

# FORECASTING THE NEED FOR A PUBLIC SECTOR WORKFORCE AND TEACHER WORKFORCE PILOT PROGRAMME

SRSS LITHUANIA, 2017–2018

## PROJECT DESIGN

### Problem/ need to be addressed

There is no concise system on policy measures and decisions used to form the number of students admitted to study/ training programmes that provide professional qualifications needed for public sector workers (such as teachers, doctors, police and other). The urgent problem is the ageing teaching workforce, which suffers from an oversupply of teachers from older age sections and low admission rates to pedagogical study/training programmes. The mismatch between the supply and demand in the public-sector workforce (teachers in particular) affects the whole labor market. The oversupply of public sector workers is one of the factors of low average wages, increasing emigration and low public image and prestige of public-sector professions.

### Support measures requested

The technical assistance would be made of one or more expert to provide expertise and technical support to the LT national team/working group in charge of developing a teacher workforce forecasting model. The scope of action refers only to school teachers. It is expected that an expert of the related field will support the national team currently working on the matter by:

- 1) providing examples of tools and measures used by other (one specific or several) EU member states to plan the public-sector workforce, teachers in particular;
- 2) providing consultancy on tool selection and preparation including the justification of assumptions and data needed;
- 3) giving insights on the teacher workforce pilot programme preparation and implementation.

### Expected results

- 1) Advisory activities on existing tools and measures used in practice by other EU member states to systematically plan the supply and demand of publicly funded labor force including an example of teacher workforce.
- 2) Advisory activities on elaboration of tools and measures that are used and planned to be developed by the national team (recommendations).
- 3) Advisory activities on the pilot teacher workforce needs and forecast programme preparation and implementation (recommendations).

The new model should provide accurate information about **specific teacher demand** to inform:

- 1) the Higher Education system on the development of specific training programmes for pre-primary, primary and secondary school teachers and programmes admission quota;
- 2) the Ministry of Education and the Ministry of Finance on the related budget needs.

The current model for forecasting labor demand in LT is inspired by the NL-CZ model and provides a general estimation of teachers demand only, but has not been used in policy making for teacher planning.

### Workplan

The new tool shall be prepared, discussed and approved before the new budget cycle (May 2018) to form the government financial means for initial teacher training admission at the higher education institutions and other policies needed to tackle the mismatch in the teacher workforce.

The work plan for the SRSS action could be the following:

<b>Time</b>	<b>Activity phase</b>	<b>Details</b>
<b>July – August, 2017</b>	Best practice	Research on possible models and best practices of inspiration and experts by SRSS and LT team.
<b>September, 2017</b>	Model identification strategy Technical assistance proposal	Scoping mission at the beginning of September to assess which are the most suitable best practices and fine-tune the technical assistance proposal. If by then a specific model of reference is identified, a relevant expert could already participate in the mission; otherwise we would leave it open and do an SRSS mission alone.
<b>Mid-October, 2017</b>	Expert contract	Signature of the contract with expert(s) completed by mid-October
<b>End-October, 2017</b>	Workshop	Workshop to present best practices that are relevant to the context and needs of LT, or alternatively, a study visit to one MS if one MS is considered to be the best option.
<b>November – January, 2017</b>	New model creation	Assistance of the expert to the LT working group on the elaboration and implementation of a pilot model.
<b>March – April, 2018</b>	New model implementation	Implementation of the pilot model by the LT authorities to inform the April 2018 planning exercise
<b>May – June, 2018</b>	Evaluation	Monitoring of evaluation of the outcomes of the pilot model (monitoring modality to be defined).

## TEACHER TRAINING AND OTHER RECENT EDUCATIONAL REFORMS

Even if there is currently an oversupply of teachers nationally, it is important for the school system to plan ahead and ensure an adequate rate of teacher renewal. The biggest challenge in planning is the misbalance of supply and demand between urban and rural areas and different subjects.

Also, teacher demand is closely related to other processes and reforms in education. Recently, in 2016 mandatory one-year pre-school education was introduced, and the governmental decision to lower the age (starting at 6) for primary education has raised demand of pre-school teachers in the context of national oversupply of primary teachers. At the same time, it means that lower secondary education students will be starting their education at still a very young age. Thus, there is a need not only to forecast statistic numbers for teacher training, but also necessary changes in the tertiary offer towards, for example, wider profile of teacher qualification. This should allow easier teacher mobility between pre-school and primary education, primary and lower secondary education.

In addition, with the governmental effort to move towards inclusive education and closure of special education schools, the forecast of special education teachers and teacher assistance in general schools is necessary. Traditionally, SEN specialists also are trained in a narrow professional area, but there is a need to make sure that they have adequate qualifications to work in a general school and have adequate work load for a decent salary. So, the forecast needs to take into consideration not only statistic teacher-student ratio, but also consider the factor of qualification-workload balance.

Another change is related to the more integrated school curriculum. This concerns forecast for subject teacher demand. With the dramatic drop in student population, the lowest student-teacher ratio is in lower secondary education, because the curriculum subjects are a long list and to cover the curriculum adequately there is a need for many teachers of different subjects. Traditionally, teachers acquire one subject qualification, and due to this, subject teachers' work load is limited, especially in small rural schools. Thus, there is a need for forecasting which is not based on a traditional one-subject-teacher training, but on plans for reforms, recent and future.

We need to know **what** teachers schools need **when** and **how many**. This will assure implementation of reforms (inclusive schools and integrated curriculum) and efficient investment in tertiary teacher education (the right number and quality of teachers).

## TEACHER WORKFORCE PLANNING IN LITHUANIA: BACKGROUND

Until now, the practice of determining the teacher workforce needs and size has been inconsistent, based on rather assumption than evidence. There has been no systematic approach to form the government budget needs and inform higher education institutions on specific teacher training programmes and admissions quota.

Casual and individual forecasting analyses were made by various public and private institutions (Institute of Mathematics and Informatic, Education Development Centre, School Improvement Centre, Civil Society Institute and others) during the past 20 years for the Ministry of Education and Science or other relevant centres as a client. There have been analyses for general teacher workforce forecasting done (Merkys G. et al. 2006, 2008) as well as analyses focusing on specific regions in 2007. In addition, other academic

type of research has been written and published mainly by academics (Dzemyda G. et al, 2003; Petkus T., Karaliun I., 2014) interested in the topic. Its use on the policy making level is not known.

Lately, the admission quota to teacher training programmes has been based on several measures. The Ministry of Education and Science keeps close communication with municipal education departments and asks them to identify the real need of new teachers in their schools for the upcoming year. In addition, some administrative data analysis is used from time to time to identify underlying situation. In conclusion, last year's admission quota is taken into account and changes are made where needed.

## LABOR DEMAND FORECASTING MODEL, THE MINISTRY OF ECONOMY 2013-2015

There has been an attempt to create a Lithuanian labor demand model that would provide forecasts on human resources needed in the labor market by the Ministry of Economy in 2013–2015. Based on the final project report prepared on the 18th June, 2015, a short summary on project results is provided below.

The goal of the project was to create and implement human resource demand forecasting and monitoring model and formal qualification links to specific job placements (occupations). Comprehensive system is needed for evidence based policy making, which could at once unify data on the present labour demand and supply situation and forecast for the future by occupational and qualification level.

Similar forecasting models have been developed in almost all EU member states including neighbouring countries Latvia and Estonia. At the moment of final project report preparation, a similar model in Poland was mentioned as being prepared. The Czech Republic, the Netherlands and the United Kingdom might be identified as best practice countries that integrate forecasting and monitoring data into the advanced labor market monitoring system.

The newly created model forecasts labor demand and supply based on mathematical ROA-CERGE model that was initially created by the Research Centre for Education and the Labour Market, Maastricht University (ROA in the Netherlands). This model has been intact for more than 20 years now in the Netherlands and is used for forecasting human resource demand and supply. A similar model has been used and is still being improved for 10 years in the Czech Republic. The Lithuanian forecasting model has taken over almost all ROA-CERGE model components, based on the available data.

By using aggregated historical data on macroeconomic forecasts, employment by sector of economic activity, new labor market entrants, HE graduates and other data, the project team has prepared mid-term, 5-year (2014-2018) forecasts by 21 occupational and 19 qualification clusters. In addition to the forecasting model, labor market monitoring indicators by 92 occupational clusters were calculated and published on the new internet website for monitoring and forecasting results [www.zips.lt](http://www.zips.lt). There are more occupational clusters in the monitoring than forecasting model due to historic data that are used for monitoring indicators. In contrast, to calculate labor demand and supply forecasts, general 5-year employment forecasts prepared by CEDEFOP are used in the forecasting model. Considering statistical errors, each forecasting cluster must be made from higher employee number than clusters in monitoring model.

Lithuanian forecasting model includes almost all resident groups such as employees, the unemployed, students and pupils and can at once estimate labor demand and supply forecasts by specific qualification and occupational clusters. Like other forecasting models, the Lithuanian model considers substitution and

expansion demand effects on employment. The model estimates labor demand forecast for 5 upcoming years that will be needed to be replaced due to ageing labor force or newly established work placements. Since the model uses historical data, the output for years 2014-2018 assumes that general tendencies in education and labor market will stay the same.

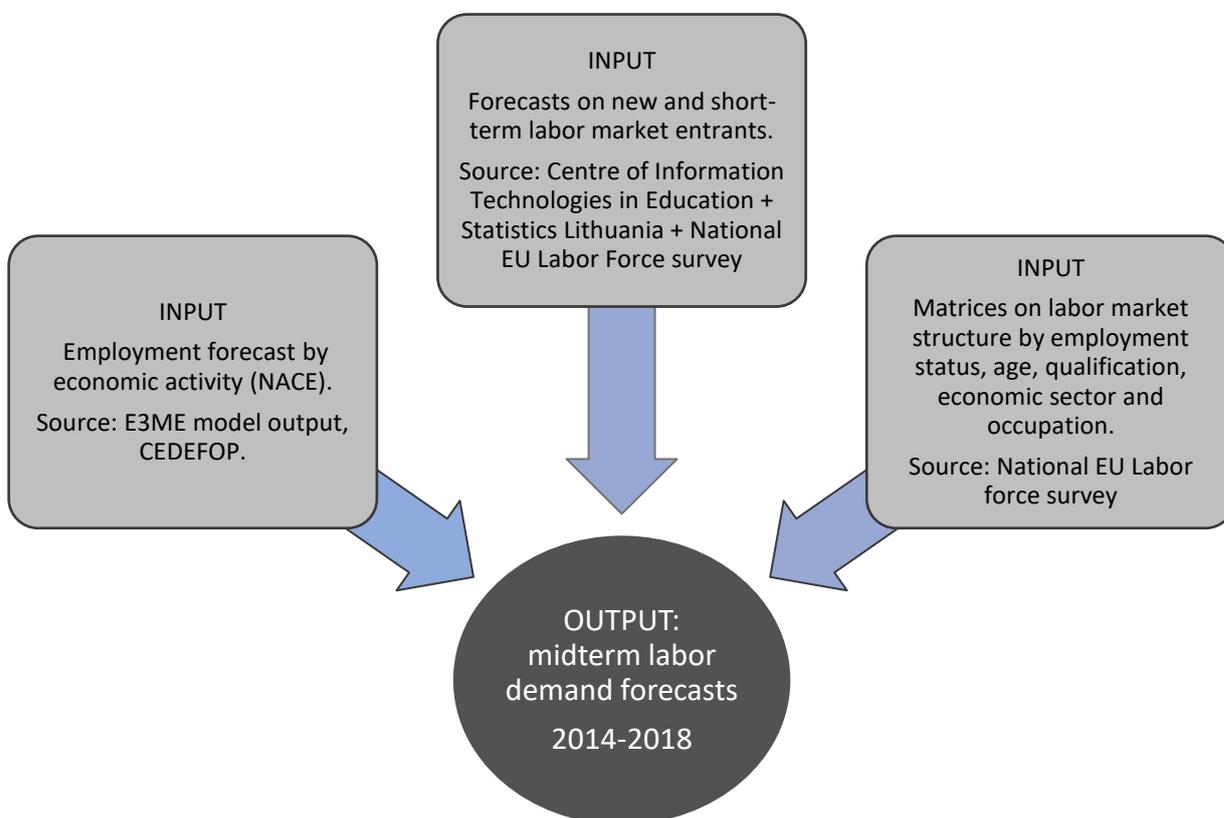


Figure 1. Lithuanian labor demand forecasting model input and output.  
Source: Final project report, 2015

### Model drawbacks and its use for teacher workforce planning

In case the model will be updated with new data, the use of its output to determine specific needs for teacher workforce might be limited due to several reasons.

First, forecasting clusters provide aggregate forecasts for very broad categories. In case of teachers, only one demand forecast is provided for a very broad cluster that consists of: higher education lecturers; pre-school and primary school teachers; secondary school teachers; non-formal education specialists and other specialists; teaching assistants; managers in the education sector. Thus, this forecast does not allow to specify the needs for teachers in a specific educational level, subject, region or other desirable dimension that is relevant in policy making. In addition, there is a rich national register for teacher workforce containing much more variables of interest compared to other free-market professions.

Second, the model’s input is unified for all occupational clusters despite its sector specifics. In case of teaching occupations, indicators such as student-teacher ratio, inactive but qualified teachers cannot be considered.

Third, due to its structure, model does not allow scenarios. Since premade CEDEFOP employment forecasts are used, the model inputs cannot be controlled to calculate pessimistic or optimistic scenarios. As well, necessary adjustments and shifts in input indicators cannot be made to reach, for example, a desirable student-teacher ratio or class size. In addition, there is a risk that in case CEDEFOP will change its employment forecasting model or a component of it, the Lithuanian model will need some major adjustments.

In conclusion, in case the model was updated, it might provide valuable information on the shape and future of the general educational sector. This will add essential background information in making assumptions for the teacher pilot model.

## PROSPECTS FOR A NEW MODEL

### Vision

The project team has a vision that the teacher workforce planning model should be:

- Data driven. Model uses administrative data from the register of teachers and tax authorities as an input and provides quantitative projections or forecasts. The output of the model, together with an expert evaluation or other qualitative analysis, provides annual information for policy making.
- Flexible. The model allows analytics test scenarios by changing model inputs (in example, pupil-teacher ratio)
- Level of detail. The model results are provided by region/teaching subject/year level.
- Automated. The model is updated annually before a budget planning cycle and requires as less human driven data mining as possible.
- Relevant. The model reflects teacher training system aspects.
- Applicable. Model results are used in policy making or specific recommendations in forming the teaching workforce are given.

### Best practice examples

The project team will conduct an exploratory analysis on best practice examples of foreign models used to plan the teacher workforce demand. In some cases, search on models can be limited to language barriers in which the information is provided. A list of agencies/ centres that are in charge of teacher planning models might be helpful to contact. Models are summarized based on the following form similar to the vision statements provided above:

Criteria	Comments
Data needs	
Flexibility (scenario testing)	
Level of detail (region/teaching subject/year)	
Automated (user experience)	

Relevancy (teacher training system)	
Application (policy making)	

## 1. The UK

Teacher Supply Model developed by the UK Department for Education (DfE) has evolved over a number of years. Information can be found online at the following links:

<https://www.gov.uk/government/publications/teacher-supply-model>.

<https://www.gov.uk/government/statistics/teacher-supply-model-2017-to-2018>

### Contents

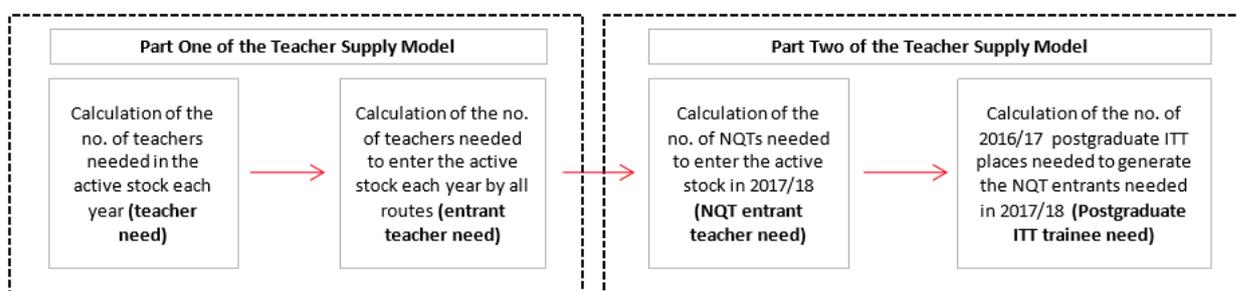
The TSM is a statistical model used to estimate the future national need for teachers. The outcomes from the teacher supply model are used to:

- inform the initial teacher training (ITT) recruitment process
- help us meet the demand for the number of newly qualified teachers

### Output

- The teacher need (the number of teachers needed in the active stock each year),
- The entrant teacher need (the number of teachers required to enter into the active stock each year by all entrance routes into the profession),
- The Newly Qualified entrant teacher need or NQT entrant teacher need (the number of Newly Qualified Teachers required to enter into the active stock in the 2017/18 academic year to meet the needs of the system)
- The postgraduate Initial Teacher Training trainee need or postgraduate ITT trainee need (the number of ITT places required in the 2016/17 academic year to generate this number of NQTs entering into the active stock in 2017/18).
  - This **postgraduate ITT trainee need is the final output** of the 2016/17 Teacher Supply Model and feeds into the NCTL 2016/17 ITT recruitment process. The outputs of the TSM directly inform the phase/subject level ITT recruitment controls **and the amount of funding made available to support trainees.**

### TSM structure



Criteria	Comments
<b>Data needs</b>	<ul style="list-style-type: none"> <li>- Pupil population projections from pupil projections model.</li> <li>- Teacher leavers and entrants' data from School Workforce Census: teachers leaving active stock as wastage, retirements, deaths; data on characteristics (age and gender) of entrants by all entrance routes (snapshot of November)</li> <li>- Teacher stock data from School Workforce Census: teacher characteristics; secondary subject timetable; teachers' FTE rates; teachers' qualification status (snapshot of November)</li> <li>- Projected teacher wastage rates from econometric wastage model.</li> </ul>
<b>Flexibility</b> (scenario testing)	<p>Both parts of the model allow scenario testing capability by altering the assumptions.</p> <p>Scenarios available:</p> <p>Part 1. Impact on teacher need and entrant teacher need by altering future teacher wastage rates by gender; projections of pupil population; projections on how the active stock (via PTR) will change;</p> <p>Part 2. Impact on the postgrad ITT trainee need by altering proportions of newly qualified entrants expected among entrants in active stock;</p>
<b>Level of detail</b> (region/teaching subject/year)	<ul style="list-style-type: none"> <li>- Historical data from 1970-2010/2013 is used to calculate outputs for 2015/2016 – 2026/2027. Each year the model is updated with the data from the latest Censuses.</li> <li>- Only the teachers employed in regular roles within the state-funded schools are considered by the TSM (nursery, primary and secondary).</li> <li>- The Secondary active stock is broken down by subject (19 groups) by using assumptions as to how much work (proportionately) is spent teaching different subjects by the total stock.</li> <li>- Wastage calculations broken down to 3 teaching subject groups and age cohorts.</li> <li>- most of the inputs/outputs are broken down by age group and gender</li> </ul>
<b>Automated</b> (user experience)	The model is broken down into two parts, which inputs and outputs are given in two different

	interactive platforms on Excel. Both documents contain various tabs with calculations that are clearly explained.
<b>Relevancy</b> (teacher training system)	Every year the Department for Education allocates places to ITT providers and School Direct lead schools to provide courses to train new teachers to enter the profession in the state-funded sector in England. Using the outputs of the TSM, the National College for Teaching and Leadership (NCTL) allocates places to ITT providers and School Direct lead schools.
<b>Application</b> (policy making)	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. Some policy changes are included in TSM. For confirmed government policy, the model assumes the expected direction from the announced policy; if a government position has yet to be announced, a range of scenarios is modelled in line with government policy and the central scenario is presented. For example, an assumption that a range of mathematics curriculum and qualification factors will lead to an increase in hours spent teaching mathematics at key stages 4 and 5;

**Overall summary in terms of possible model application to Lithuania:**

- The UK model represents a very comprehensive, well-planned system
- The results are provided via an interactive tool (Excel, separately for Part 1 and Part 2). The tool is very convenient since more people (analytics from the Ministry and others) can use the results, form scenarios, etc.
- In addition, the model has policy assumptions as an input.
- The model is very much data driven (uses time series as inputs from ~1970), Lithuanian teaching workforce records start only in ~2009.
- Main model uses two other external models as inputs: Pupil Projections Model and econometric Teacher Wastage Model (uses forecasts of economic growth and unemployment data, based on teacher wastage and these econ indicators from 1975-2011).

## 2. Ireland

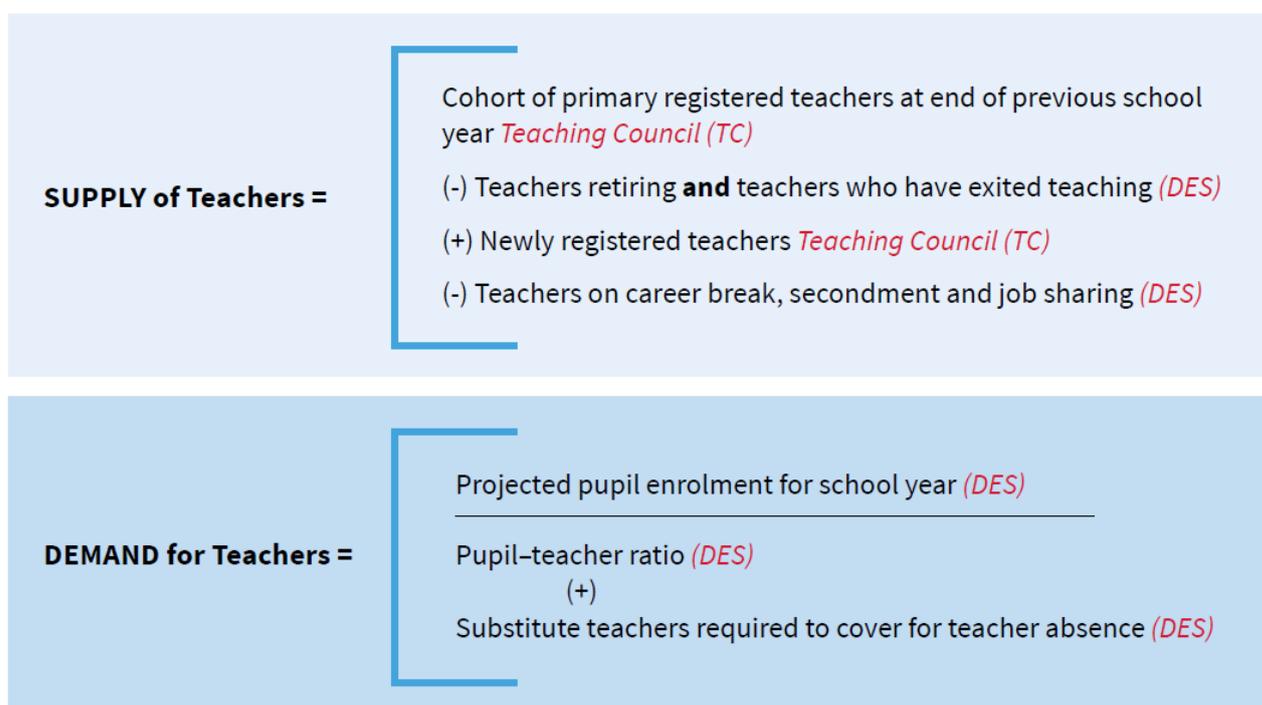
**Source:** “Striking the Balance. Teacher Supply in Ireland: Technical Working Group Report”. The Teaching Council, June 2015. Available at: <http://www.teachingcouncil.ie/en/Publications/Teacher-Education/Teacher-Supply-in-Ireland.pdf>

**Author:** Technical Working Group (TWG), representatives from Department of Education and Skills (DES) and the Teaching Council.

### Output

2015-2020 projections for: current and future pupil numbers; the number of primary teachers currently in service, including those available but not working full-time; about age and gender; about those in training; and about where registered teachers are educated and, insofar as this information is available, currently located; the number of teachers who leave the profession, temporarily or permanently.

### Model structure



Criteria	Primary school teachers	Post-primary
<b>Data needs</b>	Three sources: <ol style="list-style-type: none"> <li>1. Use DES premade selected <b>pupil projections</b> (based on medium migration; gradually declining fertility)</li> <li>2. Teaching Council’s Register. Annual <b>supply/inflows</b> of newly-registered teachers from accredited teacher education programmes,</li> </ol>	Main source: DES annual payroll.

	<p>teachers who qualified abroad, teacher graduates.</p> <p>3. DES payroll system. Number of employed teachers, status of <b>employment</b> (primary teachers)</p>	
<b>Level of detail</b> (region/ teaching subject/year)	<p>No region level included. Reflects primary teaching workforce only (there are no teaching subjects in primary schools).</p> <p>2015-2020 annual projections.</p>	<p>Conclusion on over/undersupply for specific subjects given; no additional details on projections or confidence intervals given for both regional/teaching subject level.</p>
<b>Flexibility</b> (scenario testing)	<p>Possible to adjust model inputs but no examples provided</p>	<p>Possible to adjust model inputs but no examples provided</p>
<b>Automated</b> (user exp)	<p>Projected figures are calculated for 2015-2020 (each year) using snap-shot of available data (one-time report)</p>	<p>Projected figures are calculated for 2015-2020 (each year) using snap-shot of available data (one-time report)</p>
<b>Relevancy</b> (teacher training system)	<p>Hibernia College (commercial provider) is now the largest provider for newly qualified (NQ) primary teachers (50%), there are six HEIs-providers in total. More various providers in post-primary teacher training.</p> <p>Primary teachers (age section 4 -12) are paid via DES payroll system.</p> <p>DES payroll figures suggest that there are only 2% of graduates that do not seek employment in teaching.</p>	<p>Most post-primary teachers are employed by voluntary secondary, community and comprehensive schools that vary in school management, these schools make up almost 2/3 of post-primary schools. The rest are state-established.</p> <p>Teacher education providers currently have full autonomy to decide on enrolments of students, including those with subject specialisms which may be already over-supplied, into teacher education programmes. The extent of over (and under) supply may therefore be partly linked to this unregulated (and possibly uninformed) flexibility.</p>
<b>Application</b> (policy making)	<p>This Report proposes a way forward in respect of planning for teacher supply in primary schools, no specific recommendations on changes provided. Most of recommendations are on data needs and new Standing Committee formation.</p>	<p>The Report also makes suggestions about work which needs to be undertaken to secure a working model for the post-primary sector. However, the TWG has, within the time available, found it difficult to bring together the quite complex data which is needed to plan effectively for the future needs of post-primary schools.</p>

### **Overall summary in terms of possible model application to Lithuania:**

- The Irish model is straightforward and does not require advanced econometric modelling (which might be a good thing considering the time we have).
- It does not provide regional level projections, which we see as an essential element in Lithuanian model.
- The authors as well mention that the post-primary calculations are rough due to data on teaching subjects' issues.
- There are two challenging parts of the model that could be an issue with the data we have (temporary teacher inflow/outflow and teacher with foreign qualification supply).
- Application in decision making not clear.

### **NON-EU:**

#### **Report from Australia**

Paul R. Weldon "The Teacher Workforce in Australia: Supply, Demand and Data Issues", Australian Council for Educational Research, 2015. Available at:

<http://research.acer.edu.au/cgi/viewcontent.cgi?article=1001&context=policyinsights>

#### **Report from the USA**

Sutcher L. et al. "A Coming Crisis in Teaching? Teacher Supply, Demand, and Shortages in the U.S."

Learning Policy Institute, September 2016. Available at: <https://learningpolicyinstitute.org/product/coming-crisis-teaching>

## Data capacities

The Ministry of Education and Science manages several national registers that would be used as data inputs for the model. Individual level data is available on:

<b>Register name</b>	<b>Time span</b>	<b>Educational information</b>	<b>Individual characteristics</b>
<b>Pre-primary education</b>	2009 – 2017 (by school year)	School year, institution, municipality, programme level and length, group type, ISCED level, language of instruction.	Age, gender, nationality, social status, social benefits, special needs.
<b>Primary and secondary education</b>	2009 – 2017 (by school year)	School year, class year, class type, institution, municipality, programme level and length, ISCED level, learning type, language of instruction, non-formal and after class activities, foreign languages, dormitories, drop outs, examinations, class attendance rate.	Age, gender, nationality, social status, social benefits, special needs.
<b>Teachers</b>	2009 – 2017 (by school year)	School year, institution, municipality, workplace type (primary/ secondary employer), occupation at school, teaching or managing job experience in years, teaching subject type, teaching hours by subject by class (grade) category, non-formal education teaching type, international exchange.	Age, gender, nationality, highest educational level acquired, current educational status, qualification category, management category.
<b>Social Insurance Fund Board</b>	2009 – 2017 (monthly)	Monthly insurable income; monthly employment status; type of employment; profession code (national ISCO); firm legal status; social benefits.	Age, gender.

The confidence of registers' time span should be double – checked in case of use. Additional data registers on vocational and higher education are available (additional educational data for recent teacher training graduates). New data sources on registered unemployment and self-employment might be available due to current plans of database modernization.

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