Geospatial modelling in support of Latvia's school network reorganisation initiative

During the last decades, demographic shifts, regional economic developments and changing student needs have generated costly mismatches between educational demand and the supply of school places in several OECD Member and non-Member countries. Operating a fragmented school network with a large number of small schools or schools with overcapacities in terms of staffing can place a significant financial burden on education systems – as is the case for Latvia, in particular in certain geographical areas (i.e. very low density rural areas). Recognising that these shifts are likely to continue and cause further inefficiencies in the years to come, Latvia has made the reorganisation of its school network a policy priority.

The OECD supported the Ministry of Education and Science of Latvia (MoES) in its school network reorganisation initiative. The initiative was founded on the collaboration between the MoES and municipalities and aimed at jointly working to strengthen the child-centred governance of Latvia's school network and the effective management of human resources – and (above all) ensuring a high-quality education for every child regardless of their school location. The technical assistance provided by the OECD centred on a series of capacity building workshops that were facilitated by the OECD Secretariat and the "co-construction" (by the OECD Secretariat and the MoES) of a geospatial simulation model that was used to support the identification of schools that are to be considered for closing or merging.

This report presents the key findings of the geospatial modelling, confirming there indeed is considerable scope for consolidating the school network and offers concrete policy recommendations for MoES and education stakeholders to consider for advancing Latvia's school network reorganisation initiative.

This report was drafted in the OECD Secretariat by Ana Moreno Monroy, Marcos Diaz Ramirez, Carsten Dolle (of the OECD Centre for Entrepreneurship, SMEs, Regions and Cities), Marco Kools and Solène Burtz (of the OECD Directorate for Education and Skills). The OECD Secretariat is very grateful for the good collaboration with the MoES, including Ilze Saleniece, Rinalds Gulbis, Dace Kalsone and Ramona Urtāne, and many other education stakeholders that participated in the capacity building workshops and informed the development of the geospatial model that helped ensure it fits the Latvian context.

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1 Introduction

A school network that provides all students with adequate spaces to learn is a critical pre-condition for an accessible and high-performing education system. During the last decades, however, demographic shifts, regional economic developments and changing student needs have generated costly mismatches between educational demand and the supply of school places in several OECD Member and non-Member countries. Demographic shifts, including migration from rural-to-urban areas may lead to high demand (and under capacity) in urban schools. Operating a fragmented school network with a large number of small schools or schools with overcapacities in terms of staffing can place a significant financial burden on education systems (Cobb, 2020[1]; OECD, 2018[2]) – as is the case for Latvia, in particular in certain areas (i.e. very low density rural areas).

However, while intentions to making adjustments to the school network allow for making the often much-needed efficiency gains, it is vital that these efforts are guided by school quality considerations (Nusche et al., 2016[3]; OECD, 2018[2]). Very small schools may be challenged in their capacities to provide quality education. They often face difficulties in recruiting and retaining teachers in certain subject areas and preparing them to teach effectively, for example for teaching multi-grade classes. They may also lack the student numbers and personnel to offer specialised courses and after-school activities and may struggle to provide a supportive learning environment for specific student groups, such as students with special education needs (Nusche et al., 2016[3]; OECD, 2018[2]).

In several OECD Member and non-Member countries such as Denmark, England (United Kingdom), Estonia, Lithuania, Moldova, Portugal, Wales (United Kingdom) and the United States the reorganisation of the network of schools has become a policy priority in recent years. In these countries school consolidation efforts have been geared towards ensuring access to quality education and enhancing efficiency to free up resources for the improvement of student outcomes (Ares Abalde, 2014[4]; OECD, 2022[5]; OECD, 2018[2]; OECD, 2016[6]; OECD, 2017[7]; OECD, 2023[8]; Cobb, 2020[1]; Collingwood, Jochim and Oskooii, 2018[9]). A range of measures exist to achieve school consolidation including the grouping of schools under a single school leader or leadership team (school clusters), promoting the sharing of resources across schools and the closing of selected schools and transferring of students to proximate schools, among others (OECD, 2018[2]). The choice of measure will very much depend on the context faced and the specific schools and localities at stake.

The geospatial analysis presented in this report concerns specifically the identification of schools to be considered for closing and transferring of students to nearby schools. The use of the wording "to be considered" is deliberate as although the geospatial analysis may point to the need for closing a specific school, there may and almost certainly will be some cases where this may not be desirable to all parties involved. In such cases alternative options may be explored, such as the mentioned consolidation of two or more schools under one school leader or leadership team. This option would still bring about efficiency gains (Ares Abalde, 2014[4]).

The OECD supported the Ministry of Education of Latvia (MoES) in its initiative to consolidate its fragmented school network. This initiative was founded on a collaboration between the MoES and municipalities, aimed at jointly working to strengthen the child-centred governance of Latvia's school network and the effective management of human resources – and (above all) ensuring a high-quality education for every child regardless of their school location. This collaborative approach was vital also considering that municipalities are the owners of (most) public schools in Latvia. Ultimately, they have the responsibility to decide on the measures needed to optimise and consolidate their local school networks to ensure their efficiency and that all children are able to enjoy a quality education.

The technical assistance provided by the OECD centred on a series of capacity building workshops for staff from the MoES and other ministries that were organised and facilitated by the OECD Secretariat and the "co-construction" (by the OECD Secretariat and the MoES) of a geospatial simulation model that was used to support the identification of schools that are to be considered for closing or merging.

The remainder of the report is structured as follows: Section 2 provides a brief overview of the school network in Latvia. This is followed by a description of the geospatial analysis model and examines the results of estimating the costs and accessibility of schools (Section 3). Building on a cost-accessibility classification, Section 4 simulates "cost savings" associated to reorganising the school network, provided costly and accessible schools are merged with other schools in the network. Section 5 summarizes the conclusions of the geospatial modelling and offers recommendations for MoES and education stakeholders to consider for advancing Latvia's school network reorganisation initiative.

Project overview and methodology

The objective of the project was to provide technical assistance to the MoES in support of its school network reorganisation initiative. At the time when the OECD started supporting this ongoing initiative (May 2023), the MoES was exploring a framework of indicators to evaluate the school network and guide school consolidation discussions between the MoES and municipalities. The framework explored four key areas: 1) accessibility, measured by distance to schools or between schools; 2) the number of students in class groups; 3) the capacity of teaching staff; 4) the costs per student. The geospatial analysis presented in this report was aimed to support the MoES in strengthening the measurement of indicators 1) and 4) and provides a pathway to adapt the school network, while minimising the impact on accessibility to schools, saving costs and considering the quality of education in schools.

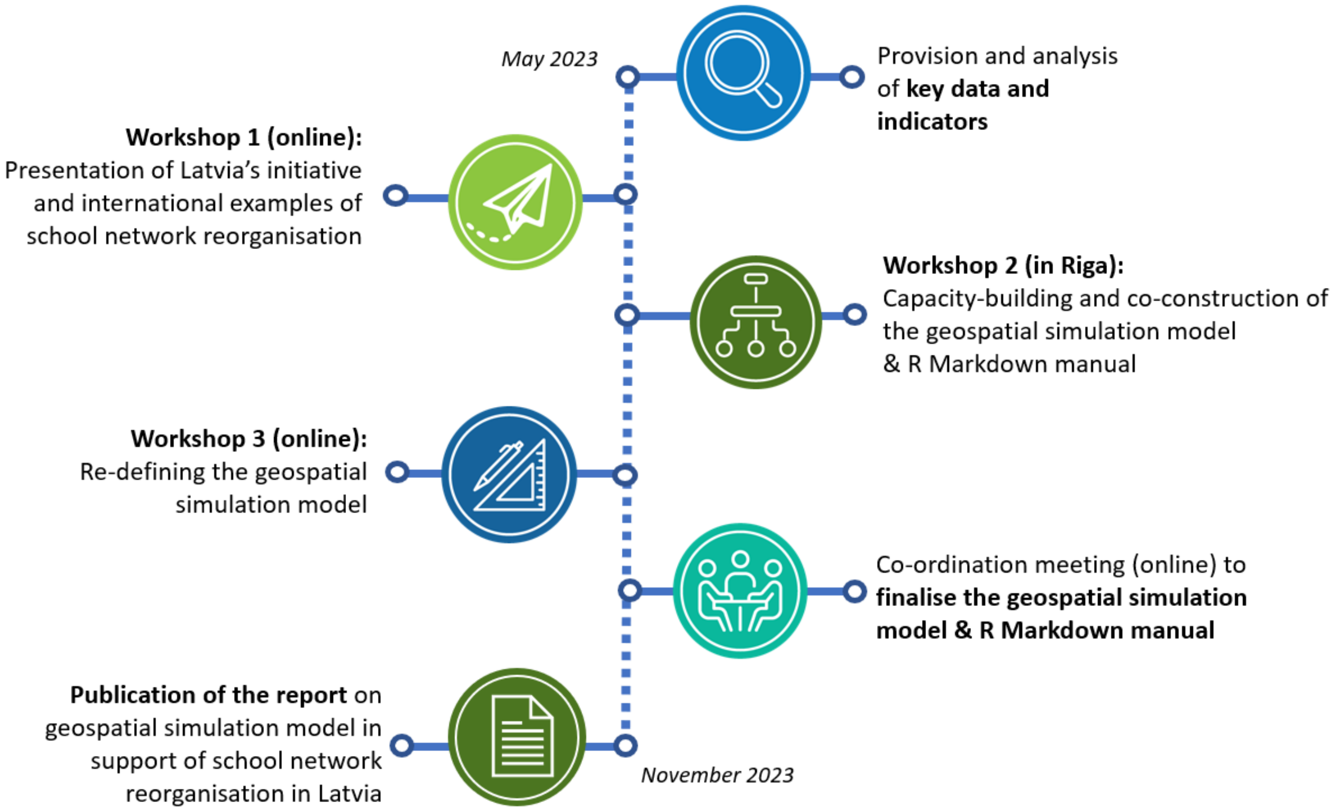
As mentioned above, the technical assistance centred on the facilitation of a series of online and face-to-face capacity building workshops and the co-construction of a geospatial simulation model that was used to support the identification of schools that are to be considered for closing or merging (see Figure 1.1). The project greatly benefited from a strong collaboration process between the OECD- and MoES project teams which allowed for an in-depth examination of the data and the development of a geospatial simulation model fitting the Latvian context.

Building on a large and growing body of geographic education policy research that has been amassed in the past 25 years (Jacobs-Crisioni et al., 2023[10]; Cobb, 2020[1]), including recent OECD research (OECD/EC-JRC, 2021[11]; OECD, 2023[8]), the geospatial simulation model examined the opportunities for school network consolidation in the Latvian context. The model combined granular and timely (i.e. the most recently available) data on Latvian schools' characteristics, expenditures and outcomes, and administrative records and geospatial data provided by the MoES. This allowed for quantifying resource gaps by type of school and by degree of urbanisation. The model identified a considerable number of schools with a high potential for consolidation, which is key to supporting an evidence-based dialogue on the reorganisation of Latvia's school network. This work resulted in several outputs:

- A co-constructed geospatial simulation model that fits the Latvian context
- A (draft) master list of schools to be considered for reorganisation

- A manual (using R Markdown[1]) with all the steps and related code necessary to estimate the model. This manual is key for replicability and transparency of the model, as well as for future updates and refinements carried out by MoES
- This report which presents the key findings of the geospatial analysis and offers recommendations for advancing Latvia's school network reorganisation initiative.

Figure 1.1. Project overview and timeline



[1] R Markdown is a file format for making dynamic documents with R which is a free software environment for statistical computing and graphics. For more information see https://rmarkdown.rstudio.com/articles_intro.html.

2 The school network in Latvia

The section aims to provide an insight into Latvia's school network to help the reader place the presentation of the geospatial modelling that is presented in the following sections into context. It starts by providing an overview of Latvia's school network. This is followed by an examination of the different school types and premises, their size by numbers of students and teachers and geographical distribution. The degree of urbanisation of Latvian municipalities is used to classify school premises according to their geographical location.

Overview of the school network

In the school year 2022/23, the school network of Latvia (excluding institutions that only provide pre-school education) comprised 527 schools and 17 180 (full-time equivalent) teachers and 3 004 (full-time equivalent) non-teaching staff. It delivered education to around 216 000 students (that make up about 12% of the Latvian population), distributed in four educational levels, namely 6% in early childhood education and care (ISCED[2] level 0), 53% in primary education (ISCED level 1), 27% in lower secondary education (ISCED 2) and 14% in upper secondary education (ISCED 3). To deliver different combinations of educational levels, Latvia has five types of pre-tertiary education institutions:

- Early childhood education and care institutions or pre-primary schools offer programmes for children aged 1 to 2 (ISCED level 01) and aged 3 to 6 (ISCED level 02). These schools/institutions are beyond the scope of this report. Since 2002, pre-primary education has been compulsory for 5 and 6-year-old children.
- Primary schools catering for children aged 7 to 12. Some of these schools also offer pre-primary education (ISCED level 02).
- Basic education schools that offer primary- and lower secondary education for children from the ages of 7 to 15. Some of these schools also offer pre-primary education.
- Secondary schools that mainly offer primary, lower- and upper secondary education for children from the age of 7 to 18), but that can also provide pre-primary education.
- State gymnasiums which mainly offer lower- and upper secondary education, but that can also provide primary education.

In Latvia, the majority of students (87%) receive education in a basic education or secondary school. Primary schools make up only a small share of schools (7%) and involve 4% of the student population and 4% of teachers. Basic education schools represent almost half of all schools (47%) and a smaller share of students (25%) and teachers (29%). In contrast, secondary schools account for around 40% of all schools,

[2] The International Standard Classification of Education (ISCED 2011) provides a comprehensive framework for organising education programmes and qualification by applying uniform and internationally agreed definitions to facilitate comparisons of education systems across countries. For more information see https://uis.unesco.org/en/topic/international-standard-classification-education-isced.

but have the largest proportion of students and teachers. Latvia's 31 gymnasiums serve 9% of the student population and employ 9% of the teachers (Table 2.1).

Table 2.1. Schools, students, and teachers by type of school

School type	Number of schools	Share of schools (%)	Number of students	Share of students (%)	Number of teachers (FTE)	Share of teachers (%)	Average school size
Primary	38	7	9 135	4	732	4	240
Basic	250	47	53 727	25	4 992	29	215
Secondary	208	39	133 942	62	9 954	58	644
Gymnasium	31	6	19 118	9	1 501	9	617
Total	527	100	215 922	100	17 180	100	429

Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science. These data include schools also offering pre-primary education (ISCED level 02).
Schools/institutions only offering early childhood education and care are excluded from the analysis.
FTE stands for full-time equivalent.

The schools can deliver education through one or more sites or premises. Latvia's 527 schools deliver education through 745 school premises. In the 2022/23 school year, around 68% of schools had only one premise, while 25% had two premises and 5% had three premises. Only 2% of schools had four, five or six premises (Table 2.2). School premises may exist to increase the geographical reach of schools and bridge accessibility gaps in rural areas, while spreading fixed costs such as management over more students (OECD, 2018[2]). However, the data showed that premises of the same school are typically located close to one another; an estimated driving time ranging from 3 to 14 minutes (Table 2.2). School premises may carry significant costs that are not necessarily considered in an estimation of annual running costs, for instance costs related to the construction, repair, maintenance and heating of the school building. Investigating the reasons for the location decisions of school premises and whether they make financial sense is beyond the scope of this report, but it is an important area for further examination.

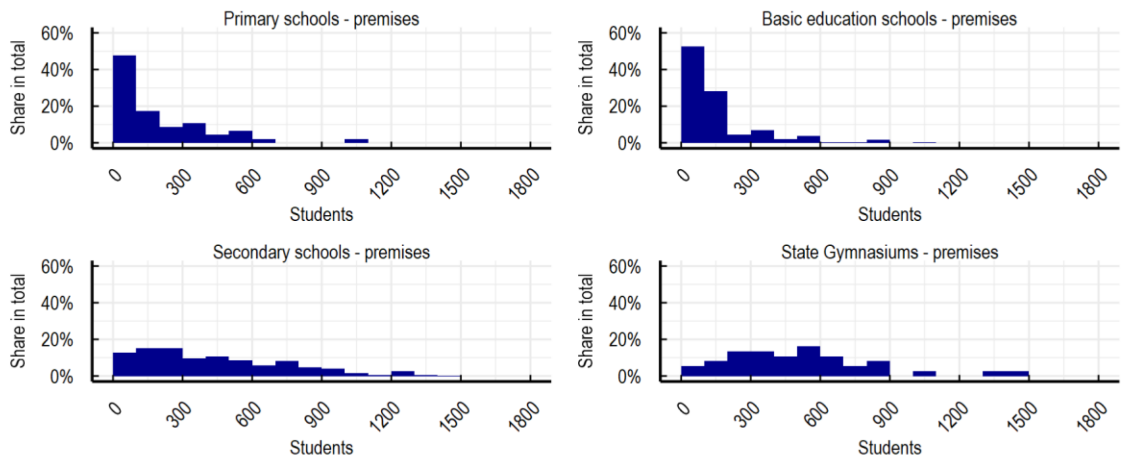
Table 2.2. Schools by number of premises

Number of premises of one school	Number of school headquarters	Share of total school headquarters	Number of school premises (all ISCED levels)	Share of premises (%) (all ISCED levels)	Number of school premises (excl. ISCED 02)	Share of premises (%) (excl. ISCED 02)	Mean driving time to premises of same school (minutes) (excl. ISCED 02)
1	359	68.1	359	48.2	359	56.3	0
2	132	25	264	35.4	199	31.2	3.5
3	26	4.9	78	10.5	54	8.5	9.2
4	7	1.3	28	3.8	16	2.5	14.1
5	2	0.4	10	1.3	7	1.1	8
6	1	0.2	6	0.8	3	0.5	5.4
Total	527	100	745	100	638	100	5.6

Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.

The average number of students per school in Latvia is around 410, while the average number of students per school premise is 290. On average, the student numbers in premises of basic education schools were smaller than in primary school premises (150 students per school premise in basic education schools compared to 200 students in primary schools, on average). Premises for secondary schools and state gymnasiums are on average larger, with about 440 and 520 students per school premise, respectively. Most primary- and basic education school premises were smaller than 100 students with only a few school premises having 300 or more students. The number of students in premises of secondary schools and gymnasiums were more evenly distributed with most having over 380 students (Figure 2.1).

Figure 2.1. Size distribution of premises by type of school



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.

Geographical distribution of the school network

The degree of urbanisation of Latvian municipalities provided a coherent methodology to classify school premises according to their geographical location[3]. Latvia is divided into 43 local administrative units, i.e. 36 municipalities (*novadi*) and seven state cities – hereafter referred to as "municipalities" for simplicity.

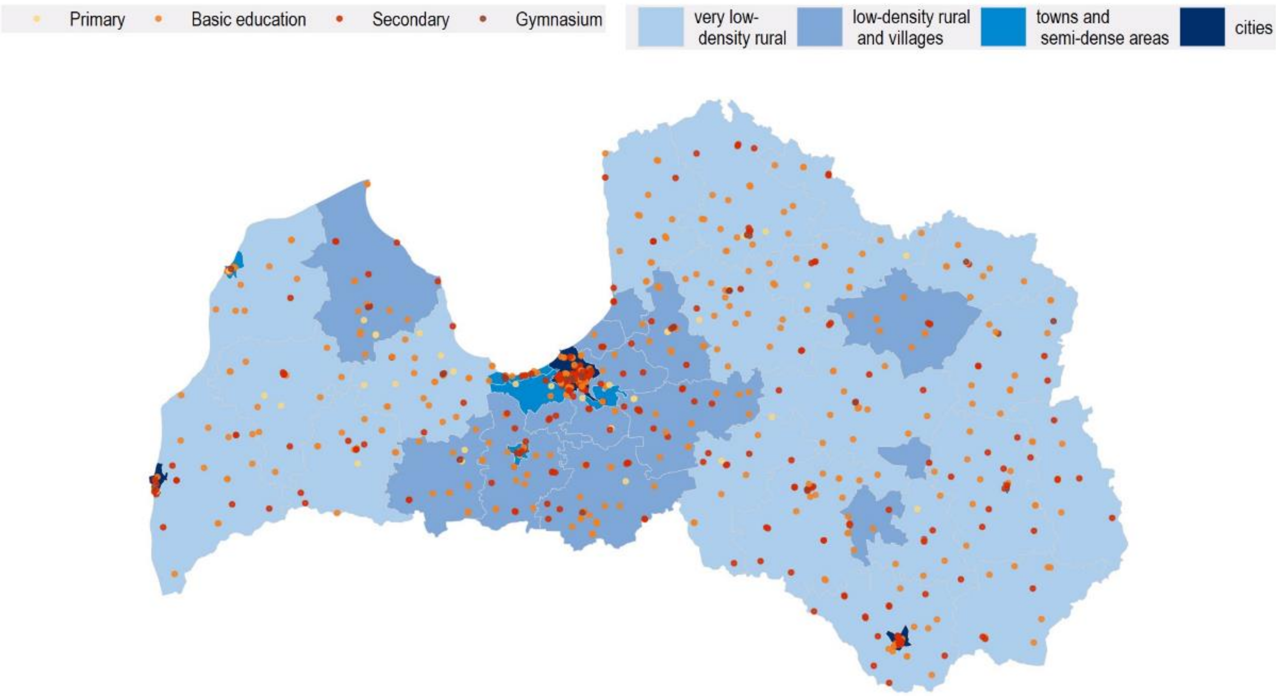
Municipalities have significant responsibility and autonomy for public service delivery, including in the field of education. Municipalities are responsible for providing their children with the ability to acquire a quality education at the school closest to their homes. This includes the establishment, reorganisation and closing of Early Childhood Education and Care (ECEC) institutions, primary, basic education, secondary schools in co-ordination with the MoES (European Commission, 2023[12]; OECD, 2016[6]). The municipal administration is shaped by Education Boards that are responsible for the provision of ECEC, basic education, upper secondary education (general and vocational) and non-formal adult education in their territory. Municipalities establish and finance these boards and appoint the head in co-ordination with MoES. These boards could be the part of the governing body of a municipality, for example in the form of an education department. The board members consist of experts on different educational matters. The

[3] At the time of writing the Ministry of Education and Science of Latvia was considering a typology for schools based on student density at the municipal level. For a detailed discussion on the advantages of using the degree of urbanisation methodology rather than the student density classification see Annex A.

boards' functions include the implementation of local educational policy, the allocation of state grants to schools for the salaries of teaching and other staff, and the organisation of teachers' professional development (OECD, 2016[6]).

Municipalities can be classified by their degree of urbanisation; a methodology that is used to classify settlements in a consistent and internationally comparable way based on fine-grained information on built-up area and population (OECD; European Union; FAO; UN-Habitat; World Bank, 2021[13]) (see Annex A for more details). To get a more balanced representation of schools across categories, this report made use of four degrees of urbanisation categories: "very low-density rural", "low-density rural and villages", "towns and semi-dense" (hereafter "towns") and "cities"[4]. Figure 2.2 shows the Latvian municipalities by degree of urbanisation and the location of school premises by type of school.

Figure 2.2. Localisation of school premises by type of school and degree of urbanisation



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

Nearly half of Latvia's schools are located in very low-density rural municipalities (Table 2.3). Cities and towns provide education to around half of Latvia's students, but through less than a third of the schools in the network. Average school sizes are considerably higher in cities and towns (750 and 630 students, respectively) compared to average school sizes in rural areas (below 370 students).

[4] Using four rather than six degrees of urbanisation categories for the analysis is a compromise to capture a smoother school size gradient and to simplify the cost modelling, particularly considering that using the maximum number of categories would yield groups with no or very few schools, and that within variations for the groups "low density rural" and "towns and semi-dense" (which are the groups that could be further disaggregated) are fairly small and captured by the aggregated group average, see Annex A.

Table 2.3. Schools, students, and teachers by degree of urbanisation

Degree of urbanisation	Number of schools	Share of schools (%)	Number of students	Share of students (%)	Number of teachers (FTE)	Share of teachers (%)	Average school size
Very low density rural	249	47	57 820	27	5 603	33	232
Low-density rural and villages	119	23	43 711	20	3 657	21	367
Towns and semi-dense	43	8	27 130	13	1 958	11	631
Cities	116	22	87 261	40	5 962	35	752
Total	**527**	**100**	**215 922**	**100**	**17 180**	**100**	**496**

Note: These data include schools also offering pre-primary education (ISCED level 02). Schools/institutions only offering early childhood education and care are excluded from the analysis.
Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

3 Assessing the cost, access and quality of schools in Latvia

This section presents the results of the modelling of costs and accessibility of schools in Latvia, aimed at identifying "high-cost" and "high-accessible" (schools at short distance from other schools offering the same education level) schools to be considered for the reorganisation of the school network (see Section 4). The simulation model used for estimating the costs and accessibility of school premises was adapted from previous OECD work on supporting the efficient delivery of public services while guaranteeing good access for all in the face of demographic change (OECD/EC-JRC, 2021[11]; OECD, 2022[5]). This section starts with a description of the methodology and parameters used to estimate school running costs (excluding infrastructure and capital investments). This is followed by an estimation of the physical accessibility of school premises across Latvia.

An estimation of school costs

School-level characteristics (such as number of students, teachers and support staff) provided the basis to estimate the costs for each school (OECD/EC-JRC, 2021[11]). Table 3.1 summarises the parameters used in the model. The simulation model estimated total annual running costs for each school based on the number of students enrolled. It did not impose any additional costs associated with the location of the school. Importantly, the cost estimation did not consider capital costs as these require a different empirical approach to modelling and measurement, for instance to consider different types of capital costs and their volatility over time.

The annual running costs were based on three main components: 1) teaching staff costs; 2) non-teaching staff costs; and 3) remaining costs, consisting only of catering and teaching materials.

Table 3.1. Assumed parameters for school costs estimation

Parameter	Primary	Basic education	Secondary	Gymnasium
Mean student-to-teacher ratio	11.02	9.67	12.88	12.14
Ratio support staff to teachers in FTE	0.10	0.09	0.10	0.06
Ratio administrative staff to teachers in FTE	0.10	0.10	0.07	0.08
Ratio Mean wage support staff / Mean wage teaching staff (EUR)	0.52	0.45	0.64	0.78
Mean wage administrative staff / Mean wage teaching staff (EUR)	1.69	1.43	1.46	1.43
Mean wage teaching staff (EUR)	9 629.53	8 885.49	12 275.10	13 973.79
Mean expenditure in catering per student (EUR)	265.20	210.43	170.39	105.89
Mean expenditure in teaching resources per student (EUR)	37.27	38.61	33.92	40.67

Note: For expenditure on catering, municipalities can provide a 50% supplementary budget, in which case the average expenditure per student ranged from around 180 EUR per student to nearly 360 EUR per student.
Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.

Other running costs include those related to premises (such as electricity and water bills). These however were not included in the model estimations as their share was considerably higher than expected. The MoES agreed that these data required further examination before considering including these in future iterations of the simulation model. Cost savings therefore only refer to annual running costs savings (that are based on the three components mentioned above), and not to other savings associated with waived infrastructure and maintenance costs for instance.

Model description

To estimate teaching costs the model first derived the number of teaching staff needed in each school according to a set student-to-teacher ratio. Teachers are often shared across ISCED levels within each school, making it difficult to estimate the number of teachers based on student-to-teacher ratios by ISCED level. To estimate the total number of teachers per school, the model used instead a student-to-teacher ratio by school type and then distributed the teachers to each ISCED level according to the share of students in each ISCED level (including ISCED level 02 (early childhood education and care) where applicable).

To estimate the number of teaching staff in each school, the model drew values from an ordered probability distribution of student-to-teacher ratios and assigned to each school the corresponding number of teachers. Assigning teaching staff in this way ensures that schools have teaching staff numbers that are proportional to their size, while allowing for some variation in the number of staff across schools in the same size range (OECD/EC-JRC, 2021[11]; Jacobs-Crisioni et al., 2023[10]).

The model further used average actual wages by ISCED level to obtain teaching staff costs. As before, costs in teaching staff were assigned to each school by drawing random values for an ordered normal distribution of teaching staff with a mean based on 2021/22 average actual wages (by ISCED level)[5] and a standard deviation of EUR 1 000.[6] Wages vary depending on the skills, qualifications, and seniority of teachers. To capture this, the model assumed that 60% of ISCED levels 1 and 2 teachers were paid at half the mean school salaries, 10% were paid at 1.5 mean salaries and the remaining share were paid at mean school salaries. For ISCED level 3 (i.e. upper secondary education), the respective shares were 20% and 40%, to reflect the higher specialisation of teachers at those levels (OECD/EC-JRC, 2021[11]; Jacobs-Crisioni et al., 2023[10]; OECD, 2022[5]).

To estimate non-teaching staff costs, the model multiplied actual proportions of administrative and support staff to teaching staff per school type by the number of teachers (in ISCED levels 02-3). Support staff includes speech therapists, psychologists, librarians, career consultants, special education teachers, and pedagogical assistants. Non-teaching staff consists of administrative staff, including the school principal.

As Table 3.1 shows, schools had approximately 10 administrative staff per 100 teaching staff, with some variations across school types. After multiplying these proportions by the number of teachers (full-time equivalent, ISCED levels 02, 1, 2 and 3), non-teaching staff costs resulted from multiplying the estimated number of administrative and support staff by their respective average (full-time equivalent) wages[7] and a scaling factor (calculated from the ratio of the average wages of administrative or support staff to the average wage of teaching staff).

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[5] Average actual wages in 2021/22 were EUR 17 672 for ISCED level 1 (primary education), EUR 17 693 for ISCED level 2 (lower secondary education) and EUR 18 837 for ISCED level 3 (upper secondary education).

[6] While the model did estimate the number of teachers in ISCED level 02 (early childhood education and care), the associated costs were not calculated as the exercise focused on the ISCED levels 1-3.

[7] These average wage values are provided in the data at the school level.

According to the data provided by the MoES, administrative staff earned around 1.4 times the average wage of teaching staff. This wage gap may result from the wages of principals that were higher than those of teaching staff for each ISCED level in 2021/22. In turn, support staff earned around 60% of the average wage of teaching staff. The gap between support staff and teaching staff wages varied considerably across school types and was found particularly low in basic education schools (45% of the average wage of teaching staff).

Finally, the model estimated remaining costs including government expenditures on teaching materials and catering. Expenditure in teaching material was found equal to a constant annual cost per student of EUR 36, while catering amounted to EUR 177 per student per school year.

Model performance

The model estimated 543 more teachers than observed in the actual data. However, the model tended to estimate less teachers in rural areas (suggesting overstaffing) and more teachers in towns and cities (suggesting understaffing or shortages) (see Table 3.2). The largest absolute differences are in very low-density rural municipalities; basic education schools, secondary schools and gymnasiums in very low-density rural municipalities were all shown to have significantly higher numbers of teachers – and overall, more staff (teaching and non-teaching) – than estimated through the model.

Table 3.2. Comparison of actual and estimated teachers and staff, by degree of urbanisation and school type

Degree of urbanisation	School type	Teachers FTE (02-3 ISCED) Actual	Teachers FTE (02-3 ISCED) Estimated	Teachers FTE (1-3 ISCED) Actual	Teachers FTE (1-3 ISCED) Estimated	Staff FTE (1-3 ISCED) Actual	Staff FTE (1-3 ISCED) Estimated
Very low-density rural	Primary	286	286	231	238	283	294
Low-density rural and villages		161	151	110	114	147	144
Towns and semi-dense		156	165	131	150	165	182
Cities		129	165	129	165	158	198
Very low-density rural	Basic education	2 136	1 962	1 711	1 555	2 124	1 917
Low-density rural and villages		1 258	1 235	994	1 001	1 214	1 229
Towns and semi-dense		652	778	621	751	755	895
Cities		946	1 252	896	1 199	1 085	1 430
Very low-density rural	Secondary	2 776	2 469	2 648	2 373	3 118	2 787
Low-density rural and villages		2 001	1 979	1 875	1 888	2 269	2 220
Towns and semi-dense		798	856	785	846	916	989
Cities		4 380	4 707	4 128	4 523	4 819	5 314
Very low-density rural	Gymnasium	406	387	406	387	462	442
Low-density rural and villages		237	236	237	236	273	270
Towns and semi-dense		352	360	352	360	402	412
Cities		506	517	506	517	574	591

Note: Total staff (last two columns of the table) include both teaching and non-teaching staff (which comprises support and administrative staff). Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science. See Annex A for definitions of the degree of urbanisation.

The model further showed that the estimated expenditure was three percentage points below actual expenditure, on average (see Table 3.3). In general, the model estimated larger shares of expenditure on teachers and support staff, compared to the actual data. This results from the larger estimated numbers of teachers and support staff (especially in cities) and relatively low wages within schools (especially in primary- and basic education schools). As in the case in England (United Kingdom) (OECD/EC-JRC, 2021[11]), the shares of expenditure did not follow a clear geographical pattern. This supports the approach adopted by this report of not introducing a geographical factor in the estimation of school-level costs, but rather allowing these differences to emerge from the estimated data.

Table 3.3. Comparison actual and estimated expenditure shares, by degree of urbanisation and school type

Degree of urbanisation	School type	Share of expenditure on teaching staff Actual	Share of expenditure on teaching staff Estimated	Share of expenditure on non-teaching staff Actual	Share of expenditure on non-teaching staff Estimated	Share of remaining expenditure Actual	Share of remaining expenditure Estimated
Very low-density rural	Primary	65.1	66.2	15.8	16.6	19	17.2
Low-density rural and villages		61.9	64.9	23.8	18.5	14.3	16.6
Towns and semi-dense		63.3	67.3	20.2	15	16.5	17.7
Cities		63.2	68.2	16.5	14.1	20.3	17.7
Very low-density rural	Basic education	69.4	72.8	19.2	14.1	12	13.1
Low-density rural and villages		69.6	73	17.2	13.4	13.2	13.5
Towns and semi-dense		71.4	74.6	16.4	10.9	12.2	14.5
Cities		66.1	74.6	15	11.1	18.9	14.3
Very low-density rural	Secondary	75	73.2	14.9	13.1	10.4	13.7
Low-density rural and villages		72.6	73	16.9	12.8	11	14.2
Towns and semi-dense		74	73.9	13.8	12.1	12.2	13.9
Cities		70.2	73.5	13.4	12.4	16.3	14.1
Very low-density rural	Gymnasium	82.8	76	12.5	15.1	4.7	8.9
Low-density rural and villages		79.4	76	13.4	14.7	7.2	9.3
Towns and semi-dense		79.8	76.2	13.4	14.3	6.8	9.5
Cities		75.3	76.9	11	13.7	13.7	9.3

Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

One geographical difference that stands out is that city schools spend relatively more on remaining costs (consisting of catering and teaching materials in this analysis) and relatively less on teaching staff costs compared to schools in other areas. Given the model consistently overestimated the number of staff in city schools, this difference may be related to actual staff wage cost differences between cities and other municipalities.

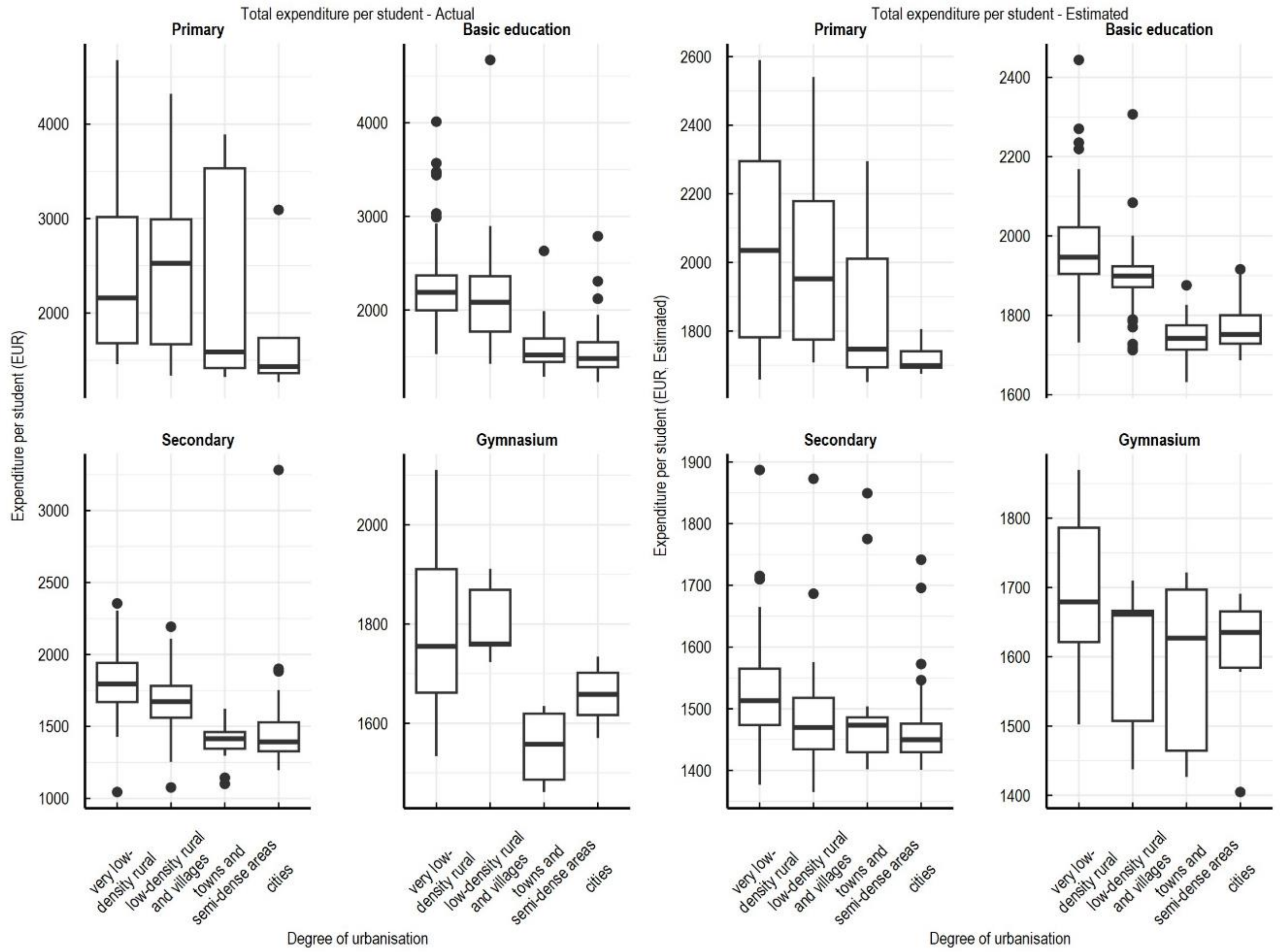
Despite these differences, the model reproduced the geographical patterns in the expenditure per student data well (Table 3.4). It captured the expected pattern of decreasing teaching and non-teaching costs per student as density increases. The model also well reproduced the observed differences in the data across school types in each degree of urbanisation, the variability within each type of school and the degree of urbanisation (Figure 3.1). This was notable since these estimated geographical differences arose directly from differences in school cost in each area, instead of from any pre-determined geographical differences in the model.

Table 3.4. Comparison actual and estimated expenditure per student, by degree of urbanisation and school type

Degree of urbanisation	School type	Expenditure in teaching staff per student (ISCED 1-3) Actual	Expenditure in teaching staff per student (ISCED 1-3) Estimated	Expenditure in non-teaching staff per student (ISCED 1-3) Actual	Expenditure in non-teaching staff per student (ISCED 1-3) Estimated	Total expenditure per student (ISCED 1-3) Actual	Total expenditure per student (ISCED 1-3) Estimated
Very low-density rural	Primary	1 203.5	1 207.7	573.1	515.3	2 159.4	2 034.9
Low-density rural and villages		1 284.3	1 189.1	679.4	426.7	2 526.6	1 952.3
Towns and semi-dense		1 013.0	1 184.8	285.4	253.1	1 587.0	1 746.7
Cities		891.8	1 161.1	239.3	236.4	1 433.1	1 699.0
Very low-density rural	Basic education	1 477.1	1 410.2	418.9	290.8	2 188.6	1 946.3
Low-density rural and villages		1 417.5	1 356.8	358.9	284.8	2 084.0	1 899.3
Towns and semi-dense		1 068.5	1 305.2	244.4	192.0	1 520.5	1 742.2
Cities		950.5	1 307.6	245.9	190.6	1 482.0	1 752.0
Very low-density rural	Secondary	1 317.6	1 102.8	276.5	199.2	1 795.8	1 513.2
Low-density rural and villages		1 174.9	1 064.6	261.0	190.1	1 672.2	1 469.7
Towns and semi-dense		1 038.9	1 083.6	200.1	183.6	1 414.3	1 473.4
Cities		956.8	1 062.8	194.7	179.5	1 393.2	1 449.9
Very low-density rural	Gymnasium	1 472.4	1 287.0	212.1	250.5	1 755.1	1 679.2
Low-density rural and villages		1 506.4	1 272.9	223.2	239.3	1 759.7	1 661.4
Towns and semi-dense		1 278.4	1 252.9	223.8	227.5	1 557.6	1 627.0
Cities		1 305.2	1 264.7	139.7	221.3	1 658.4	1 635.1

Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

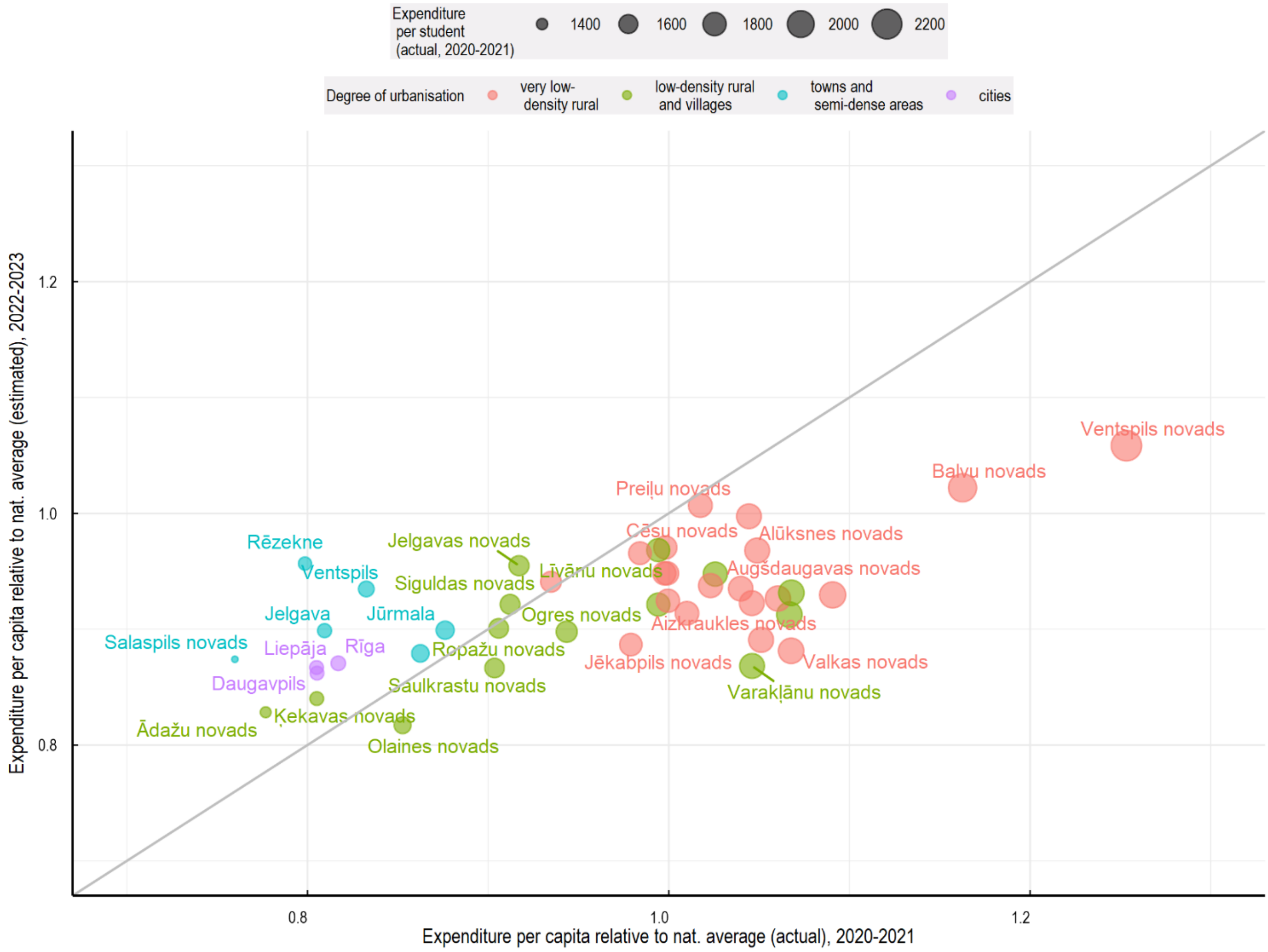
Figure 3.1. Comparison of the actual versus estimated variation in expenditure per student, by school type and degree of urbanisation



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

The estimates also showed that very low-density rural areas spent more on running their schools than would have been expected based on their size. Figure 3.2 compares estimated costs and actual expenditure per student by municipalities, relative to the national median. Values smaller than 1 indicate that the municipal costs per student are below the national median. Larger values in turn show that the costs per student are above the national median. For instance, the value for the actual expenditure in Ventspils Novads was found to be 1.25, meaning that the municipality had per student costs that were 25% larger than the national median. In the figure, values close to the 45-degree line indicate alignment between the estimated costs and actual expenditure. Values to the right (left) of the 45-degree line indicate that the actual expenditure of the municipality (relative to the national median) is larger (smaller) than the estimated running costs. All city and town municipalities fall on the left of the 45-degree line, suggesting that they were spending less than estimated by the model. In contrast, most municipalities located in very low-density rural areas fell to the right of the 45-degree line, indicating that actual expenditure for their schools was larger than the estimated running costs.

Figure 3.2. Actual versus estimated expenditure per student, by degree of urbanisation and municipality

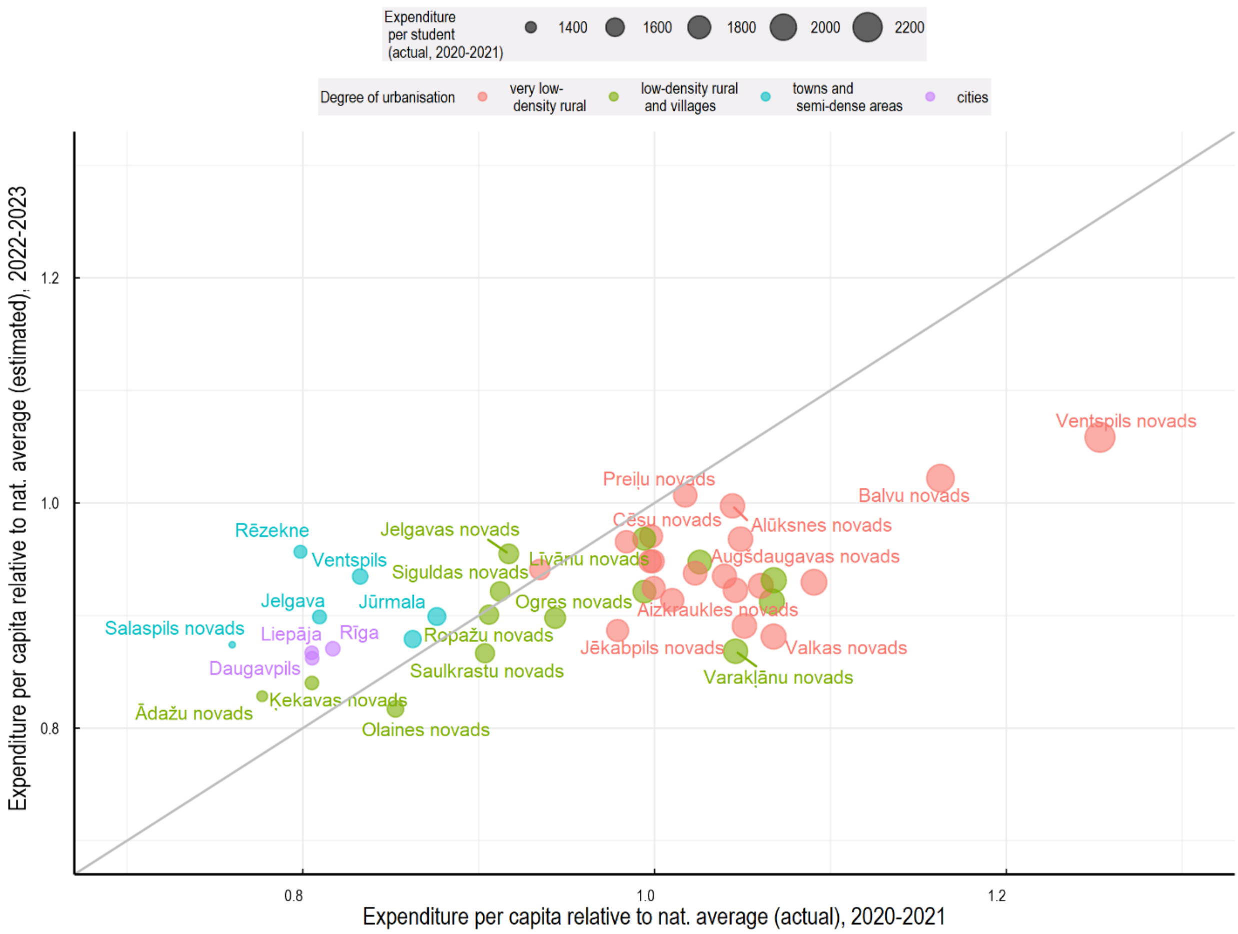


Note: Estimates based on 2022/23 school year data and actual based on 2020/21 school year data, provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

A similar picture emerged when comparing the actual and estimated shares of total expenditure by municipality. This comparison signals whether resources are allocated across municipalities in a way that reflects differences in costs resulting from differences in the number and distribution of students in municipalities. Figure 3.3 shows the results, excluding Riga for visual purposes[8]. Municipalities classified as cities and towns got a smaller share in the total estimated expenditure, compared to the actual expenditure (i.e. they are at the left of the 45-degree line), while some rural municipalities got a larger share than expected. Despite these differences, the shares of total expenditure by municipality were found similar in the estimated and actual data.

[8] Riga has a share of 30%, far larger than the next largest share of around 4% in Daugavpils.

Figure 3.3. Actual versus estimated shares of expenditure (excluding Riga), by degree of urbanisation and municipality



Note: Estimates based on 2022/23 school year data and actual based on 2020/21 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

Accessibility – distance to alternative schools

Due to data confidentiality issues, accessibility was not measured based on students' homes but on the location of school premises. Accessibility refers to the time it takes to reach the most proximate school premise offering the same level of education[9] using the fastest means of transportation available, based on a global travel impedance grid (Weiss et al., 2018[14]). The travel data from this source tends to underestimate actual travel times however, as it does not consider congestion, availability of public transport or suitability of roads for walking or biking. Therefore, the threshold for summary statistics on

[9] Specifically, the set of possible schools for primary was a primary-, basic education- and secondary school; for basic education school this was another basic education school or secondary school; for secondary this was another secondary school; and for gymnasium this was another gymnasium or secondary school. Premises that only provided ISCED level 0 (early childhood education and care) were excluded from the accessibility analysis.

school premises with high accessibility, i.e. "low-distance" was set relatively low at 15 minutes driving time, assuming not all students have motorised transport to get to school.

Access to another school premise (in a different school) within a 15-minute drive was found to be possible for most students in cities and towns. In low-density rural and village municipalities the situation was different, however. In these municipalities, for example, 17% of students in basic education and 58% of students in secondary education could not access another school within a 15-minute drive (Table 3.5).

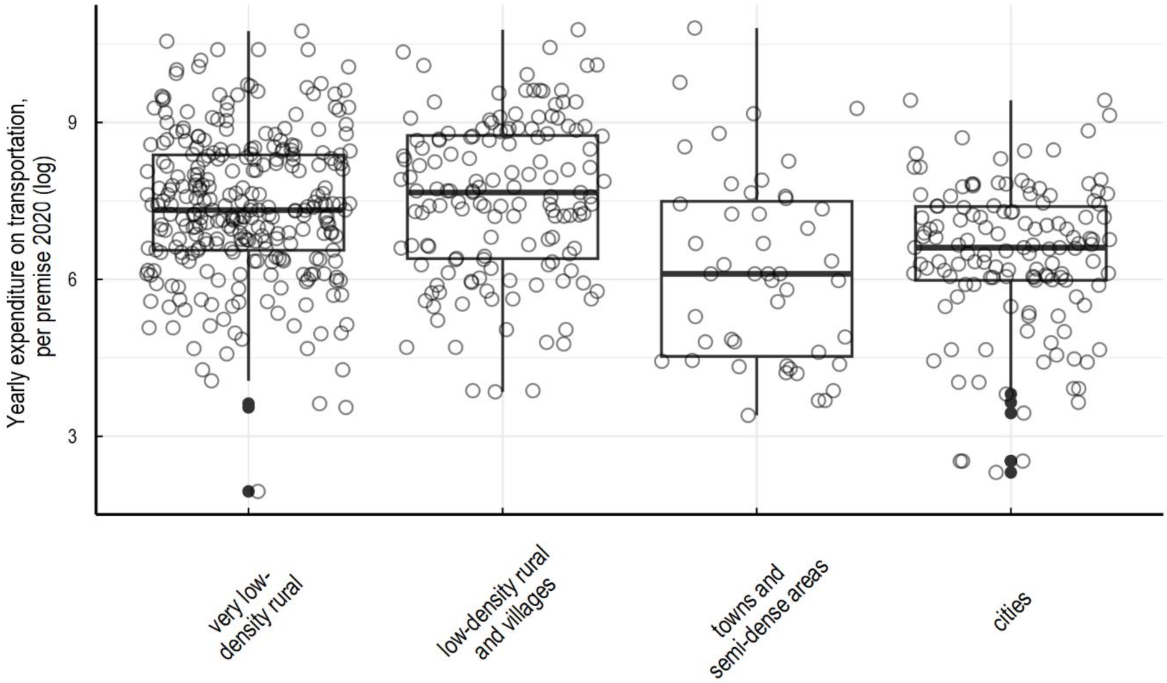
Table 3.5. Share of schools and students further than 15-minutes driving from most proximate school, by degree of urbanisation and school type

Degree of urbanisation	School type	Share of schools further than 15 min driving from most proximate school (%)	Share of students further than 15 min driving from most proximate school (%)
Very low-density rural	Primary	15.8	2.5
Low-density rural and villages		0	0
Towns and semi-dense		0	0
Cities		0	0
Very low-density rural	Basic education	37.5	29.5
Low-density rural and villages		16.9	9.8
Towns and semi-dense		0	0
Cities		0	0
Very low-density rural	Secondary	57.5	48.1
Low-density rural and villages		58.3	39.4
Towns and semi-dense		0	0
Cities		0	0
Very low-density rural	Gymnasium	28.6	23.8
Low-density rural and villages		0	0
Towns and semi-dense		0	0
Cities		0	0

Note: School premises providing only ISCED level 02 were excluded from the analysis.
Based on 2022/23 school year data, and on school premises provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation. Driving times to premises of the same school were not considered.

These percentages go up to 38% for students in basic education in very low-density municipalities. This means that schools in rural areas face both high costs per student and that their students have difficulties in accessing alternative schools. These municipalities also spend more on the transportation of students (Figure 3.4).

Figure 3.4. Expenditure on transportation, by degree of urbanisation



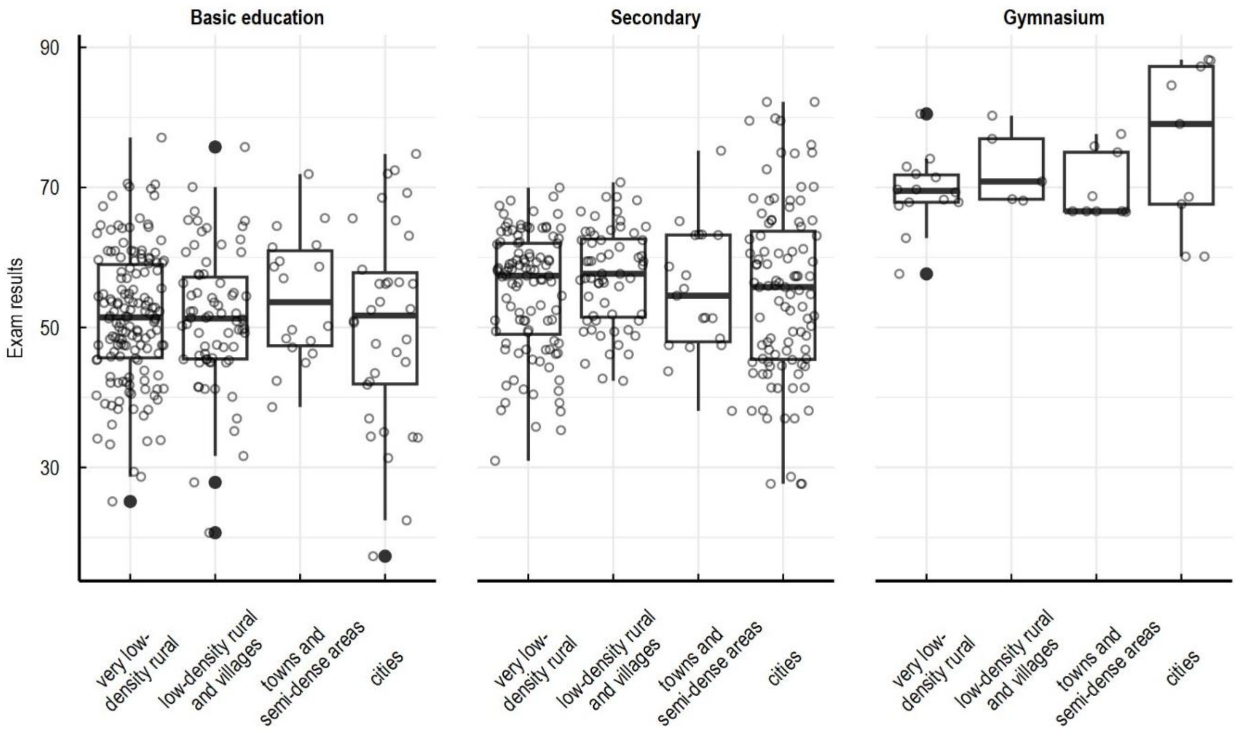
Note: School premises providing only ISCED level 0 were excluded from the analysis.
Based on 2022/23 school year data and on school premises provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

Considering the quality of education in Latvian schools

As improving the quality of education should be the primary goal of any intervention on the school network, a model guiding its consolidation should ideally also consider the quality of education provided by schools. Evaluation and assessment provide a basis for monitoring how effectively education is being delivered to students and for assessing the performance of systems and schools, among others. Within OECD countries, central examinations are widely used to certify student learning and, in some circumstances, for quality assurance and supporting improvements at different levels of the system, including schools (OECD, 2013[15]). This is also the case for Latvia where standardised exam results are taken into consideration as part of school self-evaluation and external evaluation processes (in addition to other data and information) (OECD, 2016[6]). The only (proxy) data available on the quality of education provided by schools are the national standardised exam results in mathematics, Latvian language, and foreign language for students in grade 9 (of the 2022/23 school year). No such standardised student assessment data was available for primary schools at the time of developing the geospatial simulation model. Also ideally – and this is something to consider for future further development of the model, such a measure would be a "value-added" measure which takes account of where each student started from and the progress they made relative to other, similar students (OECD, 2023[16]; OECD, 2013[15]).

Recognising these limitations, the analysis of the data within the framework and methodology used in the geospatial simulation model suggested there was no clear relationship between higher exam scores and the degree of urbanisation of the municipality in which schools are located (see Figure 3.5). In the following section we will continue the examination of schools' average exam results in relation to the identified schools with a high consolidation potential – i.e. those with high-costs and low-distance.

Figure 3.5. Exam results by school type and degree of urbanisation



Note: The index of exams is measured as the average of exam results in mathematics, Latvian language, and foreign language for students in grade 9. As exam results do not include primary schools, the figure covers 480 schools.
Based on 2022/23 school year data and on school premises provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

4 Reorganisation of the school network

This section presents the simulation results to illustrate the impact of a hypothetic consolidation of the school network by examining the costs and accessibility of schools i.e. their level of access to other schools offering the same education level. The section starts by classifying schools based on their costs and accessibility. Schools identified as "high-cost & low-distance" are to be considered for merging with other school premises. The section continues by examining the quality of education provided by schools on the basis of the schools' average exam results in relation to the identified "high-cost & low-distance" schools,

Classifying schools based on costs and accessibility (distance)

The simulation first classified school premises into four categories, based on their access to other schools offering the same education level (i.e. whether they are below or above a 15-min drive) and their school costs per student (i.e. if they are above or below the 75th percentile of expenditure per student across all schools of the same type):

- Low-cost & high-distance
- Low-cost & low-distance
- High-cost & high-distance
- High-cost & low-distance -> schools to be considered for merging with other schools

Using these criteria, most schools in Latvia fell in the category "low-cost & low-distance". This included all schools located in cities except for nine secondary schools and one gymnasium, which were categorised as "high-cost & low-distance", i.e. the schools to be considered for consolidation (see Table 4.1 and Figure 4.1).

Table 4.1. Typology of schools according to their cost and access levels, by degree of urbanisation and type of school

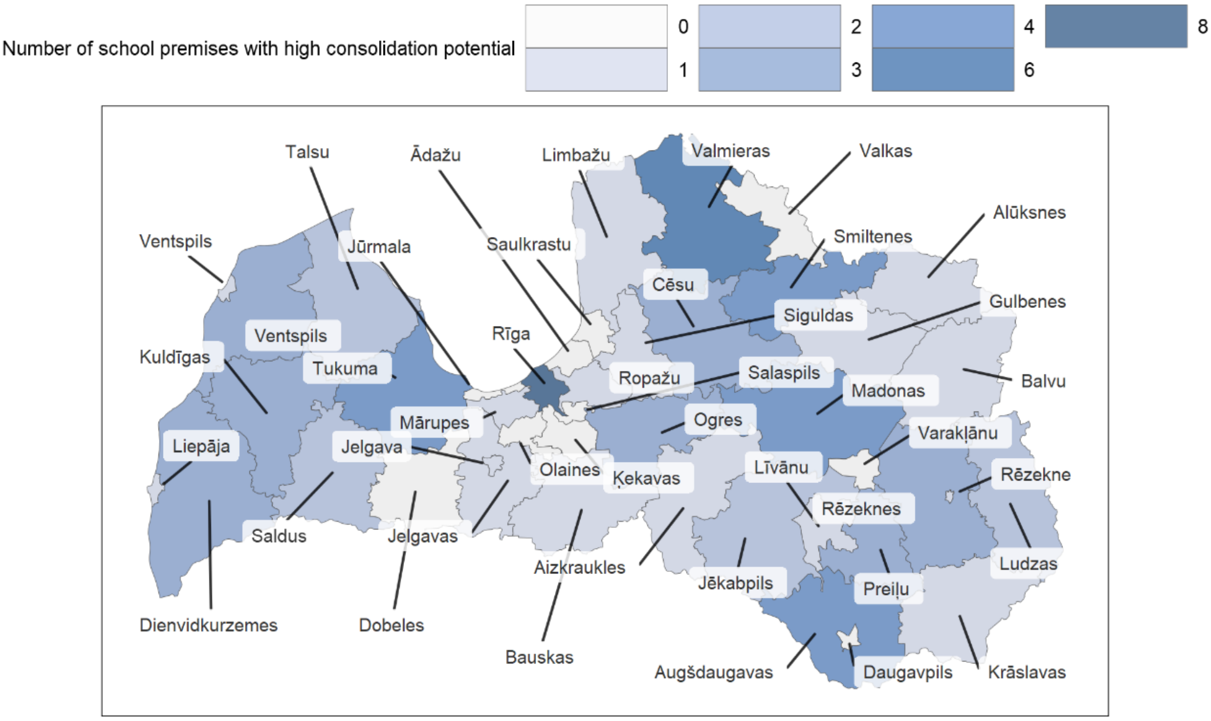
Degree of urbanisation	School type	Low-cost & high-distance	Low-cost & low-distance	High-cost & high-distance	High-cost & low-distance
Very low-density rural	Primary	1	11	2	5
Low-density rural and villages		0	8	0	3
Towns and semi-dense		0	4	0	1
Cities		0	6	0	0
Very low-density rural	Basic education	32	58	25	37
Low-density rural and villages		10	54	2	5
Towns and semi-dense		0	18	0	0
Cities		0	35	0	0
Very low-density rural	Secondary	26	33	35	12
Low-density rural and villages		23	23	12	2
Towns and semi-dense		0	17	0	2
Cities		0	90	0	9
Very low-density rural	Gymnasium	2	6	2	4
Low-density rural and villages		0	4	0	1
Towns and semi-dense		0	7	0	2

Note: High costs are schools above the 75th percentile of relative expenditure per student. High-distance schools are more than 15 minutes away from the most proximate school.
Based on data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

The simulation resulted in 84 school premises (from 78 different schools) that were classified as “high-cost & low-distance” and are thus candidates for merging with approximate schools. These schools constituted the initial target group for consolidation in the simulation, because reallocating students in those schools means that they will still be able to access a school within a relatively short travel time, while they will offer the highest cost savings per student.

Although 84 school premises satisfied the “high-cost & low-distance” criteria, this number was reduced to 75 school premises (from 70 different schools) because some receiving school premises also fell in the “high-cost & low-distance” category, meaning both the target and the alternative school premise would be closed. In such cases, the largest school premise was kept in the sample. Figure 4.1 shows the geographical distribution of the 75 “high-cost & low-distance” schools with potential for consolidation.

Figure 4.1. High-cost & low-distance schools with high potential for consolidation, by municipality



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

Importantly, the simulation did not include a mechanism for rebalancing school premise sizes (OECD, 2022[5]).[10] This meant that in theory some receiving school premises – and particularly secondary school premises – could become too large, even if the adjustment in costs considered the additional staff that needed to serve the new student population. The results of the simulation are therefore not to be translated automatically into closures and mergers as other factors need to be taken into account such as the capacities of receiving schools. The MoES could consider introducing a balancing mechanism in further iterations of the simulation model, for instance by considering a limit in the learning space per student.

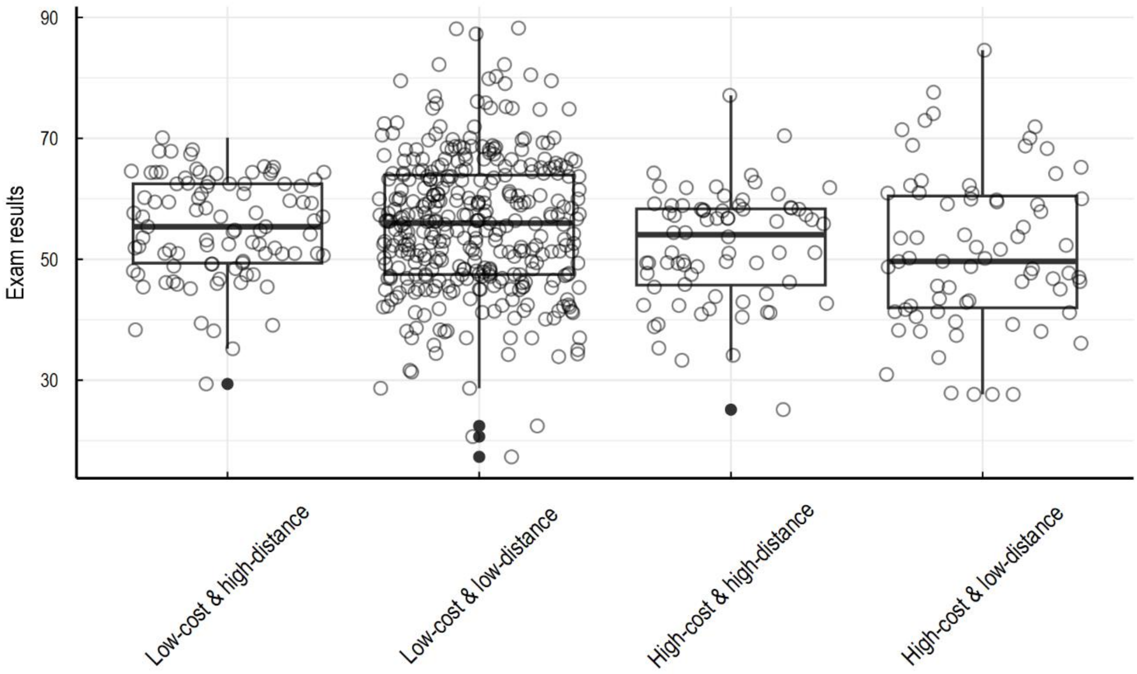
Considering the quality of education in schools

As mentioned earlier, while intentions to making adjustments to the school network allow for making the often much-needed efficiency gains, it is vital that these efforts are guided by school quality considerations (Nusche et al., 2016[3]; OECD, 2018[2]). Using the available data on exam results in mathematics, Latvian language, and foreign language, the model showed that "low-cost" schools tended to perform better than "high-cost" schools. In addition, "high-cost & low-distance" schools – which are the main candidates for consolidation – performed worse than other categories of schools in the index of exams, with an average index of 50, six points below the index for "low-cost & low-distance" schools (Figure 4.2). Although the

[10] Introducing a balancing mechanism is technically complex as it can bring unintended effects in the consolidation exercise. This area is beyond the scope of the present exercise and is left as an option for future refinements of the geospatial simulation model.

analysis, based on the exam mean results, by degree of urbanisation did not reveal significant quality differences between rural and urban areas (see Figure 3.5), there is an overlap between lower performant schools and location in rural areas: 82% of high-cost & low distance schools are located in very low-density rural and low-density rural and villages. The analysis shows that geographical criteria alone may be insufficient to uncover quality differences, and that a multi-dimensional criteria may be more informative to guide school reorganisation decisions, as well as a more granular look into exam results would inform quality related conclusions and decisions.

Figure 4.2. Exam results by cost-accessibility typology



Note: The index of exams is measured as the average of exam results in mathematics, Latvian language, and foreign language for students in grade 9. As exam results do not include primary schools, the figure covers 480 schools.
Based on 2022/23 school year data and on school premises provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

With the hypothetic consolidation, the number of school premises (excluding ISCED 02) would decrease from 638 to 563 (i.e., 75 less school premises from 70 different schools). In nearly 19% of the cases, the consolidation involves transferring students to a school premise in another municipality. In 29 cases, it involves schools also offering ISCED level 02 (8 primary schools, 16 basic education schools, 5 secondary schools). While consolidation involves school premises of all types, 31 of the 75 cases (concerning 2 100 students) were of basic education schools in very low-density rural municipalities.

The hypothetical consolidation involves only a small change in the number of teachers (an increase of 0.15%). As the schools involved in the consolidation are all within a 15-minute drive from the most proximate school offering the same level of education, the travel cost for students of this consolidation should in principle not increase significantly. The total estimated expenditure savings of this consolidation amount to an annual decrease from EUR 316 676 203 to EUR 316 324 211 (0.1% less of the initial expenditure), close to EUR 5 000 annually per school premise that is consolidated. These savings are only a small part of the total savings that would be realised once maintenance and repair costs and especially after any capital investments needed to maintain these premises are considered.

Table 4.2. Changes after consolidation by degree of urbanisation and type of school

After relocating students from high-cost & low-distance schools

Degree of urbanisation	School type	Number of schools with changes	Change in the # of students	Percentage change in total expenditure (%)	Percentage change in the # of teachers (%)	Percentage change in the # of staff (%)
Very low- density rural	Primary	-5	-91	-4.6	-3.49	-4.62
Low-density rural and villages		-3	-90	-7.75	-3.82	-6.55
Towns and semi-dense		-1	-44	-3.12	-2.42	-3.26
Cities		0	0	0.44	0.82	0.82
Very low-density rural	Basic education	-31	-1177	-7.82	-7.55	-7.62
Low-density rural and villages		-5	-157	-0.97	-0.32	-0.25
Towns and semi-dense		0	0	0.47	1.01	1.01
Cities		0	50	0.96	1.48	1.5
Very low-density rural	Secondary	-7	1742	5.46	5.13	5.2
Low-density rural and villages		0	860	4.37	4.65	4.67
Towns and semi-dense		-1	1048	9.54	9.04	9.13
Cities		-5	1094	2.03	2.2	2.19
Very low- density rural	Gymnasium	-4	-969	-21.42	-21.6	-21.6
Low-density rural and villages		-1	-571	-19.38	-17.52	-17.52
Towns and semi-dense		-2	-935	-21.28	-20.58	-20.58
Cities		-1	-760	-10.84	-9.99	-9.99

Note: Based on data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

The number of students and staff, however, would not decrease across all types of areas: primary schools, basic education schools and gymnasiums in very low-density municipalities lose students, while secondary schools across all areas gain students. For instance, even after closing premises in seven secondary schools in very low-density municipalities, secondary schools in those areas would still increase their student numbers by 1 742 students. The largest running cost savings compared to initial expenditure would occur in gymnasiums in very low-density areas.

The hypothetical consolidation model shows that the largest savings associated to reorganising schools concern very low-density rural municipalities. In these municipalities, the reorganisation of schools could lead to significant changes in total and per student expenditure in education at the municipal level. Table 4.3 ranks the changes in expenditure from the largest to the smallest in total savings in running costs, suggesting that the highest gains are concentrated in very low-density municipalities. In the top 10, decreases in expenditure range from -2 to -10%.[11]

Table 4.3. Changes in expenditure following consolidation, by municipality

Municipality	Change in total expenditure (%)	Change in expenditure per student (%)	Degree of urbanisation
Augšdaugavas novads	-10.0001998	-1.6398692	Very low-density rural
Dienvidkurzemes novads	-6.71201095	-1.16652699	Very low-density rural
Preilu novads	-5.50521899	-2.41026798	Very low-density rural
Ventspils novads	-5.49462344	-5.49462344	Very low-density rural
Rezeknes novads	-4.28040425	-1.20599729	Very low-density rural
Madonas novads	-3.85452602	-3.85452602	Very low-density rural
Ludzas novads	-3.55711263	-1.67223535	Very low-density rural
Smiltenes novads	-2.96028269	-2.96028269	Very low-density rural
Saldus novads	-2.26845727	-0.39567398	Very low-density rural
Jekabpils novads	-1.95018928	0.20264872	Very low-density rural
Valmieras novads	-1.85664454	-1.85664454	Very low-density rural
Cesu novads	-1.15120726	-0.14090601	Very low-density rural
Tukuma novads	-0.86934405	-0.4503135	Very low-density rural
Marupes novads	-0.61342467	-0.61342467	Towns and semi-dense
Ventspils	-0.36065489	-0.36065489	Towns and semi-dense
Ogres novads	-0.21464667	-0.21464667	Low-density rural and villages
Ropažu novads	-0.16526672	-0.16526672	Low-density rural and villages
Kraslavas novads	-0.05828438	-0.05828438	Very low-density rural
Adažu novads	-0.05089385	-0.05089385	Low-density rural and villages
Jelgava	-0.04559249	-0.04559249	Towns and semi-dense
Siguldas novads	0.01275025	0.71459411	Low-density rural and villages
Bauskas novads	0.07432019	0.07432019	Low-density rural and villages
Talsu novads	0.07670753	0.07670753	Low-density rural and villages
Salaspils novads	0.12340036	0.12340036	Towns and semi-dense
Aizkraukles novads	0.19302834	0.19302834	Very low-density rural
Riga	0.28104433	0.28104433	Cities
Jelgavas novads	0.39249525	0.39249525	Low-density rural and villages
Jurmala	0.55590641	0.55590641	Towns and semi-dense
Valkas novads	0.60052226	0.60052226	Very low-density rural
Gulbenes novads	0.68004926	0.68004926	Low-density rural and villages
Rezekne	0.69824893	-1.13552758	Towns and semi-dense
Saulkrastu novads	0.73778239	0.73778239	Low-density rural and villages
Balvu novads	0.79931195	0.79931195	Very low-density rural
Kekavas novads	1.02086149	1.02086149	Low-density rural and villages

Note: Based on data provided by the Latvian Ministry of Education and Science.
See Annex A for definitions of the degree of urbanisation.

[11] Note that if premises are merged with other schools and their students redistributed, premises providing only ISCED level 02 (early childhood education and care) become "orphan" (without a main school) and their students are not transferred to other schools. Solving this issue would require data on the location and cost structure of all schools offering ISCED level 02, which was unavailable at the time of writing this report.

Although the school network consolidation simulation points to considerable opportunities to bring about the much-needed efficiency gains, international experiences show that investments will be needed to encourage and support schools, parents and municipalities in the consolidation of the school network (Ares Abalde, 2014[4]; OECD, 2018[2]). These may include investments in new (state-of-the-art) school buildings or renovating and/or expanding existing buildings of receiving schools to accommodate the expanded student population and school staff, as well as potential other temporary incentives to support the closing and merging of schools. We will elaborate on these possible incentives in Section 5.

5 Conclusions and policy recommendations

Geospatial modelling indicates there is considerable scope for reorganising Latvia’s school network

Latvia is faced with a fragmented school network resulting from rural-to-urban migrations and significant decline of its student population that have taken place over the last decades (OECD, 2016[6]; OECD, 2022[17]). This has generated costly geographical mismatches between educational demand and the supply of school places. Recognising that these demographic shifts are likely to continue and cause further inefficiencies in the years to come, Latvia has made the reorganisation of its school network a policy priority.

The joint development of a geospatial simulation model by the OECD Secretariat and MoES is aimed to support Latvia in its school network reorganisation initiative. The simulation model supported the identification of schools to be considered for closing and transferring of students to nearby schools. The simulation showed there was considerable scope for consolidation of the school network, entailing a (hypothetical) decrease from 653 to 563 school premises, so impacting a total of 75 school premises from 70 different schools:

- Primary schools: a decrease from 41 to 32 (i.e. 9 school premises)
- Basic education schools: a decrease from 276 to 240 (i.e. 36 school premises)
- Secondary schools: a decrease from 284 to 262 (i.e. 22 school premises)
- Gymnasiums: a decrease from 37 to 29 (i.e. 8 school premises)

While the (hypothetical) consolidation involves school premises of all types, 31 or the 75 school premises are basic education schools in very low-density rural municipalities. In 19% of all cases, the consolidation involves transferring students to a school premise in another municipality. The consolidation involves only a small change in the overall number of teachers (an increase of 0.15%). Furthermore, as the schools are all under a 15-minute drive from the most proximate school offering the same level of education, travel costs for students should in principle not increase significantly for this consolidation.

This consolidation would lead to an annual decrease of total estimated expenditure from EUR 316 676 203 to EUR 316 324 211 (0.1% less of the initial expenditure) which is close to EUR 5 000 of savings per consolidated premise (without considering maintenance costs). Although this average decrease may not seem that substantial, the simulation showed that more substantial cost savings could be made by some municipalities, i.e. in very low-density municipalities. The simulation model showed that the decreases in expenditure could range from 2% to as much as 10% among the top 10 municipalities when ranking these (by the estimated savings in running costs).

In addition, using the available data on schools' average exam results in mathematics, Latvian language and foreign language (in grade 9) as a (proxy) measure of school quality, the model showed that schools classified as "low-cost" tended to perform better than "high-cost" schools. Importantly, "high-cost & low-distance" schools – which are the main candidates for consolidation – performed significantly worse than the schools in the other categories. This is of particular relevance considering also Latvia's overarching goal of the school network consolidation initiative needing to ensure a high-quality education to every child regardless of their school location.

However, although the geospatial analysis may point to the need for closing a specific school, there may and almost certainly will be some cases where this may not be desirable to all parties involved. In such cases alternative options may be explored, such as the consolidation of two or more schools under one school leader or leadership team or the sharing of resources across schools. Such alternative options would still bring about some efficiency gains (Ares Abalde, 2014[4]; OECD, 2018[2]).

Furthermore, any decision to close schools should be taken with care, and research evidence warns of the disruptive experience that relocation and increased travel distances can have on students' well-being and learning outcomes in the short term (Beuchert et al., 2016[18]). The benefits of school closures need to be carefully weighed against their social and economic impact on surrounding communities, the transition costs generated in the process and the public and private expenditure on longer commuting distances.

That said, experiences from OECD Member countries, including Latvia, have shown how school mergers have (in due time) been welcomed by school communities, especially when these offered significant improvements in school buildings, better equipment and facilities, greater curricular diversity, specialised teachers, as well as the ability to organise all teaching in single-grade settings, among others (OECD, 2018[2]).

Next steps for advancing Latvia's school network initiative

To support the MoES and muncipalities in strengthening the child-centred governance of Latvia's school network and the effective management of human resources – and (above all) ensuring a high-quality education for every child regardless of their school location, the following actions (not necessarily in the order presented below) may be considered by the MoES to advance the school network consolidation:

- The MoES noted it intends to use the geospatial simulation model to inform the ongoing school network consolidation initiative and establish a "master list" of schools that are potentially considered for consolidation. It should carefully review this list as there may and likely will be some cases for which special circumstances apply and that argue against closing of a school – a "one-size-fits-all" solution may not be possible or desirable. It is important to review the context and circumstances faced by each of these schools.
- Using this information, the MoES should considering developing a holistic school network consolidation strategy that supports different approaches to consolidating schools (e.g. closing and merging of schools, clustering of schools, etc.), starting with the identified schools. As part of this strategy, decide on possible supporting policies to be put in place, for example, for the possible reduction teacher numbers, to decide on what to do with the empty school buildings and reflect on broader consequences for municipalities.

  In addition, as part of this strategy, the MoES should – as intended – explore the development of "a package" of suitable and affordable incentives, i.e. policy instruments to encourage and support schools, parents and municipalities in consolidating schools. The MoES should use the obtained master list to estimate the possible costs involved. Policy instruments to consider involve the offering of direct aid programmes for consolidating schools, as well as providing transportation aid to cover the capital investments and the changes in operating costs associated to consolidation (Duncombe and Yinger, 2010[19]; World Bank, 2023[20]). Policies seeking to incentivise consolidation should cover at least the costs incurred during and immediately after the consolidation process (OECD, 2018[2]).

In addition, following the examples from OECD Member countries such as Portugal (OECD, 2018[2]), Denmark (OECD, 2018[2]) and England (United Kingdom) (Nusche et al., 2016[3]), the MoES should consider establishing a funded school infrastructure programme for renovating and/or expanding the facilities of schools that receive the additional students and teaching staff, as well as the construction of new, larger school buildings to accommodate the student populations of two or more schools. The MoES should aim to invest in modern, state-of-the-art school buildings, better equipment and facilities that allow for team teaching and other pedagogical innovations, among others. These conditions can provide an attractive incentive for schools to voluntary opt for closing and/or merging with another school.

- After defining this strategy and the package of incentives, the MoES would be well-positioned to engage with those schools and their municipalities that have been identified for consolidation. However, as noted above a "one-size-fits-all" solution may not be possible or desirable, with in some cases there being better alternatives to the closing or merging of schools.

In addition, 32% of Latvia's schools have more than one school premise. School premises may exist to increase the geographical reach of schools and bridge accessibility gaps in rural areas, while spreading fixed costs such as management over more students. However, the data showed that premises of the same school are typically located close to each other. Investigating the reasons for the location decisions of school premises and whether they make financial sense was beyond the scope of this report. This however is an important area for further examination by the MoES.

Recognising that demographic shifts are likely to continue putting pressure on the school network of Latvia in the years to come, the MoES should also consider investing in research to examine the effects of the current - and to the extent possible also past school network consolidation efforts on a range of variables such as costs, student outcomes (e.g. learning outcomes and well-being) and staff outcomes (e.g. teacher job satisfaction and/or well-being). Such research findings could support the communication on the benefits and potential difficulties of school consolidation in Latvia.

In addition, the examination of the data showed there is significant overstaffing in teaching staff and non-teaching staff (who tend to have much higher salaries than teachers) in a considerable number of schools – also beyond the schools in the "high-cost & low-distance category" that have been identified for consolidation. These data corroborated the findings of earlier studies that have pointed to the issue of overstaffing in a significant number of Latvia's schools (OECD, 2016[6]; OECD, 2014[21]) and that have added to inefficiencies of the school system and as such challenged the country's capacity to invest in improving the quality and equity of education.

Therefore, as part of the proposed holistic strategy for Latvia's school network consolidation, the MoES should consider taking a range of measures to reduce overstaffing in some areas, such as regulating student-teacher ratios or by defining minimum class sizes. In addition, it should incentivise and hold the founders (i.e. owners) of public schools (of which the vast majority are made up by Latvia's municipalities) to account for enhancing the "good governance" of their schools, including their financial and administrative efficiency. This concept of good governance is part of the MoES' (new) requirements for the systematic quality assurance of education (Ministry of Education and Science of Latvia, n.d.[22]). In recent years, Latvia's Education Law has been updated by clarifying the roles and responsibilities of school founders for monitoring the quality of education and provision of improvement support to their schools. Further clarifying their roles and responsibilities for ensuring good governance, including financial and administrative efficiency would help ensure issues such as overstaffing in identified schools are timely addressed.

Adding to this, as was also noted by several education stakeholders that took part in the process, it would seem important to promote the good governance of schools and their financial and administrative efficiency through the school self-evaluation and improvement planning process and the external evaluations conducted by the State Education Quality Service. While the current framework of quality standards that is used for school self-evaluations and external evaluations (among others) points to the importance of ensuring the effective and efficient use of infrastructure and (material) resources, no reference is made to ensuring efficiency in staffing (i.e. human resources). The MoES and the State Education Quality Service should therefore consider revisiting the framework of quality standards.

Lastly, the MoES may also consider revisiting and/or clarifying the use of the recently released "school efficiency monitoring tool" in relation to overstaffing. This tool, among others, looks at changes in the numbers of teachers to determine the efficiency of schools (Ministry of Education and Science of Latvia, 2023[23]). Significant changes in teachers (i.e. teacher turnover) would be identified as an issue of concern. This however stands at odds with the need for reducing the overstaffing in a significant number of schools that are more prominent in certain geographic areas (i.e. very low density rural areas) in Latvia. The revisiting of the monitoring tool may be needed to ensure its effective use by schools and municipalities in helping reduce overstaffing and enhance the efficiency of Latvia's school network.

Policy recommendations

Ultimately, the goal of the Ministry of Education and Science (MoES) is to ensure high-quality education for every child. Accordingly, the following actionable recommendations are presented for consideration by Latvia:

- As the MoES intends to use the geospatial model to inform its ongoing school network reform, it should undertake a **careful review of the "master list" of schools proposed for consolidation** as there may likely be cases where special circumstances apply and that argue against closing a school; a "one-size fits all" solution may not be possible or desirable.
- Using this information, **the MoES should consider developing a holistic school network consolidation strategy that supports different approaches to consolidating schools** (e.g. closing and merging of schools, clustering of schools, etc.) and start with the identified schools. As part of this strategy, **explore supporting policies to be put in place, for example, for the possible reduction of teacher numbers and deciding on what to do with the empty school buildings.**

  Also, the MoES should, as intended, **develop a "package" of suitable and affordable incentives**, i.e. policy instruments (direct aid programmes, transportation aid, etc.) to encourage and support schools, parents and municipalities in consolidating schools.
- After developing this strategy and defining the package of incentives, the MoES would be well-positioned to **engage with the schools and municipalities identified for consolidation**. However, as noted above a "one-size-fits-all" solution may not be possible or desirable, and there might be better alternatives to the closing or merging of schools in some cases.
- The MoES should **consider investing in research to examine the effects of the current and to the extent possible also past school network consolidation efforts** on a range of variables such as costs, student outcomes (e.g. learning outcomes and well-being) and staff outcomes (e.g. teacher job satisfaction, and/or well-being). Such research findings could support the communication on the benefits and potential challenges of school consolidation in Latvia.

- Recognising that almost a third of Latvian schools have more than one school premise, and that in most cases these are geographically close to each other, the MoES should **consider further investigating the reasons for the location decisions of school premises and whether they (still) make financial sense**.
- As part of the proposed holistic strategy for Latvia's school network consolidation, **the MoES should consider taking a range of measures to reduce overstaffing, such as regulating student-teacher ratio's or by defining minimum class sizes**.

  In addition, it should consider using the ongoing efforts to **clarify the roles and responsibilities of founders (i.e. owners) of public schools to deal with overstaffing and hold them to account for enhancing the "good governance" of their schools, including their financial and administrative efficiency.**
- The MoES and the State Education Quality Service should **consider revisiting the framework of quality standards that are used for school self-evaluations and external evaluations by adding one or more standards or indicators that focus on financial and administrative efficiency, including efficiency in staffing**.
- The MoES should also **consider revisiting and/or clarifying the use of the school efficiency monitoring tool in relation to overstaffing**.

Annex A. The degree of urbanisation

The Degree of Urbanisation (DEGURBA) allows classifying the entire territory of a country along the urban-rural continuum. It relies primarily on population size and population density thresholds applied to a population grid with cells of 1 by 1 km. The different types of grid cells can be used to classify small local units, such as municipalities or census enumeration areas (see Figure A.1 for an example). The Degree of Urbanisation has two hierarchical levels. The Level 1 uses three classes, and the Level 2 – which is the one used in this paper – uses 7 classes.

The methodology is applied in a two-stages process. First, 1 km^2 grid cells are classified based on population density, contiguity and population size. Second, local units (e.g., municipalities) are classified based on the type of grid cells where most of their population resides in.

Stage 1: Grid classification for DEGURBA Level 2

In the first stage, grids cells are classified into seven groups as follows:

An **urban centre**: contiguous grid cells with a density of at least 1 500 inhabitants per km^2 of permanent land and has at least 50 000 inhabitants in the cluster.

The **urban cluster** cells that are not part of an urban centre are subdivided into three types:

1. A **dense urban cluster**: contiguous cells with a density of at least 1 500 inhabitants per km^2 of permanent land, with a population of at least 5 000 and less than 50 000 in the cluster.
2. A **semi-dense urban cluster**: contiguous grid cells with a density of at least 300 inhabitants per km^2 of permanent land and has a population of at least 5 000 (i.e., an urban cluster) and this cluster is neither contiguous with nor within 2 km of a dense urban cluster or an urban centre.
3. **Suburban or peri-urban cells**: the remaining urban cluster cells. These cells are part of an urban cluster that is contiguous or within 2 km of a dense urban centre.

Rural grid cells can be categorised into three types:

A **rural cluster**: contiguous cells with a density of at least 300 inhabitants per km^2 of permanent land and a population between 500 and 5 000 in the cluster.

Low-density rural grid cells: rural grid cells with a density of at least 50 inhabitants per km^2 of permanent land and are not part of a rural cluster.

Very low-density rural grid cells: rural grid cells with a density of less than 50 inhabitants per km^2 of permanent land.

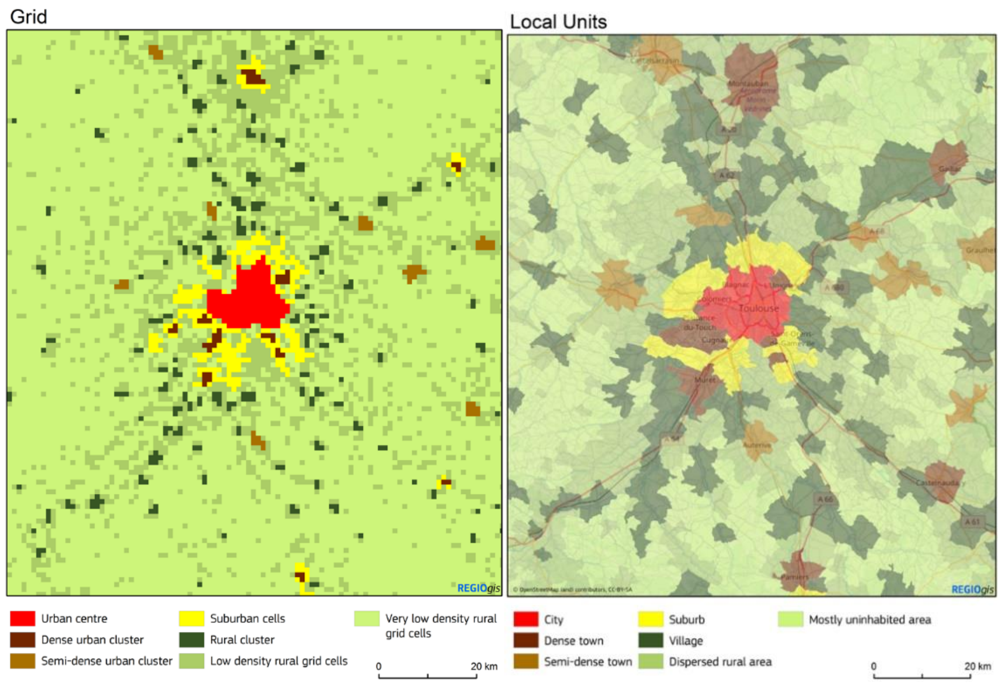
Stage 2: From grid cells to local unit classification for DEGURBA Level 2

In the second stage, the methodology classifies local units (e.g., municipalities) based on their population distribution across grid types. Each local unit is assigned exclusively to one of the following seven classes:

1. **Cities** are local units that have at least 50% of their population in an urban centre.

2. **Dense towns** have a larger share of their population in dense urban clusters than in semi-dense urban clusters (i.e., it is dense) and a larger share in dense plus semi-dense urban clusters than in suburban or peri-urban cells (i.e., it is a town).
3. **Semi-dense towns** have a larger population share in semi-dense urban clusters than in dense urban clusters (i.e., it is semi-dense) and a larger share in dense plus semi-dense urban clusters than in suburban or peri-urban cells (i.e., it is a town).
4. **Suburbs** have a larger population share in suburban or peri-urban cells than in dense plus semi-dense urban clusters.
5. **Villages** have the largest share of their rural grid cell population living in a rural cluster.
6. **Low-density rural** have the largest share of their rural grid cell population living in low-density rural grid cells.
7. **Very low-density rural** have the largest share of their rural grid cell population living in very low-density rural grid cells.

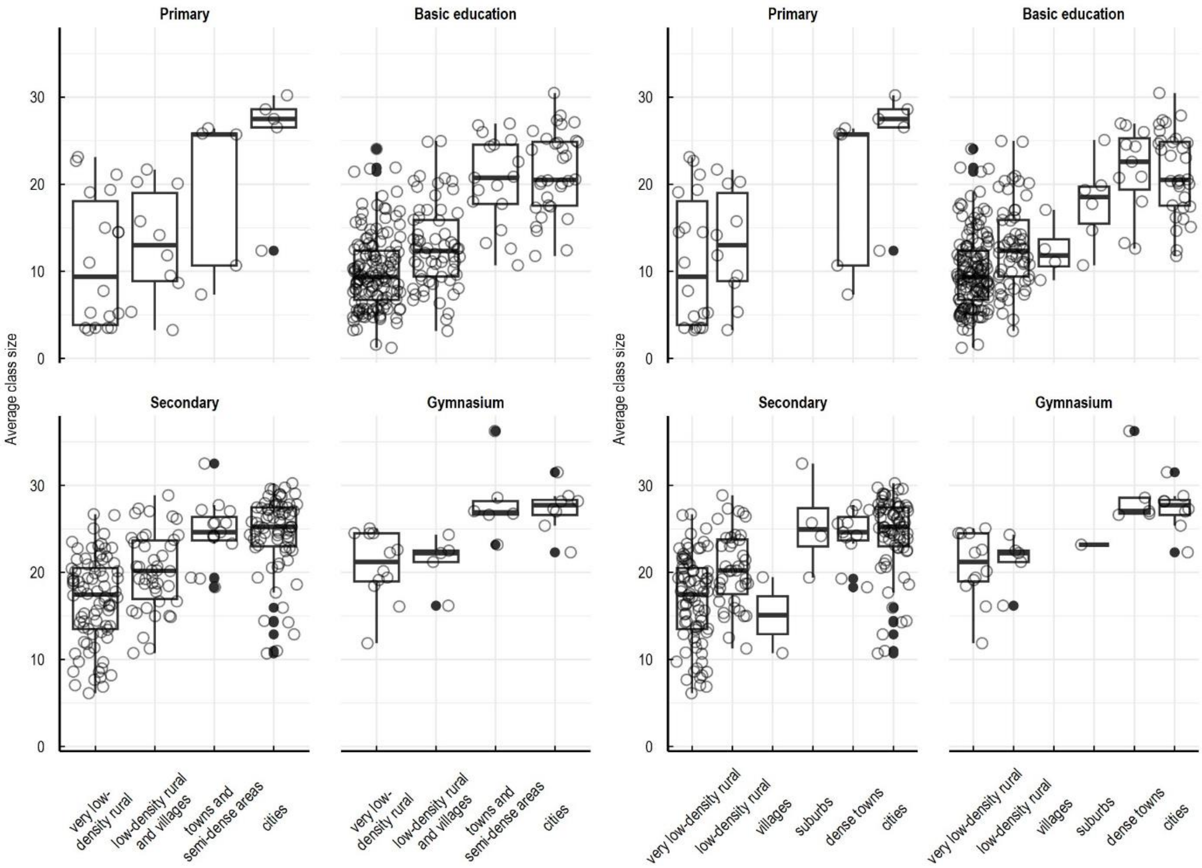
Figure A.1. Degree of Urbanisation Level 2 grid classification around Toulouse, France



Source: Maffenini, L., Schiavina, M., Melchiorri, M., Pesaresi, M. and Kemper, T., GHS-DU-TUC User Guide, Publications Office of the European Union, Luxembourg, 2023, doi: 10.2760/615330, JRC132762.

Figure A.2 shows average school size by degree of urbanisation using four and six groups, to demonstrate why an aggregation across pairs of categories makes sense.

Figure A.2. Average school size by degree of urbanisation using four and six groups



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.

Annex B. The student density classification vs. The degree of urbanisation

At the time of writing, the national proposal for classifying schools was based on student density, calculated as the number of students over the land area of the municipality. Schools then were classified into three types according to the student density in the municipality where they are located: 1) less than one student per km^2, 2) between one and five students per km^2, and 3) more than five students per km^2.

The student density classification relies on the area of municipalities, which in turns depends on municipal borders which are drawn based on geographical and political criteria. The measure may thus reflect idiosyncrasies of the territory that are not necessarily linked to the local environment of schools, such as the presence lakes or national parks. Moreover, the measure changes with the number of students, which is not ideal in a system where the same classification can lead to student numbers re-adjustments.

The degree of urbanisation methodology represents the environments of schools in a more nuanced way. Table B.1 displays the overlap between the student density classification and the degree of urbanisation. As the table shows, all schools classified as "very low-density rural" belong to the national category "less than one student per km^2". Similarly, "towns and suburbs" and "cities" fall in the category "more than five students per km^2". However, the opposite is not true: 50 and 39 "more than five students per km^2" schools are identified as "very low-density rural" and "low-density rural and villages", respectively. The 204 schools in the national category "one to five students per km^2" are split in 124 "very low-density rural" and 80 "low-density rural and villages".

Table B.1. Comparison of classification of schools according to the student density and degree of urbanisation classifications

Degree of urbanisation	Student density < one student per km^2	Student density one to five students per km^2	Student density > five students per km^2
very low density rural	75	124	50
low-density rural and villages	0	80	39
towns and semi-dense areas	0	0	43
cities	0	0	116

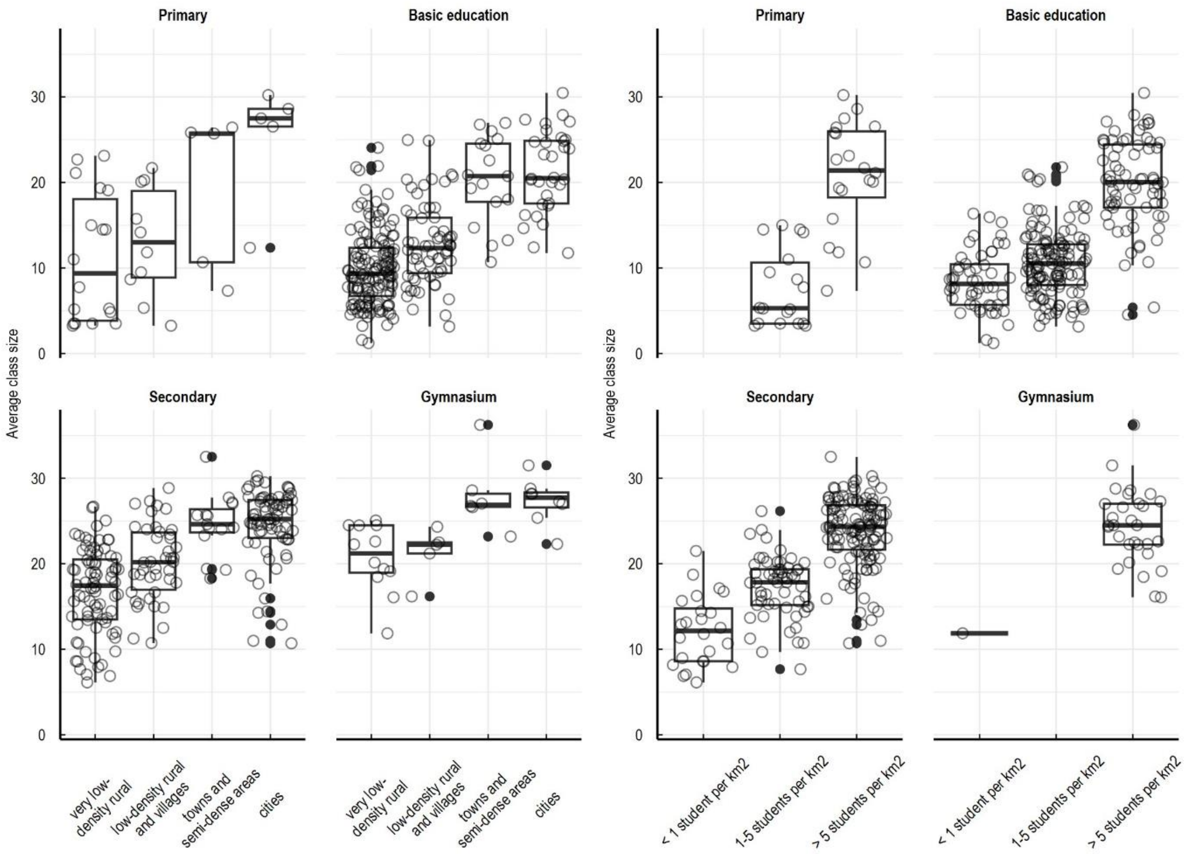
Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science.

While the degree of urbanisation based on four groups distributes primary schools and gymnasiums across all its categories, the student density classification has very few or no schools in some of its categories. For example, based on the student density classification, no primary schools exist in areas with "< one student per km^2"; and all gymnasiums except for 1 fall in the "> five students per km^2" category (see Figure B.1 and Figure B.2).

Compared to the student density classification, the degree of urbanisation captures the relationship between a place's density and its average school size more clearly. In theory, any classification should reflect the fact that schools are smaller in more sparsely populated areas, where local demand is low and distances between schools are large (OECD/EC-JRC, 2021[11]). Thus, the expectation is that average class sizes should be smaller for more rural categories and increase with density.

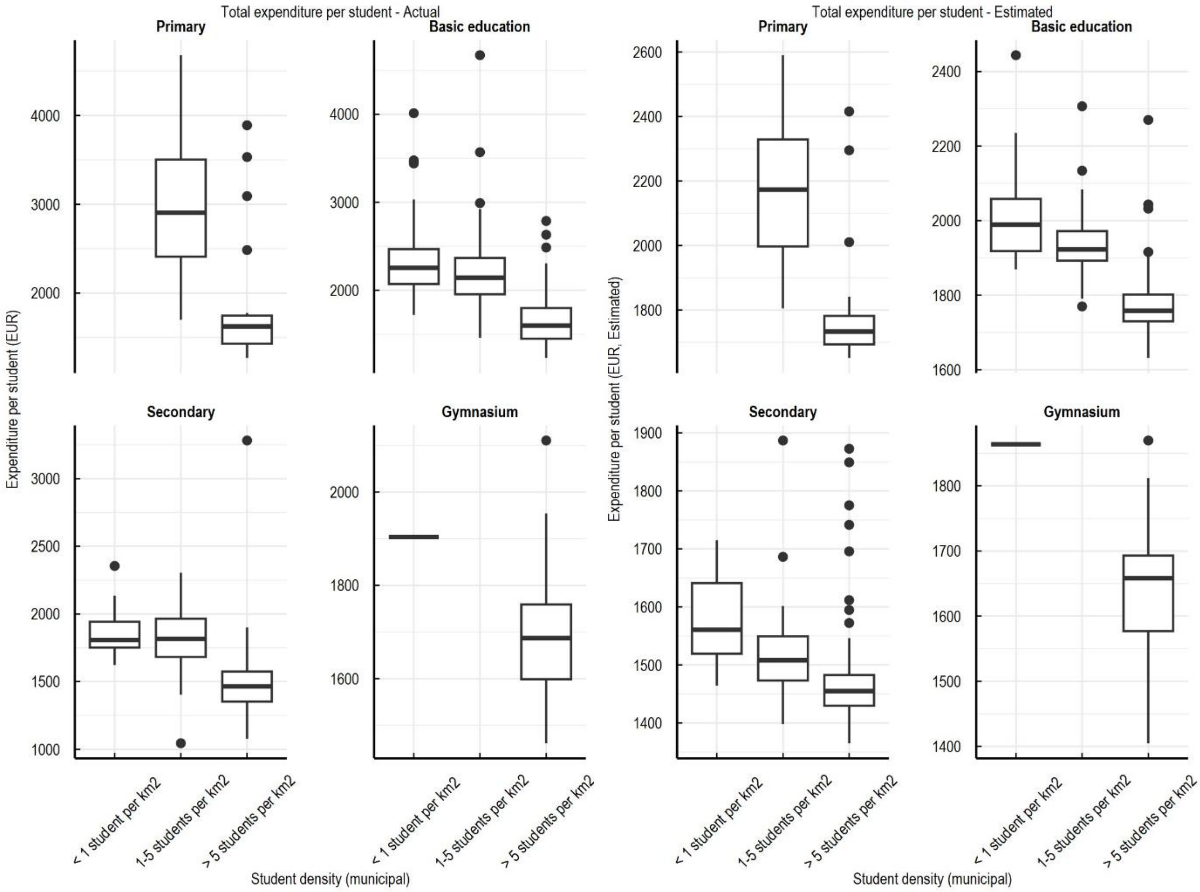
Figure B.1 compares the distribution of average class sizes in the two classifications, with average class size defined as weighted average of the number of students over the number of classes in each ISCED level, with weights given by the share of students by ISCED level. The degree of urbanisation shows average class sizes increasing in density across all school types. In contrast, the student density-based classification shows considerable overlap in the average class size of basic schools falling in the "less than one student per 1km^2", and "one to five students per km^2" categories. Similarly, the classification of municipalities by student density does not capture the density gradient in costs per student (Figure B.2). In particular, actual costs in basic and secondary schools do not decrease between the lowest student density and the middle student density categories. In addition, for primary schools and state gymnasiums, differences in running costs are stark across student density categories.

Figure B.1. Comparison of average school sizes by school type according to the student density and degree of urbanisation classifications



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science. See Annex A for definitions of the degree of urbanisation.

Figure B.2. Comparison of the actual versus estimated variation in expenditure per student comparison, by student density classification



Note: Based on 2022/23 school year data provided by the Latvian Ministry of Education and Science. See Annex A for definitions of the degree of urbanisation.

References

Ares Abalde, M. (2014), "School Size Policies: A Literature Review", *OECD Education Working Papers*, No. 106, OECD Publishing, Paris, https://doi.org/10.1787/5jxt472ddkjl-en. [4]

Beuchert, L. et al. (2016), *The Short-Term Effects of School Consolidation on Student Achievemen: Evidence of Disruption?*, Institute for the Study of Labor (IZA), http://hdl.handle.net/10419/147881. [18]

Cobb, C. (2020), "Geospatial Analysis: A New Window Into Educational Equity, Access, and Opportunity", *Review of Research in Education*, Vol. 44/1, pp. 97-129, https://doi.org/10.3102/0091732x20907362. [1]

Collingwood, L., A. Jochim and K. Oskooii (2018), "The Politics of Choice Reconsidered: Partisanship, Ideology, and Minority Politics in Washington's Charter School Initiative", *State Politics & Policy Quarterly*, Vol. 18/1, pp. 61-92, https://doi.org/10.1177/1532440017748569. [9]

Duncombe, W. and J. Yinger (2010), "School District Consolidation: The Benefits and Costs", *The School Administrator*, Vol. 67/5, pp. 10-17. [19]

European Commission (2023), *Latvia - Organisation and governance, Administration and governance at local and/or institutional level*, https://eurydice.eacea.ec.europa.eu/national-education-systems/latvia/administration-and-governance-local-andor-institutional-level. [12]

Jacobs-Crisioni, C. et al. (2023), "Estimating school provision, access and costs from local pupil counts under decentralised governance", *Journal of Geographical Systems*, https://doi.org/10.1007/s10109-023-00425-w. [10]

Ministry of Education and Science of Latvia (2023), *School effectiveness monitroing tool*. [23]

Ministry of Education and Science of Latvia (n.d.), *The categories and elements that make the concept of quality in education*. [22]

Nusche, D. et al. (2016), *OECD Reviews of School Resources: Austria 2016*, OECD Reviews of School Resources, OECD Publishing, Paris, https://doi.org/10.1787/9789264256729-en. [3]

OECD (2023), *An assessment of the professional development of teachers and school leaders, and curriculum and learning resources in Moldova*, https://doi.org/10.1787/22633a40-en. [8]

OECD (2023), *Strengthening the design and implementation of the standardised student* [16] *assessment reform of the Flemish Community of Belgium*, https://doi.org/10.1787/85250f4c-en.

OECD (2022), *OECD Economic Surveys: Latvia 2022*, https://doi.org/10.1787/c0113448-en. [17]

OECD (2022), *Shrinking Smartly in Estonia: Preparing Regions for Demographic Change*, OECD Rural Studies, OECD Publishing, Paris, https://doi.org/10.1787/77cfe25e-en. [5]

OECD (2018), *Responsive School Systems: Connecting Facilities, Sectors and Programmes for Student Success*, OECD Reviews of School Resources, OECD Publishing, Paris, https://doi.org/10.1787/9789264306707-en. [2]

OECD (2017), *Education in Lithuania*, OECD Publishing, http://dx.doi.org/10.1787/9789264281486-en. [7]

OECD (2016), *Education in Latvia*, Reviews of National Policies for Education, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264250628-en. [6]

OECD (2014), *Teacher Remuneration in Latvia: AN OECD Perspective*, https://www.oecd.org/education/OECD%20Review%20of%20Teacher%20Remuneration%20in%20Latvia_OPS_FINAL.pdf. [21]

OECD (2013), *Synergies for Better Learning: An International Perspective on Evaluation and Assessment*, https://doi.org/10.1787/9789264190658-en. [15]

OECD/EC-JRC (2021), *Access and Cost of Education and Health Services: Preparing Regions for Demographic Change*, OECD Rural Studies, OECD Publishing, Paris, https://doi.org/10.1787/4ab69cf3-en. [11]

OECD; European Union; FAO; UN-Habitat; World Bank (2021), *Applying the Degree of Urbanisation : A Methodological Manual to Define Cities, Towns and Rural Areas for International Comparisons*, https://doi.org/10.1787/4bc1c502-en. [13]

Weiss, D. et al. (2018), "A global map of travel time to cities to assess inequalities in accessibility in 2015", *Nature*, Vol. 553/7688, pp. 333-336, https://doi.org/10.1038/nature25181. [14]

World Bank (2023), *Building Better Formal TVET Systems - Principles and Practice in Low- and Middle-income Countries*, https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099071123130516870/p175566037a5e20650a657068b5152205bf (accessed on 24 August 2023). [20]

This document was drafted by the Implementing Education Policies Team within the OECD Directorate for Education and Skills (EDU) and the Territorial Statistics and Analysis team within the OECD Centre for Entrepreneurship, SMEs, Regions and Cities (CFE).

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For more information:

Contact

- Marco Kools, Project manager & Analyst**,** Marco.Kools@oecd.org
- Ana Moreno Monroy, Head of Unit, Ana.MorenoMonroy@oecd.org

Websites

- OECD Implementing Education Policies
- OECD Centre for Entrepreneurship, SMEs, Regions and Cities

This Education Policy Perspective has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

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