 Central

KS4: Pupils FTE KS4 Central

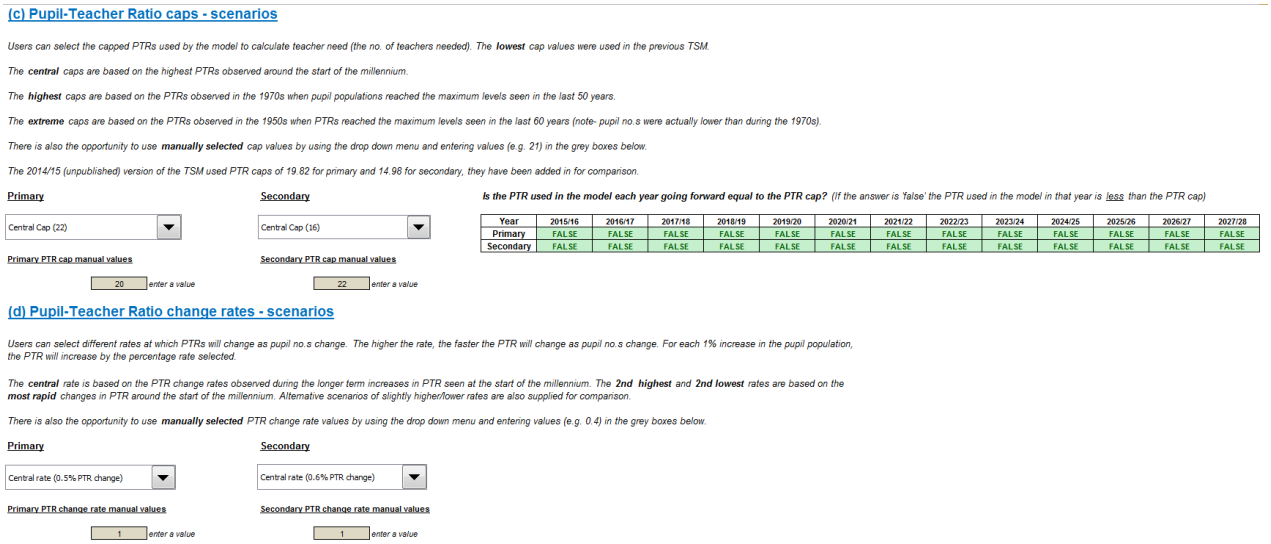
KS5: Pupils FTE KS5 Central

Source: 2017/18 Teacher Supply Model.

c) Figure 14 below shows the section of the **USER TESTING TAB** related to scenario testing of the pupil:teacher ratios. There are two pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these alter the PTR caps for the two phases, primary and secondary. For both of these, the user can select a number of more extreme pre-sets on top of the "central" scenario used by the model. It is also possible to type in values manually. Given the large range of pre-sets available, **if the user applies manual values for the PTR caps outside of the range provided by the pre-set scenarios, the caveats given at the start of this chapter must be carefully considered.**

d) Figure 14 also shows the section of the **USER TESTING TAB** related to scenario testing of the rate of change of pupil:teacher ratios. There are two pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these alter the PTR rates of change for the two phases, primary and secondary. For both of these, the user can select a number of more extreme pre-sets on top of the "central" scenario used by the model. It is also possible to type in values manually. Given the large range of pre-sets available, **if the user applies manual values for the PTR rates of change outside of the range provided by the pre-set scenarios, the caveats given at the start of this chapter must be carefully considered.**

Figure 14: Screenshot of the PTR scenario testing in the 2017/18 Teacher Supply Model.



(c) Pupil-Teacher Ratio caps - scenarios

*Users can select the capped PTRs used by the model to calculate teacher need (the no. of teachers needed). The **lowest** cap values were used in the previous TSM.*

*The **central** caps are based on the highest PTRs observed around the start of the millennium.*

*The **highest** caps are based on the PTRs observed in the 1970s when pupil populations reached the maximum levels seen in the last 50 years.*

*The **extreme** caps are based on the PTRs observed in the 1950s when PTRs reached the maximum levels seen in the last 60 years (note- pupil no.s were actually lower than during the 1970s).*

*There is also the opportunity to use **manually selected** cap values by using the drop down menu and entering values (e.g. 21) in the grey boxes below.*

The 2014/15 (unpublished) version of the TSM used PTR caps of 19.82 for primary and 14.98 for secondary, they have been added in for comparison.

Primary — Central Cap (22)

Secondary — Central Cap (16)

Is the PTR used in the model each year going forward equal to the PTR cap? *(If the answer is 'false' the PTR used in the model in that year is less than the PTR cap)*

Year	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Primary	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Secondary	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

Primary PTR cap manual values — 20 *enter a value*

Secondary PTR cap manual values — 22 *enter a value*

(d) Pupil-Teacher Ratio change rates - scenarios

Users can select different rates at which PTRs will change as pupil no.s change. The higher the rate, the faster the PTR will change as pupil no.s change. For each 1% increase in the pupil population, the PTR will increase by the percentage rate selected.

*The **central** rate is based on the PTR change rates observed during the longer term increases in PTR seen at the start of the millennium. The **2nd highest** and **2nd lowest** rates are based on the **most rapid** changes in PTR around the start of the millennium. Alternative scenarios of slightly higher/lower rates are also supplied for comparison.*

*There is also the opportunity to use **manually selected** PTR change rate values by using the drop down menu and entering values (e.g. 0.4) in the grey boxes below.*

Primary — Central rate (0.5% PTR change)

Secondary — Central rate (0.6% PTR change)

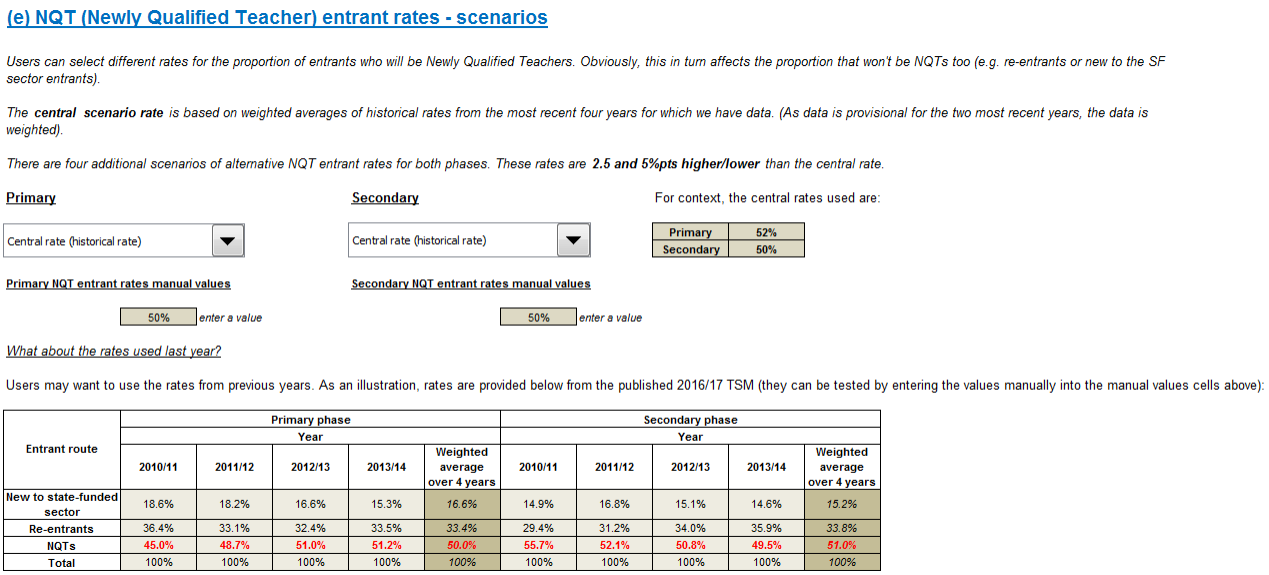
Primary PTR change rate manual values — 1 *enter a value*

Secondary PTR change rate manual values — 1 *enter a value*

Source: 2017/18 Teacher Supply Model.

e) Figure 15 below shows the section of the **USER TESTING TAB** related to scenario testing of the rate of NQT entrants. There are two pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these alter the NQT entrant rates for the two phases, primary and secondary. For both of these, the user can select a number of more extreme pre-sets on top of the "central" scenario used by the model. It is also possible to type in values manually. Given the large range of pre-sets available, **if the user applies manual values for the NQT entrant rates outside of the range provided by the pre-set scenarios, the caveats given at the start of this chapter must be carefully considered.**

Figure 15: Screenshot of the 'NQT entrant rate' scenario testing in the 2017/18 Teacher Supply Model.



(e) NQT (Newly Qualified Teacher) entrant rates - scenarios

Users can select different rates for the proportion of entrants who will be Newly Qualified Teachers. Obviously, this in turn affects the proportion that won't be NQTs too (e.g. re-entrants or new to the SF sector entrants).

*The **central scenario rate** is based on weighted averages of historical rates from the most recent four years for which we have data. (As data is provisional for the two most recent years, the data is weighted).*

*There are four additional scenarios of alternative NQT entrant rates for both phases. These rates are **2.5 and 5%pts higher/lower** than the central rate.*

Primary: Central rate (historical rate)

Secondary: Central rate (historical rate)

For context, the central rates used are:

Primary	52%
Secondary	50%

Primary NQT entrant rates manual values: 50% *enter a value*

Secondary NQT entrant rates manual values: 50% *enter a value*

What about the rates used last year?

Users may want to use the rates from previous years. As an illustration, rates are provided below from the published 2016/17 TSM (they can be tested by entering the values manually into the manual values cells above):

Entrant route	Primary phase					Secondary phase				
	Year					Year				
	2010/11	2011/12	2012/13	2013/14	Weighted average over 4 years	2010/11	2011/12	2012/13	2013/14	Weighted average over 4 years
New to state-funded sector	18.6%	18.2%	16.6%	15.3%	*16.6%*	14.9%	16.8%	15.1%	14.6%	*15.2%*
Re-entrants	36.4%	33.1%	32.4%	33.5%	*33.4%*	29.4%	31.2%	34.0%	35.9%	*33.8%*
NQTs	45.0%	48.7%	51.0%	51.2%	*50.0%*	55.7%	52.1%	50.8%	49.5%	*51.0%*
Total	100%	100%	100%	100%	*100%*	100%	100%	100%	100%	*100%*

Source: 2017/18 Teacher Supply Model.

f) Figure 16 below shows the section of the **USER TESTING TAB** related to scenario testing of the rates of post-ITT employment. There are two pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these alter the post-ITT employment rates for the two phases, primary and secondary. For both of these, the user can select the latest NCTL data or the rates from the previous year's model, 2016/17 TSM.

Figure 16: Screenshot of the 'post-ITT employment rate' scenario testing in the 2017/18 Teacher Supply Model.

(f) Post-ITT employment rates

Users can select different values for the post-ITT employment rates. Users can use rates calculated from the latest NCTL data or values from the 2016/17 TSM.

These rates are used to estimate the proportion of trainees that will gain employment in the state-funded schools sector within 6 months of completing training.

Primary Rates from latest NCTL data

Secondary Rates from latest NCTL data

The table below illustrates rates from the published 2016/17 TSM in comparison to those derived from the latest NCTL data for use in this model under the central scenario:

Subject/phase	Rates from the 2016/17 TSM				Rates from latest NCTL data			
	Undergrad	Postgraduate			Undergrad	Postgraduate		
		HEI (Core)	SCITT (Core)	SD		HEI (Core)	SCITT (Core)	SD
Art & Design	80%	77%	81%	75%	82%	79%	81%	75%
Biology	73%	78%	84%	85%	77%	78%	84%	75%
Business Studies	79%	76%	89%	85%	70%	77%	75%	79%
Chemistry	73%	77%	77%	94%	76%	77%	82%	85%
Classics	79%	80%	84%	85%	70%	71%	75%	75%
Computing	66%	73%	84%	92%	72%	75%	85%	85%
Design & Technology	75%	77%	85%	85%	74%	77%	86%	75%
Drama	86%	78%	83%	85%	70%	79%	85%	84%
English	82%	84%	88%	87%	85%	83%	87%	85%
Food	79%	72%	90%	85%	70%	71%	75%	75%
Geography	80%	78%	82%	85%	81%	79%	88%	75%
History	86%	81%	82%	98%	88%	82%	81%	90%
Mathematics	82%	79%	86%	84%	83%	80%	87%	82%
Modern Foreign Languages	83%	75%	83%	88%	83%	75%	83%	82%
Music	74%	77%	76%	85%	86%	77%	75%	90%
Other	86%	80%	83%	85%	90%	80%	82%	75%
Physical Education	74%	75%	74%	81%	74%	76%	78%	77%
Physics	63%	76%	82%	85%	71%	76%	83%	81%
Primary	79%	83%	87%	81%	81%	84%	88%	86%
Religious Education	78%	78%	85%	85%	82%	77%	80%	85%
Total		80%	84%	85%		81%	85%	85%

Source: 2017/18 Teacher Supply Model.

g) Figure 17 below shows the section of the **USER TESTING TAB** related to scenario testing of the rates of unqualified teachers. There are two pull-down menus allowing the user to select the pre-set scenarios incorporated in the model: these alter the unqualified teacher rates for the two phases, primary and secondary. For both of these, the user can select the latest SWC data or the rates from the previous year's model, 2016/17 TSM.

Figure 17: Screenshot of the 'unqualified teacher rate' scenario testing in the 2017/18 Teacher Supply Model.

(g) Unqualified teacher rates

Users can select different rates for the proportion of teachers in active service that will be unqualified. Users can use rates calculated from the latest School Workforce Census (SWC) data or values from the 2016/17 TSM.

These rates are used to estimate the proportion of teachers that will be unqualified in future.

Primary Rates from 2016/17 TSM

Secondary Rates from 2016/17 TSM

The table below illustrates rates from the published 2016/17 TSM in comparison to those derived from the latest School Workforce Census (SWC) data for use in this model under the default scenario.

This allows the model to account for the recruitment of additional teachers to address (and counter) increases in the proportion of teachers that are unqualified (at the rate of increase observed in LA maintained schools).

The rates from the published 2016/17 TSM have been adjusted to account for increased/decreased numbers of School Direct (salaried) and Teach First trainees that are classed as being 'unqualified teachers' in the SWC.

If the proportion of unqualified teachers has not increased, the value for this year has been used instead. Values may be lower compared to last year if the number of School Direct (salaried) and Teach First trainees has fallen for that subject.

If the unqualified teacher rates are scaled down to a previous level the no. of qualified teacher entrants would need to be scaled up accordingly.

The model would assume these extra teachers would be recruited in the 2017/18 ITT round and are added on to the 2018/19 entrant teacher need accordingly.

	% of teachers that are unqualified		
	From 2016/17 TSM	From latest SWC data	Difference
Primary	3.00%	3.23%	0.24%
Art & Design	5.89%	5.89%	0.00%
Biology	3.81%	4.50%	0.69%
Business Studies	7.51%	8.99%	1.48%
Chemistry	4.67%	4.67%	0.00%
Classics	7.59%	7.70%	0.11%
Computing	5.28%	5.29%	0.01%
Design & Technology	6.53%	7.01%	0.48%
Drama	7.70%	8.17%	0.47%
English	7.44%	7.93%	0.49%
Food	9.17%	9.17%	0.00%
Geography	3.83%	4.54%	0.72%
History	4.75%	4.75%	0.00%
Mathematics	5.49%	6.07%	0.58%
Modern Foreign Languages	4.25%	4.25%	0.00%
Music	5.42%	5.42%	0.00%
Other	13.07%	14.14%	1.07%
Physical Education	3.92%	4.06%	0.14%
Physics	3.60%	3.60%	0.00%
Religious Education	4.62%	5.45%	0.83%

Source: 2017/18 Teacher Supply Model.

h) Figure 18 below shows the section of the **USER TESTING TAB** related to scenario testing of the uptake rates of English Baccalaureate subjects. There is one pull-down menu allowing the user to select the pre-set scenarios incorporated in the model: these alter the uptake rates for the EBacc, assuming all EBacc subjects have the same uptake rate. The user can select the current rate of EBacc uptake, or uptake rates of between 50% and 90%. The different scenarios have been selected so that users can assess the scale of impact of different uptake rates.

Figure 18: Screenshot of the EBacc uptake rate scenario testing in the 2017/18 Teacher Supply Model.

(h) Increased EBacc entry policy assumptions

Users can select different scenarios for the impact of the increased EBacc entry policy on the number of secondary teaching hours required for each subject. These scenarios do not change the total number of secondary teaching hours; only the balance between subjects is changed. Scenario D is used as the default to estimate the ITT place projections used by NCTL for 2017/18 ITT (i.e. the default scenario figures).

Scenario D - 70% entry rate

Scenario	Details of policy
A. Current EBacc entry rate	Assume that EBacc entry rates stay at 'current' November 2015 SWC levels.
B. 50% entry rate	50% EBacc entry rate –Teaching hours increase along the levels seen in high-EBacc schools (with some class size increase for Geography, History, and Modern Foreign Languages); KS3 impact observed over 3 years; English & Mathematics protected at expense of Classics, Music, and Religious Education etc.
C. 60% entry rate	60% EBacc entry rate – Teaching hours increase along the levels seen in high-EBacc schools (with some class size increase for Geography, History, and Modern Foreign Languages); KS3 impact observed over 3 years; English & Mathematics protected at expense of Classics, Music, and Religious Education etc.
D. 70% entry rate	70% EBacc entry rate – Teaching hours increase along the levels seen in high-EBacc schools (with some class size increase for Geography, History, and Modern Foreign Languages); KS3 impact observed over 3 years; English & Mathematics protected at expense of Classics, Music, and Religious Education etc.
E. 80% entry rate	80% EBacc entry rate – Teaching hours increase along the levels seen in high-EBacc schools (with some class size increase for Geography, History, and Modern Foreign Languages); KS3 impact observed over 3 years; English & Mathematics protected at expense of Classics, Music, and Religious Education etc.
F. 90% entry rate	90% EBacc entry rate – Teaching hours increase along the levels seen in high-EBacc schools (with some class size increase for Geography, History, and Modern Foreign Languages); KS3 impact observed over 3 years; English & Mathematics protected at expense of Classics, Music, and Religious Education etc.

Source: 2017/18 Teacher Supply Model.

- The TSM provides six different scenarios for EBacc entry rates (current rate, 50% take-up, 60% take-up, 70% take-up, 80% take-up and 90% take-up). These enable estimation of the impact that each of the entry rate scenarios would have on the hours taught in each subject by schools at both KS3 and KS4 (see the **USER TESTING TAB** and **Increased EBacc scenario data** tab). The changes in hours taught were informed by analysis conducted internally that looked at how teaching time by subject differs between schools with different levels of EBacc entry rates, while controlling for school size, pupil prior attainment and whether or not the school was selective.

- Using a linear relationship between EBacc entry and the proportion of teaching in each subject, internal analysis informed what the breakdown in teaching time would be if schools achieved EBacc entry rates equivalent to the scenario values mentioned above. It was assumed that changing EBacc entry rate would not have an effect on overall teaching time, in accordance with the internal analysis conducted.

- This analysis suggested the scale of changes in MFL and humanities teaching time – more minor differences (such as small reductions in Maths and English teaching time and small increases in Classics and RE) were ignored. We considered it unlikely that these small variations are how schools currently without high EBacc entry would adapt, and that despite the controls in the analysis they may instead reflect other unobservable characteristics of high entry schools.

- These changes have been applied to every year from 2018/19 with the KS4 changes occurring over two years (in the first year the increase will only apply to Year 10 pupils) and the KS3 changes over 3 years.

5.2 How to use scenario testing in the 2017/18 TSM: viewing outputs.

For all changes made in the **USER TESTING TAB**, it is possible to view immediately the effects of these changes on the outputs for the two sections of the model: the **OUTPUTS FOR SECTION 2 OF MODEL** and the **FINAL OUTPUTS OF ITT PLACES**. The tables and graph at the top of the **USER TESTING TAB** give the scenario output values.

a) <u>The entrant teacher need.</u>

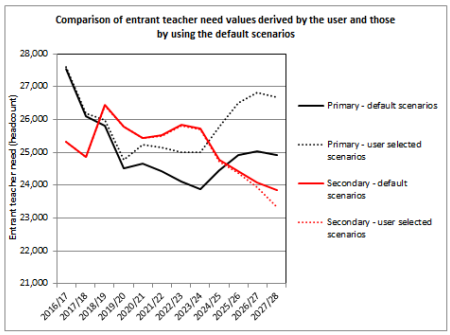
Figure 19 shows an example of scenario output values for the **entrant teacher need**. The first table gives the numerical values assigned to subjects across years estimated by the user-selected scenario. The table below it shows the differences in these values between the user-selected scenario and the central scenario of the 2017/18 TSM. The graph shows the values for the user scenario in the top table and the 2017/18 TSM values for **entrant teacher need** in the primary and secondary phases.

Figure 19: Screenshot of the scenario outputs for entrant teacher need in the Teacher Supply Model.

(a) Entrant teacher need output values generated by the model using the scenarios as selected.

These are the model outputs generated using the scenarios selected using the drop-down menus above.

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Primary	27,589	26,174	25,975	24,770	25,225	25,160	25,008	24,991	25,798	26,514	26,830	26,675
Art & Design	818	927	816	821	922	940	947	961	924	888	866	866
Biology	1,914	1,456	1,622	1,541	1,523	1,553	1,596	1,567	1,524	1,541	1,530	1,461
Business Studies	362	373	323	243	361	417	452	439	453	467	471	449
Chemistry	1,643	1,300	1,369	1,370	1,350	1,375	1,411	1,374	1,333	1,353	1,341	1,270
Classics	40	40	39	38	37	37	38	38	37	36	36	36
Computing	709	843	606	583	773	832	845	852	825	806	792	781
Design & Technology	1,244	1,311	1,010	917	1,108	1,163	1,139	1,160	1,089	1,021	980	989
Drama	500	535	523	506	502	541	545	557	534	514	502	505
English	3,776	3,597	3,859	3,693	3,613	3,628	3,657	3,615	3,449	3,428	3,369	3,243
Food	234	204	194	171	230	246	246	236	224	226	222	206
Geography	1,091	1,176	1,576	1,559	1,329	1,287	1,293	1,301	1,241	1,210	1,184	1,169
History	1,081	1,242	1,515	1,571	1,360	1,349	1,360	1,367	1,310	1,280	1,254	1,236
Mathematics	4,531	4,149	4,249	4,115	4,073	3,970	3,994	3,946	3,773	3,730	3,658	3,531
Modern Foreign Languages	1,597	1,813	3,167	3,381	2,576	2,199	2,188	2,191	2,073	2,013	1,961	1,933
Music	518	563	571	591	583	572	566	587	556	520	502	518
Others	1,500	1,427	1,185	977	1,246	1,453	1,535	1,533	1,558	1,543	1,537	1,522
Physical Education	1,348	1,686	1,514	1,481	1,661	1,741	1,766	1,776	1,700	1,678	1,652	1,617
Physics	1,631	1,285	1,355	1,351	1,326	1,347	1,378	1,335	1,290	1,311	1,299	1,221
Religious Education	775	844	930	869	859	855	859	857	818	801	795	767
Total Secondary entrant teacher need	25,314	24,852	26,423	25,782	25,432	25,507	25,815	25,693	24,711	24,366	23,941	23,320



Differences between the values calculated above and the default values.

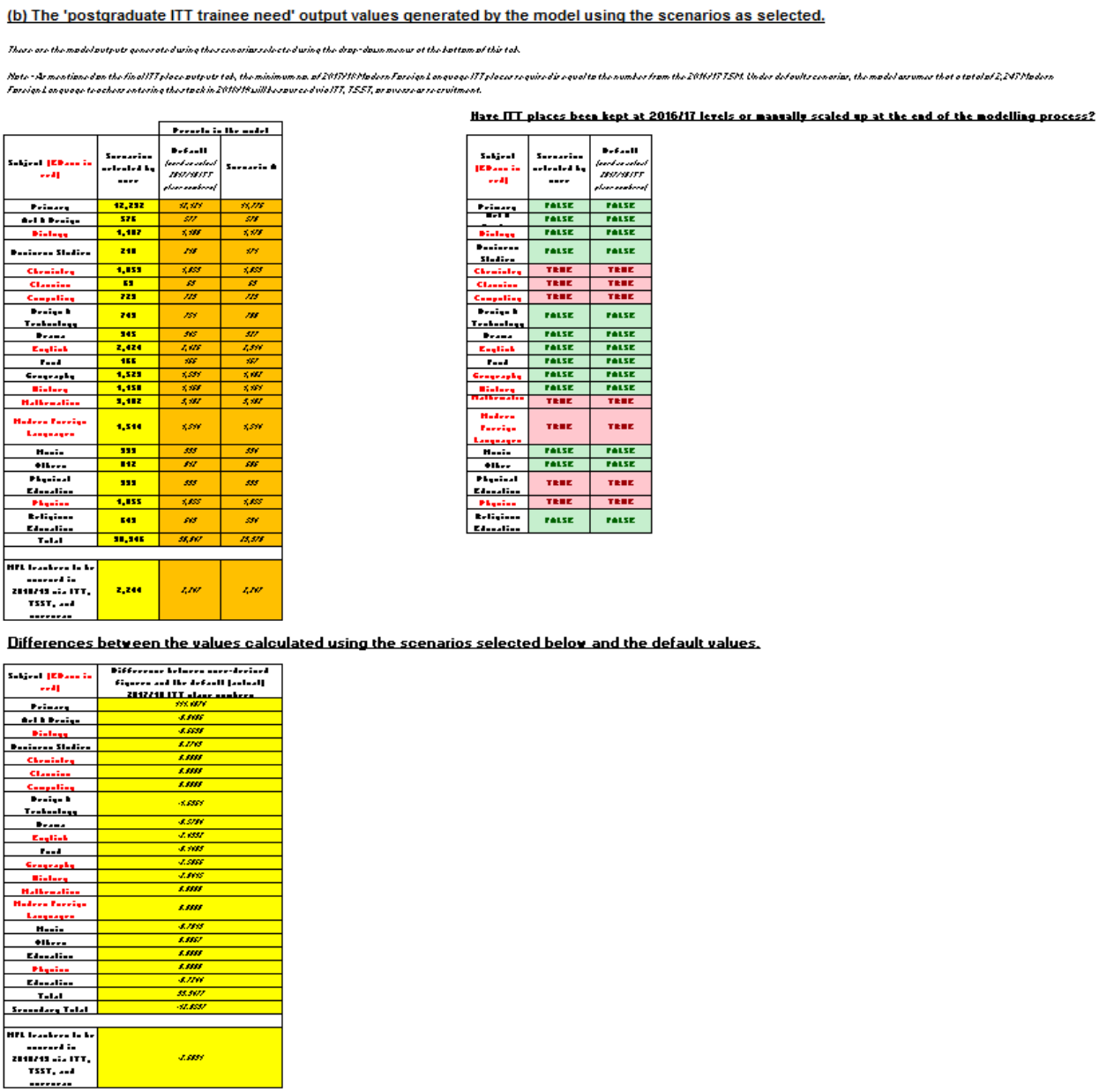
	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Primary	51	69	171	261	568	727	905	1,117	1,348	1,598	1,794	1,751
Art & Design	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-6	-25
Biology	0	0	-1	-1	-1	-1	-1	-1	-2	-2	-4	-18
Business Studies	0	0	0	0	0	0	0	1	1	1	2	8
Chemistry	0	0	-1	0	0	-1	-1	-1	-1	-1	-3	-14
Classics	0	0	0	0	0	0	0	0	0	0	0	0
Computing	0	0	-1	-1	-1	-1	-1	-1	-2	-2	-5	-19
Design & Technology	-1	-1	-2	-1	-2	-2	-3	-3	-4	-4	-11	-45
Drama	0	0	-1	-1	-1	-1	-1	-1	-2	-2	-4	-18
English	-2	-2	-4	-2	-3	-3	-5	-6	-7	-8	-20	-81
Food	0	0	0	0	0	0	0	0	0	0	-1	-4
Geography	-1	-1	-2	-1	-1	-1	-2	-3	-3	-3	-9	-35
History	-1	-1	-2	-1	-1	-1	-2	-2	-3	-3	-8	-34
Mathematics	-2	-2	-4	-2	-3	-3	-5	-6	-8	-8	-20	-82
Modern Foreign Languages	-1	-1	-3	-1	-2	-2	-3	-4	-5	-5	-13	-51
Music	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-6	-24
Others	0	0	0	0	0	0	0	0	0	0	0	2
Physical Education	-1	-1	-2	-1	-2	-2	-3	-4	-5	-5	-13	-52
Physics	0	0	-1	0	0	-1	-1	-1	-1	-1	-3	-14
Religious Education	0	-1	-1	-1	-1	-1	-1	-2	-2	-2	-5	-21
Total Secondary entrant teacher need	-12	-13	-26	-15	-18	-20	-31	-38	-48	-50	-129	-530

Source: 2017/18 Teacher Supply Model.

b) <u>The postgraduate ITT trainee need.</u>

Below the tables described above, there are three further tables showing the effects of the user-selected scenario on the **postgraduate ITT trainee need** (see Figure 20 below). On the left are two tables analogous to the tables for entrant teacher need: the table above gives the postgraduate ITT trainee need values for the user scenario; the table below shows the differences between these figures and the ones provided by the central scenario of the 2017/18 TSM. To the right of these, a table shows whether values calculated have been manually scaled up at the end of the modelling process to account for policy assumptions. The screenshot below has been shrunk to fit the page, so the figure is for illustrative purposes only.

Figure 20: Screenshot of the scenario outputs for postgraduate ITT trainee need in the Teacher Supply Model.



(b) The 'postgraduate ITT trainee need' output values generated by the model using the scenarios as selected.

There are the model outputs generated using the scenarios selected during the drop-down menus at the bottom of this tab.

Note - As mentioned on the final ITT places output tab, the minimum no. of 2017/18 Modern Foreign Languages ITT places required is equal to the number from the 2016/17 TSM. Under defaults scenarios, the model assumes that a total of 2,247 Modern Foreign Languages teachers entering the stock in 2018/19 will be sourced via ITT, TSST, or excess or no recruitment.

Have ITT places been kept at 2016/17 levels or manually scaled up at the end of the modelling process?

Subject (ID nos in red)	Scenarios selected by user	Default (level or select 2017/18 ITT place numbers)	Scenario A
Primary	12,252	12,171	11,775
Art & Design	576	577	578
Biology	1,187	1,188	1,178
Business Studies	218	218	171
Chemistry	1,853	1,855	1,855
Classics	53	53	53
Computing	723	723	723
Design & Technology	743	751	788
Drama	345	345	327
English	2,424	2,425	2,314
Food	155	155	147
Geography	1,523	1,525	1,187
History	1,158	1,158	1,157
Mathematics	2,182	2,182	2,182
Modern Foreign Languages	1,516	1,516	1,516
Music	333	333	334
Other	242	242	230
Physical Education	333	333	333
Physics	1,855	1,855	1,855
Religious Education	643	643	534
Total	30,345	30,347	29,578
NPQ trainees to be sourced in 2018/19 via ITT, TSST, and successor	2,244	2,247	2,247

Subject (ID nos in red)	Scenarios selected by user	Default (level or select 2017/18 ITT place numbers)
Primary	FALSE	FALSE
Art & Design	FALSE	FALSE
Biology	FALSE	FALSE
Business Studies	FALSE	FALSE
Chemistry	TRUE	TRUE
Classics	TRUE	TRUE
Computing	TRUE	TRUE
Design & Technology	FALSE	FALSE
Drama	FALSE	FALSE
English	FALSE	FALSE
Food	FALSE	FALSE
Geography	FALSE	FALSE
History	FALSE	FALSE
Mathematics	TRUE	TRUE
Modern Foreign Languages	TRUE	TRUE
Music	FALSE	FALSE
Other	FALSE	FALSE
Physical Education	TRUE	TRUE
Physics	TRUE	TRUE
Religious Education	FALSE	FALSE

Differences between the values calculated using the scenarios selected below and the default values.

Subject (ID nos in red)	Difference between user-derived figures and the default (actual) 2017/18 ITT place numbers
Primary	-395.6874
Art & Design	-0.9985
Biology	-0.9938
Business Studies	0.2745
Chemistry	0.0000
Classics	0.0000
Computing	0.0000
Design & Technology	-0.5551
Drama	-0.5794
English	-1.9551
Food	-0.9985
Geography	-1.5995
History	-1.9993
Mathematics	0.0000
Modern Foreign Languages	0.0000
Music	-0.7993
Other	0.9967
Education	0.0000
Physics	0.0000
Education	-0.7244
Total	35.5907
Secondary Total	-41.8551
NPQ trainees to be sourced in 2018/19 via ITT, TSST, and successor	-1.9991

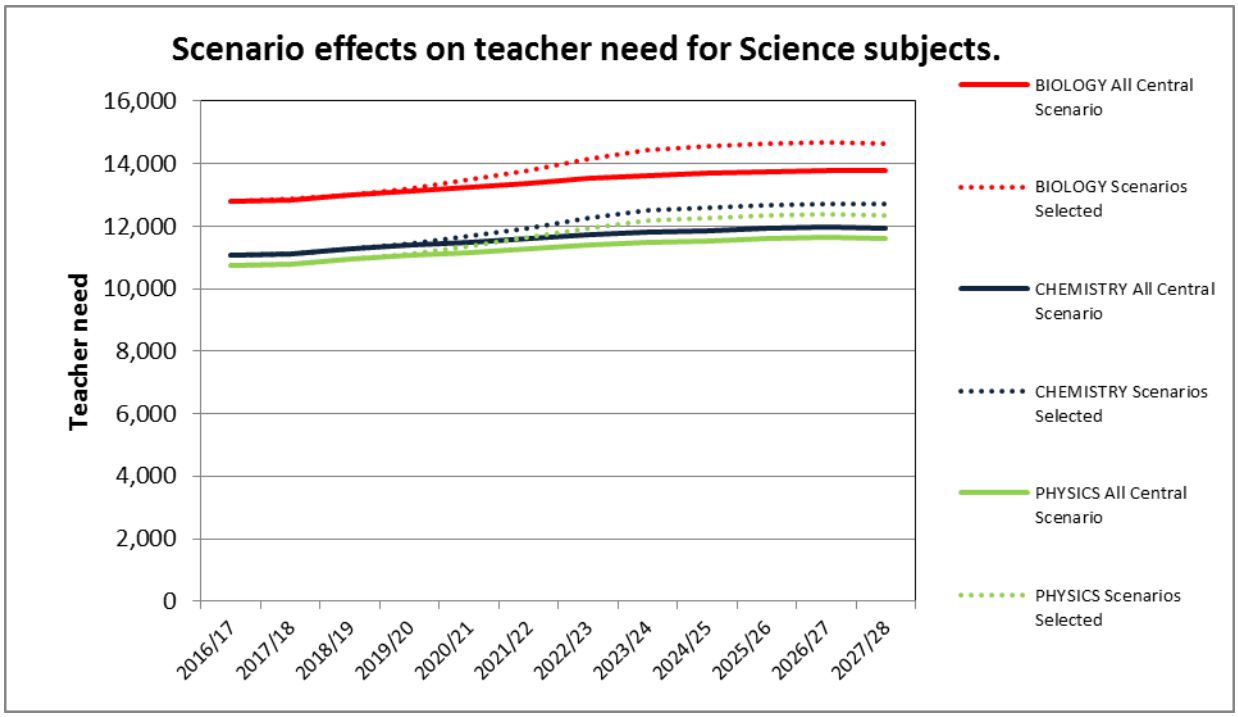
Source: 2017/18 Teacher Supply Model.

c) There are a number of output tabs (colour-coded yellow[84]) in the model that also show the effects of a user-selected scenario graphically in a similar way to the graph shown in Figure 19 above. The user-selected and default scenarios are shown on the same graph so direct comparison of the effects of scenario change can be made. On these tabs the outputs are shown contrasted by phase or by comparing selected academic subjects in the secondary phase, so that there are a number of graphs showing the effect of the scenario change.

84 Not in the ODS document.

An example of such a graph (showing the effects of scenario change on science subjects from the **Teacher need charts over time** tab) is given in Figure 21 below.

Figure 21: Teacher need values for science subjects under the central and user-selected scenarios calculated by the 2017/18 Teacher Supply Model.



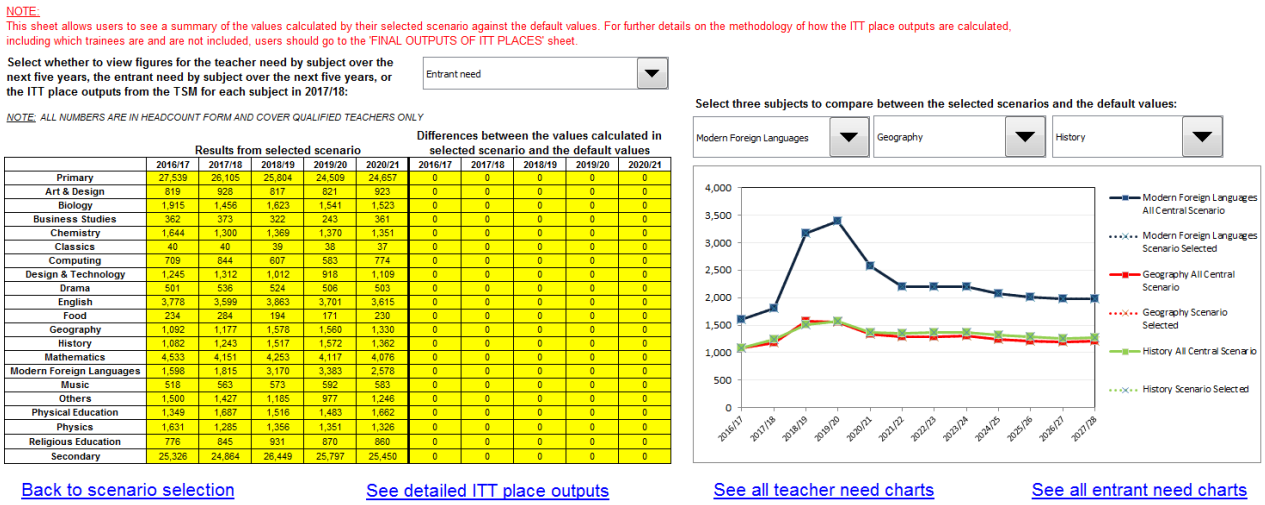
Source: 2017/18 Teacher Supply Model.

d) There are two other output tabs in the model that show historical data and projections from the model on the same charts. These are the **Outputs with historical data** and the **Historical and projected ITT** tabs. The former tab comprises a large number of graphs showing all intermediate variables in time series, including graphs for different phases; the latter tab comprises graphs showing historical and projected ITT figures broken down by phase and subject groups. On the former tab, it is important to note that the data are derived from **previous** versions of the TSM, with the most recently published figures provided in the tab. The data are in headcount form and are *for qualified teachers only*. The historical ITT figures on the latter tab comprise raw outputs from previous versions of the TSM (without policy adjustments having been made) and the figures prior to 2015/16 are estimates of postgraduate numbers derived from these previous models and not published elsewhere. Projected figures for ITT places are revised each year and are therefore liable to change.

e) Two orange tabs provide quick access to the outputs of the 2017/18 TSM. The first of these shows the final output of the model: the **postgraduate ITT trainee need**. This is the **FINAL OUTPUTS OF ITT PLACES** tab and shows in tabular form the ITT places estimated by the model, both 'raw' values from the calculations and adjusted values taking into account policy considerations.

The second orange tab (**SUMMARY OUTPUTS**) allows the user to select one output variable from the model (**teacher need**, **entrant need** or **ITT places**), and three academic subjects to show the effects of scenario testing graphically on these. In addition, it provides quick hyperlink access to user testing and main tabs for the three output variables. Figure 22 below shows a screenshot of this tab.

Figure 22: The SUMMARY OUTPUTS tab from the 2017/18 Teacher Supply Model.



NOTE:
This sheet allows users to see a summary of the values calculated by their selected scenario against the default values. For further details on the methodology of how the ITT place outputs are calculated, including which trainees are and are not included, users should go to the 'FINAL OUTPUTS OF ITT PLACES' sheet.

Select whether to view figures for the teacher need by subject over the next five years, the entrant need by subject over the next five years, or the ITT place outputs from the TSM for each subject in 2017/18: Entrant need

NOTE: ALL NUMBERS ARE IN HEADCOUNT FORM AND COVER QUALIFIED TEACHERS ONLY

	Results from selected scenario					Differences between the values calculated in selected scenario and the default values				
	2016/17	2017/18	2018/19	2019/20	2020/21	2016/17	2017/18	2018/19	2019/20	2020/21
Primary	27,539	26,105	25,804	24,509	24,657	0	0	0	0	0
Art & Design	819	928	817	821	923	0	0	0	0	0
Biology	1,915	1,456	1,623	1,541	1,523	0	0	0	0	0
Business Studies	362	373	322	243	361	0	0	0	0	0
Chemistry	1,644	1,300	1,369	1,370	1,351	0	0	0	0	0
Classics	40	40	39	38	37	0	0	0	0	0
Computing	709	844	607	583	774	0	0	0	0	0
Design & Technology	1,245	1,312	1,012	918	1,109	0	0	0	0	0
Drama	501	536	524	506	503	0	0	0	0	0
English	3,778	3,599	3,863	3,701	3,615	0	0	0	0	0
Food	234	284	194	171	230	0	0	0	0	0
Geography	1,092	1,177	1,578	1,560	1,330	0	0	0	0	0
History	1,082	1,243	1,517	1,572	1,362	0	0	0	0	0
Mathematics	4,533	4,151	4,253	4,117	4,076	0	0	0	0	0
Modern Foreign Languages	1,598	1,815	3,170	3,383	2,578	0	0	0	0	0
Music	518	563	573	592	583	0	0	0	0	0
Others	1,500	1,427	1,185	977	1,246	0	0	0	0	0
Physical Education	1,349	1,687	1,516	1,483	1,662	0	0	0	0	0
Physics	1,631	1,285	1,356	1,351	1,326	0	0	0	0	0
Religious Education	776	845	931	870	860	0	0	0	0	0
Secondary	25,326	24,864	26,449	25,797	25,450	0	0	0	0	0

Select three subjects to compare between the selected scenarios and the default values:

Modern Foreign Languages | Geography | History

Back to scenario selection | See detailed ITT place outputs | See all teacher need charts | See all entrant need charts

Source: 2017/18 Teacher Supply Model.

Chapter 6: Additional information on the data sources used within the 2017/18 TSM.

1. The **NCTL Employment Dataset** provides the number of ITT trainees who are expected to enter teaching after a one- or two-year break, using figures on ITT performance and other related census data. Additional information is given on the ITT statistics webpage from NCTL.
2. The **DLHE survey** provides the outcomes of Higher Education trainees Read the latest Destinations of Leavers from Higher Education survey (2014/15) here.
3. The **ITT Census** provides the course lengths and numbers of new ITT trainees by route. Read the latest ITT census (2016/17) here.
4. The **matched School Workforce Census** provides information (including demographics) on the teacher stock, the number of hours secondary teachers spend teaching each subject, and teacher flows. The data from 2010 onwards are here.
5. **National Pupil Projections** are used in the demand modelling. Find the published statistics here.
6. **PENSTATS** is an unpublished teacher pension data source held by the Department for Education that is used to model retirements. Penstats data are merged into the matched School Workforce Census to identify teachers specifically leaving as retirements.
7. **ONS National unemployment statistics** are used in the teacher Econometric Wastage Model and are derived from Labour Market Statistics.
8. **Office for Budgetary Responsibility estimates of Gross Domestic Product** are also used in the Econometric Wastage Model and form part of the economic and fiscal outlook publication (latest November 2016).

Annex:

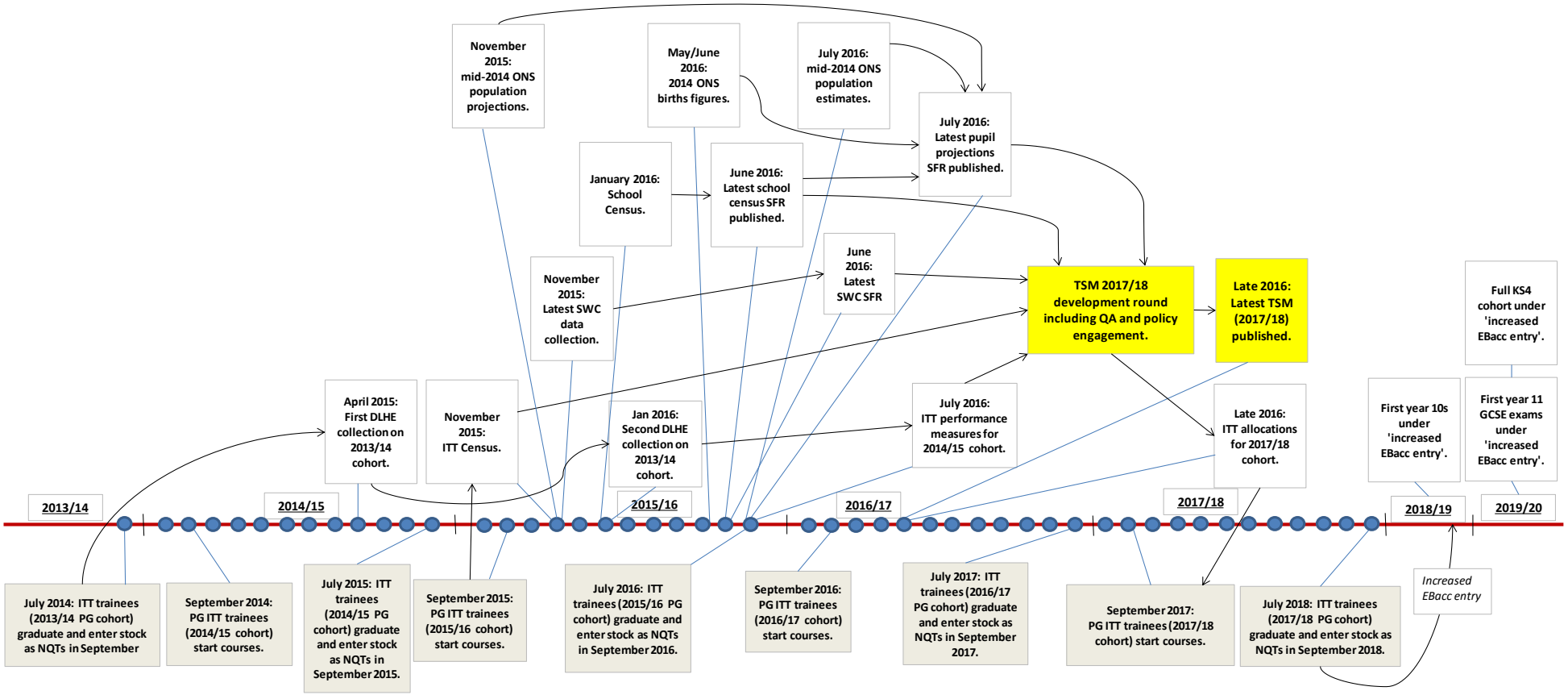
A1. Figure 23: The flow of data into and out of the 2017/18 Teacher Supply Model.

A2. Figure 24: The structure of the 2017/18 Teacher Supply Model.

A3. Table 5: The tabs within the 2017/18 Teacher Supply Model.

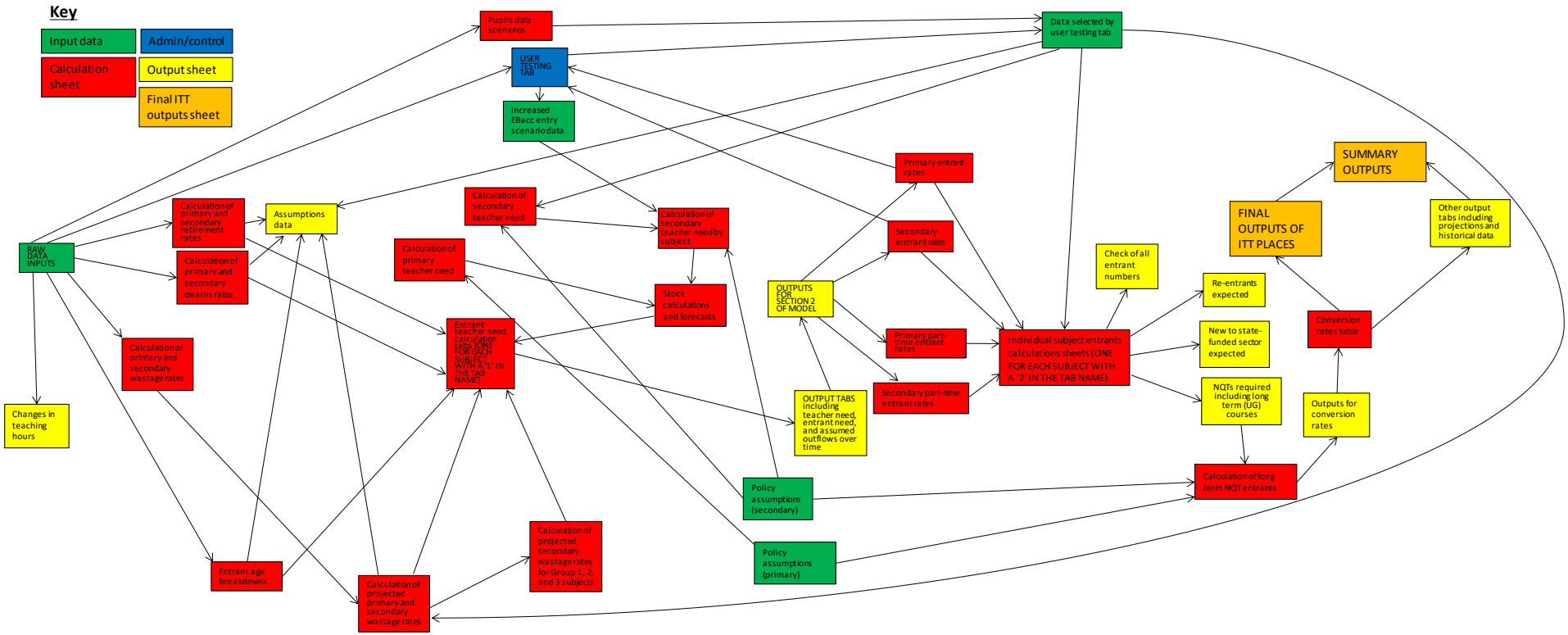
A.1 A data timeline for the 2017/18 TSM.

Figure 23: The flow of data into and out of the 2017/18 Teacher Supply Model.



A.2: Simplified overall structure of the 2017/18 TSM.

Figure 24: The overall structure of the 2017/18 Teacher Supply Model.



A.3: Further information on the structure of the 2017/18 Teacher Supply Model.

Table 5 below illustrates the purpose of each tab within the 2017/18 TSM.

Table 5: The tabs within the 2017/18 Teacher Supply Model.

Name of tab	Description	colour
Title & Contents	Contents of the Teacher Supply Model and the purpose of each tab. Hyperlinks to every other tab.	
Details	Brief summary of model (along with details of current version and colour key).	
New features	Describes how the 2017/18 TSM differs from the 2016/17 TSM.	
Map of sheets	Colour-coded map of the sheets in the spreadsheet.	
Subject groupings defined	Defines the phases and subjects as used and modelled in the TSM.	
USER TESTING TAB	Tab enabling users to select scenarios to be used in the model calculations and examine the outputs of the scenario testing.	
RAW DATA INPUTS	Takes the raw data inputs into the model from all input sources.	
Policy assumptions PRIM	Lists the policy assumptions at primary level to play into the teacher need calculations.	
Policy assumptions SEC	Lists the policy assumptions at secondary level to play into the teacher need calculations.	
Data selected by user testing	Lists the data as selected by the USER TESTING TAB to play into the wider model.	
Increased EBacc scenario data	Lists the data as selected by the USER TESTING TAB related to the different scenarios of increased EBacc entry.	
Calc PRIM retirement rates	Calculates retirement rates at primary level.	
Calc SEC retirement rates	Calculates retirement rates at secondary level. Rates used are consistent across subjects.	
Calc PRIM death rates	Calculates death in service rates at primary level.	
Calc SEC death rates	Calculates death in service teacher rates at secondary level. Rates used are consistent across subjects.	
Calculation PRIM wastage rates	Calculates wastage rates at primary level.	
Calculation SEC wastage rates	Calculates wastage rates at secondary level.	
Projected PRIM wastage rates	Calculates projected wastage rates at primary level.	
Projected SEC wastage rates	Calculates projected wastage rates at secondary level.	
Group 1 rates	Calculates projected wastage rates for the secondary phase for Group 1 subjects only.	
Group 2 rates	Calculates projected wastage rates for the secondary phase for Group 2 subjects only.	
Group 3 rates	Calculates projected wastage rates for the secondary phase for Group 3 subjects only.	
Stock calculations	Calculates the full-time equivalent (FTE) and unqualified teacher rates for the stock.	
Stock ages breakdowns	Calculates the age group breakdowns of the stocks.	
Pupils data scenarios	Summarises the pupil projection figures using different population scenarios. Also, calculates KS5 pupil projections.	
Calculation Primary teacher need	Calculates the primary teacher need.	
Calculation overall Sec teacher need	Calculates the overall secondary teacher need.	
Teacher need by subject	Calculates the secondary teacher need for specific subjects.	
Forecast stock figures	Forecasts how the size of the stock will change over time.	

Name of tab	Description	colour
Entrant age breakdowns	Calculates the age group breakdown of entrants.	
Primary 1	Calculates the entrant teacher need for primary teachers and assumptions made on the number of leavers for the phase and how the stock changes over time (including size and characteristics).	
Art & Design 1	Calculates the entrant teacher need for Art & Design teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Biology 1	Calculates the entrant teacher need for Biology teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Business Studies 1	Calculates the entrant teacher need for Business Studies teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Chemistry 1	Calculates the entrant teacher need for Chemistry teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Classics 1	Calculates the entrant teacher need for Classics teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Computing 1	Calculates the entrant teacher need for Computing teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Design & Technology 1	Calculates the entrant teacher need for Design & Technology teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Drama 1	Calculates the entrant teacher need for Drama teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
English 1	Calculates the entrant teacher need for English teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Food 1	Calculates the entrant teacher need for Food teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Geography 1	Calculates the entrant teacher need for Geography teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
History 1	Calculates the entrant teacher need for History teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Mathematics 1	Calculates the entrant teacher need for Mathematics teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Modern Foreign Languages 1	Calculates the entrant teacher need for Modern Foreign Languages teachers and assumptions made on the number of	

Name of tab	Description	colour
	leavers for the subject and how the stock changes over time (including size and characteristics).	
Music 1	Calculates the entrant teacher need for Music teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Others 1	Calculates the entrant teacher need for Others teachers and assumptions made on the number of leavers for the subjects and how the stock changes over time (including size and characteristics).	
Physical Education 1	Calculates the entrant teacher need for Physical Education teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Physics 1	Calculates the entrant teacher need for Physics teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Religious Education 1	Calculates the entrant teacher need for Religious Education teachers and assumptions made on the number of leavers for the subject and how the stock changes over time (including size and characteristics).	
Calc PRIM entrant rates	Calculates the proportion of primary teachers historically entering the stock via different entrant routes.	
Calc SEC entrant rates	Calculates the proportion of secondary teachers historically entering the stock via different entrant routes.	
Calc PRIM part-time entrants	Calculates the proportion of historical primary teacher entrants that is part-time via the different routes.	
Calc SEC part-time entrants	Calculates the proportion of historical secondary teacher entrants that is part-time via the different routes.	
Primary 2	Calculates the proportion of primary teachers expected to enter by different entrant routes.	
Art & Design 2	Calculates the proportion of Art & Design teachers expected to enter by different entrant routes.	
Biology 2	Calculates the proportion of Biology teachers expected to enter by different entrant routes.	
Business Studies 2	Calculates the proportion of Business Studies teachers expected to enter by different entrant routes.	
Chemistry 2	Calculates the proportion of Chemistry teachers expected to enter by different entrant routes.	
Classics 2	Calculates the proportion of Classics teachers expected to enter by different entrant routes.	
Computing 2	Calculates the proportion of Computing teachers expected to enter by different entrant routes.	
Design & Technology 2	Calculates the proportion of Design & Technology teachers expected to enter by different entrant routes.	
Drama 2	Calculates the proportion of Drama teachers expected to enter by different entrant routes.	
English 2	Calculates the proportion of English teachers expected to enter by different entrant routes.	
Food 2	Calculates the proportion of Food teachers expected to enter by different entrant routes.	
Geography 2	Calculates the proportion of Geography teachers expected to enter by different entrant routes.	
History 2	Calculates the proportion of History teachers expected to enter by different entrant routes.	
Mathematics 2	Calculates the proportion of Mathematics teachers expected to enter by different entrant routes.	
Modern Foreign Languages 2	Calculates the proportion of Modern Foreign Language teachers expected to enter by different entrant routes.	

Name of tab	Description	colour
Music 2	Calculates the proportion of Music teachers expected to enter by different entrant routes.	
Others 2	Calculates the proportion of Others teachers expected to enter by different entrant routes.	
Physical Education 2	Calculates the proportion of Physical Education teachers expected to enter by different entrant routes.	
Physics 2	Calculates the proportion of Physics teachers expected to enter by different entrant routes.	
Religious Education 2	Calculates the proportion of Religious Education teachers expected to enter by different entrant routes.	
Calc long term NQT entrants	Calculates the proportion of the NQT entrants needed that will be NQTs in 2017/18 who studied on longer term ITT courses that began before 2016/17.	
Conversion rates table	Converts the NQT entrant need into the postgraduate ITT trainee need using estimations of how many trainees are expected to complete ITT and how many are expected to go into employment within 6 months of ITT completion.	
Entrant need charts over time	Charts summarising entrant teacher need over time for all subjects.	
Teacher need charts over time	Charts summarising teacher need over time for all subjects.	
Pupil Projections scenarios	Charts summarising the pupil projections data used by the model.	
OUTPUTS FOR SECTION 2 OF MODEL	Summarises the entrant teacher need values calculated by the model to feed into Section Two of the model.	
Re-entrants expected	Summarises the number of teachers expected to enter as 're-entrants to the state-funded sector' by subject.	
New to SF sector expected	Summarises the number of teachers expected to enter as 'new to the state-funded sector' entrants by subject.	
NQT entrants required inc UGs	Summarises the number of teachers expected to enter as newly qualified teachers (NQTs), including those who will complete training via undergraduate training courses.	
Check of all entrant numbers	Checks that the numbers of entrants expected via all entrant routes is equal to the amount required.	
Outputs for conversion rates	Summarises the outputs to feed into the conversion rates table tab.	
Assumptions data	Summarises the assumptions data used by the model for calculations.	
Teacher need figures	Summarises the projections of teacher need from 2016/17 to 2027/28 by phase and subject (including aggregated into EBacc and non-EBacc subjects).	
Entrant need figures	Summarises the projections of entrant need from 2016/17 to 2027/28 by phase and subject (including aggregated into EBacc and non-EBacc subjects).	
Wastage over time	Summarises the number of teachers assumed will leave as wastage over time for all subjects.	
Retirements over time	Summarises the number of teachers assumed will leave as retirements over time for all subjects.	
Deaths over time	Summarises the number of teachers assumed will leave as deaths in service over time for all subjects.	
Leavers over time	Summarises the number of teachers assumed will leave from active service by all routes over time for all subjects.	
Outputs with historical data	Summarises the projections of a number of model outputs and adds historical data to provide time series from 2010/10 to 2027/28 by phase.	
Comparison of pupil projns	Graphically represents the pupil projections data from this year's model (2017/18) and last year's model (2016/17).	
Historical and projected ITT	Summarises the projections of ITT places and adds historical data to provide time series from 2011/12 to 2026/27 by phase.	

Name of tab	Description	colour
Changes in subject teaching hrs	Charts the changes in proportion of teaching hours allocated to each subject at secondary level, broken down by key stage.	
FINAL OUTPUTS OF ITT PLACES	Summarises the final outputs of the 2017/18 TSM to feed into the NCTL 2017/18 ITT recruitment process.	
SUMMARY OUTPUTS	Summarises the differences between the user-selected scenarios and the model's 'central' scenario showing a number of outputs and subjects graphically.	

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