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## On the Network of Profile Lyceums

### Table of contents:

1. The present network of secondary schools in Ukraine .....	4
2. Modelling the network of profile lyceums .....	9
3. Challenges of introducing profile lyceums .....	14
4. Policy options for lyceum founders.....	16
5. Policy options for normative class sizes of lyceums.....	21
References.....	23
Annex. Data issues encountered.....	25

### List of tables:

Table 1. Secondary schools by organizational type and stage configuration .....	5
Table 2. Students of secondary schools by organizational type and stage configuration .....	5
Table 3. School size of secondary schools by organizational type and stage configuration.....	6
Table 4. Class size of secondary schools by organizational type and stage configuration .....	6
Table 5. Students and average class size by education stage .....	6
Table 6. Class size of upper secondary grades by organizational type and stage configuration .....	7
Table 7. Class size of upper secondary grades by region .....	8
Table 8. Movement from grade 9 to grade 10 in September 2020 .....	9
Table 9. Characteristics of education systems under three scenarios.....	11
Table 10. Simulations of network of profile lyceums.....	12
Table 11. Results of the simulation by oblast (threshold population 50 thousand) .....	13
Table 12. Average characteristics of local networks of lyceums for different lyceum founders.....	17
Table 13. Number of schools by organizational type.....	25
Table 14. Secondary schools and students by organizational type.....	26
Table 15. Secondary schools and students by stage configuration .....	26
Table 16. Students in individual teaching by organizational type.....	26

One of important goals of the education reform known as New Ukrainian School (Нова українська школа) is the extension of obligatory education from 11 to 12 years and the creation of profile lyceums (профільний ліцей), that is separate upper secondary schools, comprising grades 10, 11,

and 12, and allowing the student to choose an educational profile. According to the concept of the New Ukrainian School, adopted in 2016 by the Cabinet of Ministers of Ukraine (CMU 2016), this reform is planned for the third stage, with creation of network of profile lyceums in 2025 and its full implementation in 2027. The basic principles of profile lyceums were codified on January 16, 2020 in the Law on General Secondary Education (Закон України Про повну загальну середню освіту).

To appreciate the scope of this reform, it is important to note that upper secondary education in Ukraine still follows the Soviet model and is radically different from the models used in EU countries. In most European countries, upon completion of obligatory general education (primary school or lower secondary school), graduates select the next school depending on whether they choose to continue general academic education or professional education. In Ukraine, instead, those students who choose professional education leave general secondary schools after grade 9, and other students continue in the same school until graduation. About 60% of students in grade 9 continue in secondary schools in grade 10 (see Table 8). Typically, the classes are not realigned after grade 9, and they continue with fewer students until end of grade 11. Thus class sizes in upper grades are smaller than in earlier grades (see Table 5). When the lyceum reform is implemented, the experience of changing school after completing grade 9 should extend from current 40% of student population to 100%. The reform will change all schools and will affect all students and teachers.

According the Law on General Secondary Education (Art. 6), there will be two directions of profile secondary education, namely academic direction and professional direction (other types of specialized lyceums are discussed in Art. 35, p. 5). These will be separate education institutions, thus bringing the Ukrainian model closely to the European practice. They will also have different founders. Schools providing initial and basic education (up to grade 9) will be founded by territorial gromadas, while lyceums will be founded by oblasts and by cities with more than 50 thousand inhabitants (Art. 32).

The implementation of this reform will not be easy. One challenge will be the adoption of the pedagogical concept of the profile lyceum, including the state standard, determination of available educational profiles, updated teaching programs, stronger teacher qualifications, new textbooks, required improved teaching aids and educational space (освітній простір), and adjusted external examinations. The Law in Art. 32 also requires the adoption of regulation of lyceum (Положення про ліцей), a draft of which is already under discussion. The other problem will be creation of the network of profile lyceums across the country and equipping them in accordance with the requirements of the state standard.

Moreover, the Law does not discuss the issue of whether there will be both academic and professional lyceums, or will all lyceums be academic. This is a very important problem, which will have far-reaching impact on the future network of profile lyceums. On the one hand, the Law on Professional technical Education states that there exist professional lyceum (професійний ліцей), alongside the more popular professional-technical schools (професійно-технічне училище). Strategic document of the reform New Ukrainian School (MES 2016) also discusses professional lyceums. On the other hand, draft regulation of lyceums (Проект постанови Положення про ліцей) assumes that there will be only academic profile lyceums. These legal issues will have to be clarified.

Apart from secondary schools, full general secondary education in Ukraine may be obtained also in professional-technical schools (ПТНЗ, about 170 thousand students) and in higher education (ВНЗ I-II ступеня, фахова передвища освіта, about 60 thousand students). The introduction of lyceums should be accompanied by clarification of the roles of these highly differentiated sectors of education

and their relationship with lyceums (including the possible movement of students between schools of different type).

Finally, we note that according to Ukrainian legislation (MinSocPol 2020), the Ministry introducing a sectoral reform is obliged to consider the consequences of that reform on gender equality and prepare a plan of relevant activities. This is a very new legal requirement, which may present some challenges.

In the present Short Note 123 we focus attention on the challenges of creating the network of profile lyceums. After reviewing the current network of secondary schools in Ukraine, including the chosen education path of graduates of grade 9, we undertake the first attempt, under some simplifying assumptions, to model possible network of profile lyceums at the national level – and to assess their future number and distribution. We also formulate some policy options regarding the decentralization and financing of lyceums. All analysis is conducted at the national level (we cannot and do not discuss future location, capacity or profile of individual lyceums).

It is hoped that the analysis, simulations, and discussions of the present policy note will be useful to Ukrainian reformers. Consultants of the Ukrainian-Swedish Project “Support to Decentralization in Ukraine” (SDU) are ready to engage in dialogue with experts of the Ministry of Education and Sciences of Ukraine (MES) and other education stakeholders.

We use the following linguistic convention: the term “upper secondary school” (старша школа) is applied to the current upper grades of general secondary school (середня загальноосвітня школа), namely grades 10 and 11. The planned separate upper secondary schools, comprising grades 10 to 12, is referred to as “lyceum” (лицей).

In the first section we present analysis of current network of secondary schools in Ukraine. Modelling of lyceums is presented in section 2. The main challenges of creating a network of lyceums are reviewed in section 3. In the final two sections we approach the lyceums from the decentralization perspective, namely the allocation of functions to tiers of local governments (who will be the founder of lyceums) and the financing of decentralized functions (how to set normative class sizes or NCS of lyceums). The Annex review the issues with data encountered during the analysis and how these were resolved.

The present SN is a continuation of technical cooperation of MES and the SDU project regarding analysis of network of secondary schools at the local and national level. Back in 2015, project experts together with Institute of Educational Analytics analyzed networks of rural schools in 40 rayons (Herczyński 2015). Policy options regarding fragmented local school networks were the subject of SN 24 (Herczyński 2015). Procedures and scenarios of optimization of networks of rural schools were the topic of the project publication (SKL 2016). In 2019, project experts prepared a guidebook on creation of upper secondary schools (Seytosmanov, Fasolya, Marchlewski 2019). Changes to networks of secondary schools between 2017 and 2019 were analyzed in SN 116 (Herczyński, Ostrowski 2020).

Acronyms used in the present SN are listed in the following table.

MES	Ministry of Education and Sciences of Ukraine
MF	Ministry of Finance of Ukraine
CMU	Cabinet of Ministers of Ukraine
SDU	Ukrainian-Swedish project "Support to Decentralization in Ukraine"
TG	Territorial Gromada
STS	State Treasury Service
NUS	New Ukrainian School
NCS	Normative class size
SN	Short Note

## 1. The present network of secondary schools in Ukraine

There are two classifications of secondary schools in Ukraine, one based on organizational type, and one on education stages.

Three organizational types of secondary schools operate in Ukraine:

1. Stand-alone school (not a satellite and without a satellite),
2. Hub school (опорна),
3. Satellite school (філія).

The determination of the organizational type is made on the basis of existence of satellite schools with non-zero student numbers (see Annex).

Secondary schools may operate in six stage configurations, depending on whether there are classes and students belonging to any of the following three stages (ступінь освіти):

- I. Initial education (grades 1-4),
- II. Basic education (grades 5-9),
- III. Upper education (grades 10-11).

The stage configurations extend from I (only initial education) up to I-II-III (complete secondary school). The determination of stage configuration is determined on the basis of students actually enrolled in appropriate grades (see Annex).

In the present report we discuss only secondary schools owned by local governments (not private) and without special schools. Schools without students are not taken into account. School is designated as hub school not based on its status, but on whether it has at least one satellite with students (see Annex). However, the analysis includes non-special secondary schools founded by oblasts. Here we need to note that from the purely legal point of view, the founders of schools are not local governments such as territorial gromadas or oblasts (which are not legal persona), but gromadas councils and oblast councils respectively. For simplicity of exposition, we refer to gromadas and oblasts as founders, without mentioning the councils every time.

The following presents the number of secondary schools by organizational type and by stage configuration.

Table 1. Secondary schools by organizational type and stage configuration

Stage configuration	Organizational type			
	Hub	Satellite	Stand-alone	All
I		482	968	1 450
II			4	4
III			29	29
I-II	4	885	3 803	4 692
II-III	6		315	321
I-II-III	691	29	8 289	9 009
All	701	1 396	13 408	15 505

The dominant type of secondary school is a stand-alone complete secondary schools I-II-III, comprising over 56% of all communal secondary schools. The second most dominant form is a stand-alone school with education stage configuration I-II, at nearly 25%. These two types of schools together comprise over 80% of all secondary schools in Ukraine. We can also conclude that secondary schools with just grades II or III are a rare anomaly in Ukraine, and schools with stage configuration II-III are also very rare (at about 2% of the total).

Hub schools form less than 5% of all schools, and satellite schools just 9%. All satellite schools include initial stage I, but more than half of them has stages I and II, and a handful even I-II-III. Here it is important to stress that Decree of Cabinet of Ministers of Ukraine Nr. 532 (CMU 2019, as amended in 2021) states that satellites provide initial education, and upon the decision of school founder – also basic education (stage II). There cannot be upper secondary education in satellites.

The dominance of stand-alone schools is even stronger when we review the number of students of secondary schools, see Table 2.

Table 2. Students of secondary schools by organizational type and stage configuration

Stage configuration	Organizational type			
	Hub	Satellite	Stand-alone	All
I		10 697	66 220	76 917
II			427	427
III			4 600	4 600
I-II	618	54 944	346 437	401 999
II-III	2 152		121 587	123 739
I-II-III	276 385	3 035	3 203 173	3 482 593
All	279 155	68 676	3 742 444	4 090 275

Students enrolled in stand-alone complete secondary schools, covering I-II-III, form over 78% of all secondary school students in Ukraine.

The following Table 3 shows average school size of secondary schools grouped by organizational type and by stage configuration.

Table 3. School size of secondary schools by organizational type and stage configuration

Stage configuration	Organizational type			
	Hub	Satellite	Stand-alone	All
I		22	68	53
II			107	107
III			159	159
I-II	155	62	91	86
II-III	359		386	385
I-II-III	400	105	386	387
All	398	49	279	264

Overall, satellite schools are very small, on average less than 50 students. Also, schools without stage III (upper secondary) are generally small, especially those with just initial education. Similarly the 29 schools with just stage III are quite small. The largest secondary schools are hub and stand-alone schools with grade configuration I-II-III and II-III.

From the efficiency perspective, and in light of the introduction of lyceums, class sizes are more important than school sizes. Average class size in secondary schools grouped by organizational type and by stage configuration is reported in Table 4.

Table 4. Class size of secondary schools by organizational type and stage configuration

Stage configuration	Organizational type			
	Hub	Satellite	Stand-alone	All
I		10,23	19,99	17,65
II			23,72	23,72
III			27,22	27,22
I-II	15,85	9,33	11,88	11,45
II-III	22,42		26,82	26,73
I-II-III	20,97	10,25	21,80	21,71
All	20,97	9,50	20,32	19,98

Classes in hub schools and in stand-alone schools have the same average size of 20 students, while on average classes in satellite schools are half this size. Given the fact that stand-alone schools with stage configuration II-III and I-II-III are of the same size on average (see Table 3), but those with II-III include fewer grades, it is not surprising that they also have significantly larger classes.

However, in view of the plans to create a separate network of lyceums, it is necessary to focus on average class size of grades 10 and 11. Towards this end, we first present average class sizes for different stages of education in the following Table 5.

Table 5. Students and average class size by education stage

Education stage	Students	Distribution of students	Average class size	% of national average class size
Initial	1 694 956	41,4%	20,22	101,2%
Basic	1 959 707	47,9%	20,10	100,6%
Upper	435 612	10,6%	18,66	93,4%
All	4 090 275	100,0%	19,98	100,0%

We note that the average class size for upper secondary schools is significantly lower than for initial and basic school, by about 7%. This is significantly less than the decrease of student population in secondary schools following completion of grade 9 (see Table 8 below). This shows that secondary schools do partially optimize their network of upper secondary classes following the departure of a group of students to continue education in professional schools, but this does not fully compensate for decreased student numbers.

The situation presented in Table 5 is worrying, because. As recalled in the introduction, students not willing to continue general academic education leave the secondary school and move to professional schools, while their old classes continue with fewer students. The effect is declining class size in grade 10 in comparison to grade 9.

However, it is also at upper secondary grades that the teaching program is longest, and therefore also the number of full-time equivalent teachers per class is largest. Upper secondary grades also require more specialized teaching equipment and need more access to teaching materials. For these reasons, teaching a class in upper grades is more expensive, and in most countries this is compensated by larger class sizes in upper secondary schools. Sadly, in Ukraine the reverse is the case.

For introduction of lyceums, of main relevance are the average class sizes in grades 10 and 11. They are reported in Table 6 for schools grouped by organizational type and stage configuration. Of course, only grade configurations including upper secondary school III appear in Table 6.

Table 6. Class size of upper secondary grades by organizational type and stage configuration

Stage configuration	Organizational type			
	Hub	Satellite	Stand-alone	All
III			27,22	27,22
II-III	21,05		25,26	25,20
I-II-III	18,24	7,53	18,12	18,11
All	18,27	7,53	18,71	18,66

The picture presented in Table 6 is similar to Table 4 above. Largest classes in upper secondary grades are in stand-alone schools with just stage III, and with stage configuration II-III. In the dominant form of secondary schools with upper secondary stage, namely stand-alone schools with stages I-II-III, class sizes are smaller. The very low average class size in satellite schools is a minor issue as it refers to very few students, but clearly it is very difficult to provide full value upper secondary education to a class with fewer than 10 students.

In the following Table 7 we present average class size of upper secondary education for dominant organizational types and stage configurations by region. The table indicates very significant regional differentiation of upper secondary school in Ukraine.

Table 7. Class size of upper secondary grades by region

Region	Organizational type		Stage configuration		All secondary schools
	Hub	Stand-alone	II-III	I-II-II	
Вінницька	18,95	15,77	27,80	15,48	16,10
Волинська	18,84	17,86	27,95	17,44	17,96
Дніпропетровська	18,02	22,10	25,71	21,33	21,79
Донецька	22,88	19,72	27,31	19,38	19,83
Житомирська	18,05	15,66	25,39	15,71	15,95
Закарпатська	21,71	19,84	22,75	19,64	19,92
Запорізька	17,85	18,83	24,35	18,14	18,78
Івано-Франківська	19,11	18,85	25,11	18,22	18,87
Київська	17,60	18,57	22,18	18,24	18,47
Кіровоградська	15,76	16,71	25,25	15,24	16,43
Луганська	17,92	16,36	21,76	15,68	16,46
Львівська	21,25	20,20	26,20	19,78	20,33
Миколаївська	17,90	16,57	25,88	15,43	16,66
Одеська	15,53	18,99	24,49	18,38	18,78
Полтавська	18,77	15,64	26,04	15,63	15,99
Рівненська	19,59	18,42	23,50	18,13	18,51
Сумська	15,55	16,40	26,09	15,66	16,28
Тернопільська	17,51	15,93	22,30	15,60	16,12
Харківська	18,90	20,00	26,93	19,62	19,93
Херсонська	16,46	17,44	26,69	16,44	17,34
Хмельницька	19,68	17,05	27,48	16,15	17,11
Черкаська	17,56	15,51	21,29	15,50	15,67
Чернівецька	19,68	18,95	25,66	18,15	19,01
Чернігівська	18,02	17,00	21,57	16,25	17,08
Kyiv		25,37	25,43	25,36	25,37
Ukraine	18,27	18,71	25,20	18,11	18,67

The average class size of upper school in hub schools ranges from 15,53 in Odeska region (Одеська) to 22,88 in Donecka region (Донецька), difference of over 47%. Kyiv does not have hub schools. The average class size of upper school in stand-alone secondary schools, excluding Kyiv, ranges from 15,51 in Cherkaska region (Черкаська) to 22,10 in Dnipropetrovska region (Дніпропетровська), difference of 42%. Kyiv is well above the national average, with average class size 25,37.

The average class size of upper school in secondary schools with grade configuration II-III ranges from 21,29 in Cherkaska region (Черкаська) to 27,95 in Volynska region (Волинська), difference of 31%. Kyiv is close to the national average, with class size 25,43. The average class size of upper school in secondary schools with grade configuration I-II-III, excluding Kyiv, ranges from 15,24 in Kirovogradska region (Кіровоградська) to 21,33 in Dnipropetrovska region (Дніпропетровська), difference of 40%. Kyiv is once again well above the national average, with average class size 25,36.

Overall, and outside of Kyiv, average class size of upper secondary grades is above 20 in only 2 regions (Dnipropetrovska and Lvivska), and in three it is below 16 (Cherkaska, Poltavska, and Zhitomirska). Apart from being quite differentiated, these class sizes are very low.

The significant variation of the average class sizes of grades 10 and 11 across Ukrainian regions demonstrated in Table 7 will certainly pose very different challenges when new network of profile lyceums is planned and implemented.

Finally, we return to the issue of movement of students from grade 9 to grade 10, that is when they decide on continuation of their education, and when in the future they will be selecting the lyceum after completion of basic education. For this, we need to consider data on students in grade 9 from September 2019 and data on students in grade 10 in September 2020 (the same cohort one year later). Population in grade 10 is about 60,3% of the student population in grade 9 a year earlier, which shows that almost 40% of students moved to professional education (PTU or colleges) or fall out of the Ukrainian education system altogether (maybe due to emigration). These are national averages, most likely this percentage is higher in rural areas.

We assume that 60,3% of all students in schools with stage configuration II-III and I-II-III continue in the same school. This is justified by the fact that there are very few secondary schools with these grade configurations where the number of students in grade 10 was significantly higher than in grade 9 a year earlier. For simplicity, we also assume that the few students in schools with stage configuration III come from schools without upper secondary classes (configuration I-II). The movement of students from grade 9 to grade 10 is presented in the following Table 8.

Table 8. Movement from grade 9 to grade 10 in September 2020

Students in grade 9 in September 2019		Students in grade 10 in September 2020			
		III	II-III	I-II-III	PTU, colleges, not in school
I-II	40 727	2 441	7 451	14 666	16 169
II-III	21 953		13 237		8 716
I-II-III	309 128			186 399	122 729
All	371 808	2 441	20 688	201 065	147 614

Thus we see that there are only two major groups of students who complete grade 9 who change school: about 147 thousand leave secondary school and mostly go to professional schools, and about 40 thousand complete grade 9 in school without upper secondary grades, and are forced to move to another secondary school. When the new lyceum network will be implemented, this situation will change radically.

## 2. Modelling the network of profile lyceums

Before we can start discussing modelling the network of profile lyceums, it is necessary to clarify that we can only present simulations based on some simplifying assumptions. Actual network will be created through decisions of multiple independent agents, namely the future founders of these schools. They will be under different types of pressures. One pressure will be from schools themselves, some of which will want to become the type of schools, and some which will resist such a change. Another type of pressure will come from parents, who are used to having upper secondary schools closer to their place of living. Likewise, settlements and cities will want to have their lyceums. Founders will have to take into account the available school buildings, their capacity and accessibility for student transportation. They will also be under budgetary pressure, to limit the number of profile lyceums in order to minimize the necessary investment costs. Thus the actual network will be the result of complex interplaying influences, and exact location of the schools will depend on many local factors. Ukraine is used to these types of negotiations and compromises, as the recent history of establishing the network of territorial gromadas shows. The simulations presented below are therefore only a first step in assessing future number of upper secondary school.

In order to perform modelling of possible networks of profile lyceums, it is necessary to make a number of assumptions. Three types of assumptions need to be made, the first one regarding the minimum number of students in the new type of school, the second one regarding the expected number of future students, and the third regarding how to link simulations to the current network of secondary schools.

Regarding the minimum size of the profile lyceum, we can use the requirement of art. 32 of the Law on General Secondary Education, which states that “For initiating and continuation of pedagogical activity of communal lyceum its composition should include no fewer than four classes of grade 10” (“Для започаткування та провадження освітньої діяльності комунального ліцею у його складі має бути створено та функціонувати не менше чотирьох 10 класів”). The meaning of this clause is clear: every school year, at least four classes are formed in grade 10, and they will continue until the graduation in the following school years (as grades 11 and 12). However, the Law does not stipulate the class size, other than limiting the number of students in a class to be at least 5 and at most 30 (Art. 12).

As discussed in section 1, average class size in grades 10 and 11 today is 18,7 (see Table 5). This is very low, especially given the fact that upper grades have largest teaching plans and therefore require largest number of teachers per class. Moreover, as discussed in the introduction, this is the result of current system in which classes in grade 10 are a continuation of classes in grade 9, with a number of students leaving for other types of education (and hence decreasing the class size). Since in new separate profile lyceum the classes will be formed freely, we can assume that the class sizes will be larger. For the purposes of simulation, we assume class size to be 25. With 4 classes per grade and three grades, this gives us the minimum school size of 300.

The future number of students has to be predicted, because it is not known now how many graduates of grade 9 will choose different paths of continued education. We therefore assume for the simulations that grade 10 and grade 11 will have the same number of students, distributed in the same way between territorial gromadas as in September 2020, while grade 12 will be the exact repetition of grade 11. This is the simplest assumption which can be made for simulating the number of students in the immediate future.

Clearly, the network of new lyceums will be formed on the basis of existing network of school buildings. However, some of the new schools may be in either new constructions, or in the facilities used until now by different education institutions. Of special importance here are facilities of professional technical schools, because usually they have large capacities, many of them are presently underutilized, and also because these schools very often have dormitories, which will be also useful for new profile lyceums for students coming from villages or from small cities. The same is true of special schools, whose enrollment is falling as special needs students move towards inclusive education. Special schools also have significant underutilized capacity and include dormitories. In some manner these factors have to be taken into account in the simulations. On the other hand, the simulations cannot indicate exact location of any lyceum, of course.

We will use the following assumptions:

- In territorial gromadas above certain population threshold, for example with more than 30 thousand, more than 50 thousand, or more than 100 thousand inhabitants (we call them “large territorial gromadas”), lyceums will be formed on the basis of existing network of secondary schools, and the average size of lyceums will be equal to the current average size

of all secondary schools or 300, whichever is greater. In this way, the modelling may lead to overestimating the number of lyceums (because it may be rational for future school founders to use largest facilities for the new schools).

- Outside of these large territorial gromadas, where presumably the founders of lyceums will be oblasts, the lyceums will be simulated within the territory of every rayon with the minimum school size 300 or the current average school size in small TG in that rayon, whichever is the larger. Again, this assumption may lead to overestimated number of lyceums (because founders may decide to use or to construct facilities with much larger capacity)

For clarity we point out that by “rayons” we mean the so called new or amalgamated rayons, in accordance to Order of the Ministry of Development of Gromadas and territory of Ukraine Nr. 290 of November 26, 2020 (as amended, MinRegion 2020, MinRegion 2021). In the simulations, due to their hypothetical nature, we do not assume that the number of lyceums in any rayon or gromadas must be an integer.

We stress that the population threshold and the use of amalgamated rayons in the simulation do not determine who will be the founder of individual lyceums (questions of founders are discussed in section 4 below). Due to the distinction between small and large TG, the simulation reflects the differences between urbanized and non-urbanized areas. Due to the use of rayons as areas within which networks of lyceums are formed, smaller than regions but larger than gromadas, the simulation reflects the subregional differentiation of Ukraine.

The three assumptions are sufficient to conduct modelling, but they are of course a simplification. In particular, there are many large facilities of secondary schools outside of large territorial gromadas, which may be used as seat of future lyceums. In every case, the location of a new school must take into account specific local conditions. In the future, more refined modelling approaches will certainly be used.

We will consider three simulation scenarios, with the three threshold values indicated above. The following Table 9 presents the data regarding territorial gromadas and their secondary schools in these three scenarios. In the table “large territorial gromadas” (“large TG”) and “small territorial gromadas” refer to gromadas with the number of inhabitants larger than or smaller than the threshold. The number of schools is smaller than data reported in Table 1, because we consider only schools as legal persons (without satellites) and naturally we exclude secondary schools founded by the regions. Only communal non-special schools are considered.

Table 9. Characteristics of education systems under three scenarios

	Threshold used for simulations		
	30 000	50 000	100 000
Number of small TG	1 226	1 349	1 400
Number of large TG	213	90	39
Number of secondary schools in small TG	8 579	10 579	11 567
Number of secondary schools in large TG	5 368	3 368	2 380
Average secondary school size in small TG	202	213	222
Average secondary school size in large TG	416	549	676

For lower thresholds there are more large TG and fewer small TG. This affects also the distribution of projected students between these two groups of gromadas (see Table 10). The average size of secondary schools increases with the threshold for both small gromadas and large gromadas.

In Table 10 below we present basic results of the simulations for the three scenarios (three values of threshold).

Table 10. Simulations of network of profile lyceums

	Threshold used for simulations		
	30 000	50 000	100 000
Projected students of lyceums in small TG	232 466	315 453	377 675
Projected students of lyceums in large TG	399 383	316 396	254 174
Lyceums in small TG	766	1 038	1 229
Lyceums in large TG	762	521	375
All lyceums	1 528	1 559	1 604
Average lyceum size in small TG	304	304	307
Average lyceum size in large TG	524	607	678
Average lyceum size	414	405	394

The estimated number of lyceums formed according to the modelling varies from 1528 to 1644 depending on the scenario, which means the three scenarios are very similar to each other. Moreover, all three scenarios produce network of lyceums which is quite closely aligned with the present network of secondary schools (see discussion following Table 11).

Note finally that average size of lyceum in small TG is just above 300, according to the assumptions above (the difference is due to a few small TG with average school size above 300). Moreover the average size of lyceum in large TG is higher than the average size of general secondary schools in these gromadas, again in accordance with the assumptions (the difference is due to those large TG in which average school size is below 300).

The following Table 11 presents the results of the simulation by oblast, for the simulation scenario with threshold population value 50 thousand. We provide numbers of lyceums in small and large territorial gromadas (these numbers do not always add up to the total number of lyceums in oblast due to rounding errors), as well as the average size of the lyceum. With the simple simulation methodology adopted, the simulations presented in the table are only an approximation.

Table 11. Results of the simulation by oblast (threshold population 50 thousand)

Region	Number of lyceums			Average lyceum size
	Small TG	Large TG	All	
Вінницька	59	6	65	365
Волинська	43	15	57	364
Дніпропетровська	52	59	111	455
Донецька	37	33	70	402
Житомирська	42	14	56	377
Закарпатська	58	18	76	349
Запорізька	33	26	59	430
Івано-Франківська	55	13	67	351
Київська	59	17	76	407
Кіровоградська	28	9	37	381
Луганська	17	10	27	332
Львівська	77	50	126	378
Миколаївська	30	12	42	399
Одеська	64	23	86	462
Полтавська	33	19	51	380
Рівненська	56	18	74	360
Сумська	22	14	36	379
Тернопільська	37	6	44	356
Харківська	50	36	86	446
Херсонська	32	13	45	366
Хмельницька	41	14	55	370
Черкаська	39	11	50	379
Чернівецька	45	8	53	339
Чернігівська	29	10	39	409
Kyiv		68	68	729
Ukraine	1 038	521	1 559	405

In highly urbanized oblasts (Dnipropetrovska, Donecka) many simulated lyceums are located in large territorial gromadas. The opposite is the case, naturally, in oblasts with low urbanization rates (Chernivecka, Ivanofrankivska). The correlation coefficient of average sizes of simulated lyceum and of present secondary schools is very high 0,92 (the value for other simulation scenarios is the same). This means that the network of lyceums and the network of present secondary schools are closely aligned to each other. This is of course what is expected: new lyceums will be to a great degree located in existing school buildings, so the regional differentiation of secondary schools (as seen in Table 7) under any scenario will reappear in the regional differentiation of lyceums.

It is interesting to compare the simulations presented in Table 11 with more concrete simulations for one oblast, conducted by Mr. Oleg Fasolya on the basis of detailed information on schools and local conditions (Fasolya 2021). He foresees only 31 lyceums in the in Khmel'nitska oblast, much less than 55 simulated above. However, Fasolya's simulations refer to year 2027, with the corresponding future decline of the number of students of lyceums. In addition, Fasolya points out that his simulations are lower than the planned number of lyceums foreseen by two largest cities in the oblast.

We need to stress that the assumptions behind the modelling are much easier to be met in large territorial gromadas than outside of the large territorial gromadas. In the cities, with their network of multiple large schools, also the lyceums formed will be comparably large. The difference of access to

one or another school in the city will not be significant for most students (and for very large territorial gromadas, like Kyiv or Kharkiv, there will be many lyceums formed in every city rayon). In the countryside, on the other hand, imposing the required minimum lyceum size of 300 students will require more student travelling a longer distance to the neighboring city, where lyceums will be located. One can expect significant resistance to this change. It should be expected, therefore, that in practice smaller classes and smaller lyceums will be allowed, and many more lyceums than assessed in the simulations above will be created. The review of this problem however requires detailed information about distances between schools (and more crucially, about the travelling times).

### **3. Challenges of introducing profile lyceums**

It is clear that introduction of a new type of school, profile upper secondary school or profile lyceum, is a major reform which will have impact on all school founders in Ukraine and on nearly all schools, on tens of thousands of teachers and on millions of students. This is evident from reviewing data presented in section 1 above. Therefore it is useful to summarize the main challenges facing Ukrainian reformers as they prepare for this task.

We do not touch the programmatic and pedagogical issues, although they are extremely important and will have major influence on the success of the reform. The educational concept of the profile lyceums needs to be developed in line with the determination of the range of profiles of lyceums, with the preparation of new curricula, of new textbooks, of new teacher competencies, of new requirements regarding school space and school equipment. These challenges should be approached in the light of experience of similar recent reforms, especially in former Soviet republics, which also inherited the model of integrated 11 grade school. The most useful lessons may probably be drawn from the experience of Baltic countries, Latvia, Lithuania and Estonia, which had been remarkably successful in their education reforms.

Instead, we focus on managerial and financial issues of the reform, because these more mundane issues also present formidable challenges to Ukrainian reformers. They are also more linked to specific Ukrainian conditions and legislative framework, especially the recent decentralization process, and the regional differentiation. Two key challenges, namely allocation of responsibilities for lyceums and determination of financing models are discussed respectively in section 4 and section 5. The following are remaining, not less urgent challenges of introducing profile lyceums.

- Preparing implementation schedule.

Good design of the implementation schedule will be crucial for the success of the reform. Typically, when structural reform like the introduction of lyceums is considered, students from a certain cohort (students born in a given year) start attending lyceums, while those who already begun their upper education are allowed to continue in the old type of schools. This means that during the implementation, both types of schools will coexist, and lyceums will grow as upper secondary schools become smaller. Some facilities will for a limited time serve both types of schools, some will move fully from being secondary schools to being lyceums at different school years. Therefore every year during the transition period there will be changes in how school facilities are used. This will require careful planning at the local level, as well as good guidelines prepared by the Ministry.

- Redeployment of teachers.

Part of the challenges of the transition period will be the need to redeploy the teachers. Two main problems can be identified. One is that as number of classes in upper secondary schools decrease, and as number of classes in lyceums increases, every year some teachers will have to move from one type of the school to the next one. Like the use of facilities, this will require good planning. The second problem is that if secondary schools will have different founders than lyceums (or some of the lyceums), the change of work of teachers will require ending one employment contract and beginning the new one. In the lyceums, one may expect that directors will want to select the best teachers from arriving candidates. However, this selection process will put many teachers in uncomfortable, uncertain situation and may hamper their motivation and resolve to teach well. The redeployment of teachers will need clear rules and procedures, which will be accepted as fair and objective by the teaching profession.

- Ownership of school properties.

Ownership of facilities is one of most contentious issues in the decentralization process, and in education it is also acutely important. If some lyceums will be founded by regions, the regions should also be the owners of the lyceum facilities. On the other hand, it is certain that most lyceums will be created in the present facilities of secondary schools, which are owned by territorial gromadas. Transfer of ownership from gromadas to region which would be decided by an act of parliament would be contrary to the European Charter of Local Governments. Transfer of ownership based on mutual agreement of two local governments of different tier may be difficult (Ukraine has experienced this type of difficulty when school property was supposed to be transferred from rayons to newly created gromadas; in many instances even the transfer of school documentation was not easy). Therefore some national program to assist and regulate this transfer will most likely be needed. In order to be feasible, such a program should be proposed, discussed and agreed with the national associations of local governments prior to the start of the implementation period. Such a program may include various forms of compensation to gromadas who will give away their property, but it will be necessary to control the costs of the compensation at a level acceptable to the national budget.

- Regional differentiation.

As discussed in several places already, Ukraine is a large country with significant regional variation. The variation concerns urbanization, population density, presence of mountains and lakes, and various networks (of schools, roads and railways, to name a few). This means that the network of lyceums will be likewise differentiated and that resistance to creation of a rational network of lyceums of sufficient size will be very different in different parts of the country. This means that the reform should be well prepared. One approach, which was already used in Ukraine during the decentralization process, may be to create at the national level proposed networks of lyceums ("maps of lyceums") and to present them for local discussions. This may be a better approach than allowing future founders of lyceums determine their own networks on their own. This latter approach was employed, for example, during the reform of 2000 in Poland when gymnasia were introduced, and local

governments had the responsibility to determine their networks on their own (subject to some national norms and requirements). It seems that a much safer approach would be to begin with a national proposal of the network of lyceums, to try to ensure that regional differentiation and specific local conditions do not lead to creation of excessive number of very small lyceums.

- Student transportation and student dormitories.

Lyceums will certainly be located much further from the place of living of students than present upper secondary grades in secondary schools. This will necessarily impose additional burden on students: either of travelling to the school daily (which takes up precious time), or of staying the dormitories provided in lyceums. Both of these options will require some investments and preparation. Student transportation requires roads and busses, as well as employment of drivers. Dormitories will have to be renovated if they exist, and constructed in case they do not exist. The state budget will have to financially support much of this renovation and construction, therefore some national plan of these required investments will have to be prepared and its costs estimated. In addition, as full secondary education is obligatory, it will not be possible to demand that families of student cover the corresponding costs of either using dormitories or of daily travel to lyceums. The organization and financing of transport and dormitories will require careful legal regulation, preparation, and planning.

#### **4. Policy options for lyceum founders**

The key question of decentralization is the allocation of functional responsibilities to different tiers of local governments. In the context of profile lyceums, this is the question of who will be the founders of these schools.

The Law on General Secondary Education provides one answer to this question. Namely in Art. 32 it states that the founders of profile lyceums will be regions and territorial gromadas with more than 50 thousand inhabitants. As a city with special status, Kyiv will be also the founder of lyceums, of course. Nevertheless, there have been recent developments in Ukraine which fall outside this legal norm, such as the proposal to entrust profile lyceums to voluntary associations of gromadas (intercommunal educational circles) proposed in Seytosmanov, Fasolya, Marchlewski (2019). Moreover, many cities with fewer than 50 thousand inhabitants expressed desire to form profile lyceums. This indicates that it is good time to return to this problem from the point of view of principles of decentralization.

Important context is provided by the allocation of responsibility for professional-technical education, because according to the reform of lyceums, the academic and professional education following grade 9 will be parallel. Presently, the founders of professional schools are oblasts, the oblast capitals, and Kyiv. This is of course different from the provision of Art. 32 quoted above.

Recent regional experience shows that these strategic decisions have an impact on the actual implementation of the reform. Assignment of responsibility for lower secondary schools (*gymnasium*) to the lowest tier of local governments in Poland in 2000 has led to the dominance of organizational model which the reformers specifically wanted to avoid (integrated with the primary school, see Herczyński, Sobotka 2017), and to the creation of much more and much smaller

gymnasiums than originally planned (Herczyński, Sobotka 2014). Clearly, Ukrainian reformers should consider this issue carefully.

There are two main decentralization principles which apply in this case:

- Service area of lyceums. In general, a function should be allocated to that level of governance which is most suitable for the service area of that function. Thus, preschools are clearly a function suitable for territorial gromadas, while regional roads are clearly a function suitable for oblasts.
- Local capacity to manage lyceums. In general, execution of an important social function such as education requires capacities to plan, budget, and oversee the function. Education is particularly complex social function, because it employs many staff and affects all families.

In Ukraine, there are three tiers of local administrations, territorial gromadas, rayons, and regions (oblasts). In the following Table 12, four possible options are considered. Namely, we review average local networks of lyceums when school founder are oblasts, rayons, oblast and large gromadas, and rayons and large gromadas, where large gromadas are those identified in simulations conducted above (in section 2, Table 9). In the last two cases, it is assumed that oblast and rayons respectively would be the founders of lyceums located in small territorial gromadas. The values provided in the table are based on the simulation scenario with threshold value 50 thousand (see Table 10).

Table 12. Average characteristics of local networks of lyceums for different lyceum founders

	<b>Options for allocation of responsibility for lyceums</b>		<b>Number of units</b>	<b>Average number of lyceums</b>	<b>Average number of lyceum students</b>
1	Oblasts		25	61	25 274
2	Rayons		120	13	5 265
3	Oblasts and large territorial gromadas	Oblasts	25	42	12 618
		Large TG	90	6	3 516
4	Rayons and large territorial gromadas	Rayons	120	9	2 629
		Large TG	90	6	3 516

Under the third option there would be 115 founders of lyceums in the country, and under the fourth one – 210.

In education, it is rational if school founders have at least 4 or 6 schools of the same type. This is necessary to ensure space for future adjustments to fluctuations of student numbers, to changes of preferences regarding the profiles, and similar. A founder with just one school has no opportunity to respond to these very frequent challenges. On the other hand, very large networks with over 100 schools are difficult to manage, especially regarding the cooperation between the school founder and the directors of schools. This is the reason, among others, why management of Kyiv secondary schools is delegated to city rayons.

From this point of view, Table 12 provides useful insight. The average number of lyceums in oblast is 61, and in rayon is 13. Thus both have reasonable size for school founders. If some lyceums are founded by large TG, the average number of lyceums remaining in oblast would be reduced to 42, and in rayons to 9, which are also reasonable local networks. Of course, average networks in large TG do not depend on whether the remaining schools are founded by oblasts or rayons.

However, the concept of decentralization in Ukraine foresees only some administrative and control functions for rayons, and not important and expensive social functions such as education, health, or

social protection. Therefore the rayons cannot be considered as possible founders of lyceums, even if their average size would make them suitable, which excludes options 2 and 4 in Table 12. We therefore formulate the following three policy options for allocation of that responsibility to local governments:

1. Uniform policy option: Oblasts and Kyiv are the only school founders of profile lyceum.
2. Heterogenous policy option: Oblast, Kyiv and large territorial gromadas are the school founders of profile lyceum.
3. Composite policy option: Oblast, large territorial gromadas, and local unions of territorial gromadas are the school founders of profile lyceum.

The last option is based on current discussions in Ukraine, recalled at the beginning of the present section (it is not included in Table 12 because it is not possible to foresee how many local associations of gromadas will be formed).

Below we clarify the meaning of each of these policy options and discuss their weak and strong points in the light of the two principles recalled above, but we do not provide concrete recommendations.

***1. Uniform policy option: Oblasts and Kyiv are the only school founders of profile lyceum.***

Under the uniform policy option, oblasts and Kyiv will decide on the network of all lyceums and will finance them. This is close to the present allocation of responsibilities for professional schools, and in line with the proposals that all professional schools should be under the authority of regions and Kyiv, even those located in oblast capitals.

The value of the uniform policy option is that there will be clear responsibility for the network of lyceums, and that possible competition between school founders will be avoided (see below). Regions cover catchment areas of future lyceums. Moreover oblast education departments have significant experience of managing schools. With joint responsibility for academic lyceums and for professional schools, oblasts will be able to adjust both networks to the shifting demand from students graduating from grade 9. One response to these expected shifts may be redeploying teachers between different types of schools; this will be relatively easy if the founder of these schools is the same.

Moreover, many of the schools founded by oblasts already have dormitories and kitchens, some of them underutilized. These are special schools, specialized secondary schools (with artistic or sport specialization), and professional schools. These dormitories may be used by students of lyceums, if the lyceum uses the same facility, or if it is located in the same city where one of the oblast schools with a dormitory is located. Also colleges (higher education of II level of accreditation) often have dormitories.

Finally, one school founder will make cooperation between schools much easier. Such cooperation may have many forms, from sharing the use of some facilities (sports, artistic), through joint activities, to exchanges of teachers. Academically successful lyceums may support school improvement plans in lyceums undergoing problems.

There are three main weak points of this policy option. The first is that the local networks of lyceums will be rather large (see Table 12). Presently, only very large Ukrainian cities have comparable

networks of education institutions. It seems certain that the oversight, management and financing of these networks will require additional, highly trained staff in the oblast education departments.

The second weak point is related to the first one, namely that the number of schools managed by oblasts will increase. As inclusion of special needs students in mainstream schools proceed, there will be less demand for special schools, and therefore some of their facilities may be converted into lyceums. However, in many cases it will become necessary for oblast to acquire new facilities for lyceums. One source of these facilities may be underutilized secondary schools, because creation of lyceums will reduce the student population in all secondary schools with education stage III. However, these facilities are now owned by the territorial gromadas and their transfer into the ownership of oblasts may be difficult. Moreover, the underutilized facilities of secondary schools may be located in places not convenient for lyceums (which will require as a minimum good access roads). Alternatively, oblasts would need to construct new facilities for lyceums. This, however, will be costly.

The final weakness of this policy option which should be taken into consideration is that one can expect significant resistance of large territorial gromadas to this approach. Some of them have already set up their profile lyceums, for example Slavuta (Seytosmanov, Fasolya, Marchlewski 2019). Oblast capital are also expecting to create their network of lyceums, similar to their network of professional schools. The reconciliation of these different expectations will require policy dialogue.

## ***2. Heterogenous policy option: Oblasts, Kyiv and large territorial gromadas are the school founders of profile lyceum.***

Under the heterogenous policy option, the founders of lyceums will be Kyiv and large territorial gromadas for schools located on their territory, and oblasts for schools located outside of the large territorial gromadas. As Table 12 indicates, these founders will have on average reasonable local networks of lyceums.

There may be different exact definitions of large territorial gromadas for this policy option. One would be to allocate this responsibility only to oblast capitals, exactly the same as for professional technical schools. The present legislation (Art. 32 of the Law on General Secondary Education) allocates this function to cities with more than 50 thousand inhabitants. This would exclude Slavuta (population 35 thousand), where a profile lyceum has already been created. If population is the criterion rather than administrative position such as oblast capital, negotiations are possible and may be expected (in section 3 we provided simulations with three threshold values).

One way of assessing minimum population of cities to be founders of lyceums is to estimate the number of lyceums students living there. On average across Ukraine, one grade of upper education is about 0,055% of population. This means population of about 18 thousand may support one lyceum with 300 students. However, as discussed above, it would make sense for school founder to have several such schools, for example 4, raising the expected population to 75 thousand.

The value of the heterogenous policy option – in the case of allocating this responsibility to oblast capitals – is that it would align the responsibility for lyceums with the responsibility for professional schools. As discussed above, it would be very good if these two parallel responsibilities were allocated to the same founders. This benefit disappears if population is used as criterion. Moreover, most special schools and specialized schools with dormitories are founded by oblasts and by Kyiv.

Large territorial gromadas, namely former cities of oblast subordination (including the oblast capitals), have been founders of secondary schools for many years, so they have certainly acquired experience and institutional capacities necessary for managing lyceums. In most of them the number of schools will probably not increase significantly when lyceums are created, because they will be able to simply convert some of their secondary schools into lyceums. The increase of local student population will come mainly from prolonging the compulsory education from 11 to 12 years.

The heterogenous policy option has the additional advantage that for oblasts it will reduce the need for new facilities for lyceums in comparison with the uniform policy option. However, this need will not be eliminated, so the difficulty of acquiring new facilities will certainly remain a problem.

The main weak point of this policy option is that it creates opportunities for competition between different founders of lyceums. This is because for many students living in large areas around the oblast capitals (or large territorial gromadas in a different sense) the natural location of lyceum owned and financed by the oblast would be in the city. In particular, the network of roads around large cities is always directed towards their centers. So the oblast may decide to locate their lyceum in the city, leading to competition. For example, in simulations for Khmel'nitska oblast, Oleg Fasolya foresees that in three large territorial gromadas oblast lyceums will coexist with city lyceums (Fasolya 2021).

Moreover, even if an oblast lyceum is located outside of large territorial gromadas, the city may decide to open another one in the city to attract their students. If the result of such competition is decrease of the student population in oblast lyceum, then its closure would be rational option, but it may endanger access to lyceums for some groups of students, because the city has no obligation to open lyceums for students living outside of the city. Therefore some procedures to regulate this process of opening lyceums will be necessary.

The problem of competition is related to the fact that only very large territorial gromadas will cover the catchment areas of profile lyceums. This problem appears in Poland, where secondary education (including academic lyceums and professional schools) are allocated to rayons (called "powiat" in Polish). In many cases, lyceums in large territorial gromadas attract students from surrounding rayons, and as a result these rayons are predominantly founders of professional and special schools. It is recognized in Poland that rayons are too small in comparison to the service area of secondary education.

Here it is necessary to stress that contrary to popular opinion, competition between public schools does not lead to improved teaching quality, but to increased differentiation of schools and to segregation of students. As students and their parents identify attractive schools, the demand from places there increases, leading to selection of students. We refer to literature review conducted for OECD by Waslander, Pater, van der Weide (2010).

Another problem with the heterogenous policy option is that it will become more difficult than under the uniform policy option to adjust the network of lyceums and professional schools as student populations change. This is because in some cases the school to be closed will have a different founder than a school where students go to. In that case adjustment of teacher employment may be difficult.

***3. Composite policy option: Oblast, large territorial gromadas, and local unions of territorial gromadas are the school founders of profile lyceum.***

Under the composite policy option, the number of potential founders of public lyceums increases even further in comparison to uniform and heterogeneous options, discussed above. Administratively the system becomes more complex.

The value of the composite policy option is the inclusion of lyceum founders who are closer to the student population than oblast and large territorial gromadas. This is especially true of lyceum students living in rural areas. By creating voluntary associations to manage and finance rural lyceums, territorial gromadas may improve access to lyceum education in areas far from cities. Moreover, this may be a way to mobilize additional resources for education from local budgets.

There are, however, several weaknesses of this policy option. The first is that it will be difficult to establish rural lyceum of sufficient size, due to limited catchment area. Only in some places it will be possible to organize a voluntary association of neighboring territorial gromadas with combined population of about 20 thousand to support one lyceum (see the discussion of the preceding policy option). Voluntary associations able to support several lyceums are very unlikely. This means that as the student population declines in the future, there will be no room for optimization of the network of classes in that lyceum.

As a result, one can expect much larger number of lyceums and consequently their much smaller sizes. At the same time, ensuring the availability of real choice is a key part of the reform. Even small lyceums will have to offer a real choice of different profiles to every student. This will result in small classes and significant loss of efficiency (much higher per student costs of providing lyceum education). Investment in modern school equipment in every lyceum may become prohibitively expensive.

Moreover, the key issue of competition between lyceums becomes more acute, with many different founders competing for the same shrinking student population. Cooperation between different lyceums may become extremely difficult.

We also note that educational circles as such have been removed from legal system of Ukrainian education in January this year, with the amendments to Decree Nr. 532 of June 19, 2019 (see CMU 2021). Thus a different legal entity will have to be established as the proper responsible founder of these rural lyceums. This means that the composite policy option will require changes to the normative framework.

## **5. Policy options for normative class sizes of lyceums**

The key issue is how the newly created lyceums will be financed from the education subvention. As the Decree of Cabinet of Ministers of Ukraine states 1088 (CMU 2017, with later changes), the allocation of education subvention is conducted separately for different groups of students, such as students of general secondary schools, of vocational schools, of colleges and similar. Thus there will be no problem with adding another such group, namely students of profile lyceums. The problem is how they will be treated. The most important issue concerns the normative class sizes. Two main policy options are available:

1. Localized policy option: Treat students of lyceums in a similar way to students of initial and basic education, and define normative class sizes (and other allocation parameters) for them based on the characteristics of the municipality where the school is located. Thus, there will be varied normative class sizes depending on the founder and location of lyceum.

2. **Uniform policy option:** Treat students of lyceums in a similar way to students of vocational schools, and apply the same normative class sizes (and other allocation parameters) uniformly across the country. Thus, there will be one normative class size for all profile lyceums.

We stress that under either of these policy options, a major challenge will be how to approach the fact that contrary to international experience, actual class sizes in upper secondary education are lower than in primary education (see Table 5). The financing mechanism should not encourage the continuation of the present situation. Thus for large founders of lyceums, such as oblast, the natural normative class size should be the maximum NCS for all secondary schools, as anything less would send a strong signal that classes in upper secondary school should be smaller than in initial and basic schools. In the conditions of the budget year 2021, this would set NCS for most lyceums in large founders to be 27,5. The two policy options, discussed separately below, would differ only for smaller school founders or for lyceums located in particular areas. As for the policy options regarding the founder of lyceums in section 4, we describe the policy options and point out their strong and weak points without making recommendations.

### ***1. Localized policy option.***

Under this policy option, NCS for lyceums will be determined locally, depending on the school founder and maybe the school location. As with the current NCS for all the grades, the purpose of such differentiation is to provide more funds to rural areas or small cities, where the provision of education is more expensive due to smaller class sizes.

The strong point of this policy option would be that it would recognize justified differentiation of class size in lyceums depending on their location, and therefore provide more adequate financing without imposing strong pressure to optimize. However, such a justification is not easy to formulate. In the transition countries, secondary schools are rarely located in the villages. Towns and cities are not only larger, they are usually served by a better network of roads, which allows transportation of students.

There are two main difficulties of implementing this policy option. The first is that lyceums do not yet exist, and therefore there are no empirical data available to assess the differentiated class sizes of lyceums depending on the school location or on the characteristics of its founder. Of course, the current network of upper secondary classes (as reviewed in section 1) cannot be used as a reference for this, because this network is particularly irrational and one of the goals of the reform is to correct it fundamentally. Therefore any proposed differentiation would be based on some ad hoc assumptions or on guesses, and can be challenged. This means that pursuing this policy option will quickly lead to purely political discussions, without arguments based on fact.

The second difficulty is that different lyceum classes, in contrast to different classes of initial and basic education, follow quite different teaching programs due to different profiles. Since students will freely select education profiles (assuming that sufficient choice is provided by the education system), and there is not yet sufficient evidence on what will be the statistical distribution of these choices, there is no way to link these individual decisions to the location of the lyceum or to the characteristics of the lyceum founder. An important and potentially crucial factor influencing the class sizes in future lyceums cannot be taken now into account.

### ***2. Uniform policy option.***

Under the uniform policy option, normative class size for all lyceum would be set at the same value of 27,5. Such an approach would send a very strong message to all founders of lyceums to optimize the network of lyceums and to create large classes. This would certainly allow for more choice of profiles for students, and for better financing of different profiles.

The strong point of this policy option would be that it clearly promotes efficient, large lyceums, able to provide their students with wide offer of educational profiles and additional educational services.

There are two main issues with this approach. One is that lyceums located away from the larger cities may have difficulties attracting enough students to form these large classes. With a uniformly large NCS, the allocation of funds for these schools may be insufficient.

On the other hand, education subvention is allocated not to individual schools, but to school founders. Through a fair and transparent budget process, large founders should be able to ensure sufficient level of financing for all their lyceums.

The second issue with uniform policy option is that it will create strong motivation for school founders such as oblasts to optimize their networks of lyceums. This can be seen as a strong point of this policy option, but as a result lyceums will be located far from where their students live. The stress of daily travel to the school, in particular, may be a problem for many students.

On the other hand, the students will have the choice of either commuting to the school, or staying in the dormitory. This is the choice already faced by the students of professional schools. The challenge of the school founder will be to ensure that the perceived value of lyceum education justifies, in the eyes of the students, the additional burden of attending a school located far from home.

The normative class size is the main, but not the only allocation parameter. Another one is the coefficient for non-teaching pedagogical staff. The coefficients for teaching program, another relevant factor, is uniformly applied for all schools in Ukraine.

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## Annex. Data issues encountered

Education statistical data collected in DISO in September 2020 were used for the analysis. Private and special secondary schools were excluded from the analysis, as well as schools with zero students. Thus only communal non-special schools actually operating were analyzed. However, special and inclusive classes in mainstream schools were not treated separately.

Present procedure for data entry into DISO is to include students and classes of satellite schools together with the data of the central school, and to report separately the satellite schools. In order to avoid double counting, data from satellite schools were subtracted from the central schools. This is possible because for satellite schools DISO includes school ID of the central school. In this procedure, data for 25 satellite schools without the corresponding school ID of the central school or with incorrect school ID were ignored (total of 679 students). Only schools with satellites with non-zero students were considered to be hub schools, irrespective of how they reported themselves in DISO (one school had 4 satellite schools with zero numbers). This procedure has reduced the number of schools, as indicated by the following Table 13.

Table 13. Number of schools by organizational type

Organizational type	Reported in DISO	Reclassified
Hub	996	701
Satellite	1 638	1 396
Stand-alone	13 130	13 408
All	15 764	15 505

Over 240 satellite schools disappeared because they have no students, and the number of hub schools also declined. Hub schools are the largest, and satellite schools are of course the smallest.

In the following Table 15 we provide the number of schools together with the number of students and average school size.

Table 14. Secondary schools and students by organizational type

<b>Organizational type</b>	<b>Schools</b>	<b>Students</b>	<b>Average school size</b>
Hub	701	279 155	398
Satellite	1 396	68 676	49
Stand-alone	13 408	3 742 444	279
All	15 505	4 090 275	264

The students and classes were aggregated into three stages of education (ступінь освіти): initial school denoted I (початкова освіта, grades 1-4), basic school denoted II (базова освіта, grades 5-9), and upper school denoted III (старша освіта, grades 10-11). The following Table 15 shows the number of schools and students by stage configuration (that is by the stages the school teaches). Stage configuration is based on actual student numbers, not on reported stage configuration in DISO (the designation in DISO is based on old categorization, when the number of students were much higher). The table includes stand-alone secondary schools, hub schools and satellite schools.

Table 15. Secondary schools and students by stage configuration

<b>Stage configuration</b>	<b>Schools</b>	<b>Students</b>	<b>Average school size</b>
I-	1 450	76 917	53
II-	4	427	107
III-	29	4 600	159
I-II-	4 692	401 999	86
II-III-	321	123 739	385
I-II-III-	9 009	3 482 593	387
All	15 505	4 090 275	264

Secondary schools with stage II and III are the largest on average, while schools with just stage I are the smallest.

In order to assess correctly class size, it is necessary review the impact of students undergoing individual teaching. This is relevant because they artificial increase average class size (they contribute to the number of students, but not to the number of classes). We identify in DISO those students in either initial, basic or upper education, for whom the corresponding number of classes in their school is zero. This results in an underestimate of the individual education (proper, larger number would be obtained by conducting this procedure separately for all grades). The following Table 16 presents number of students in individual teaching in initial, basic and upper education, by organizational type of school.

Table 16. Students in individual teaching by organizational type

<b>Organizational type</b>	<b>Initial</b>	<b>Basic</b>	<b>Upper</b>	<b>All</b>
Hub	40			40
Satellite	1 114	443	2	1 559
Stand-alone	2 734	1 034	271	4 039
All	3 888	1 477	273	5 638

Altogether, according to the identification used, there are only about five and a half thousand students in individual education, of whom only very few in upper secondary schools. This means that exclusion of these students would not have significant impact upon the calculations at the national level.

Nevertheless, for pedagogical and budget reasons provision of individual education, especially for upper secondary education, is problematic and should be discontinued (these issues were addressed in Short Note 110, April 2019).

Warsaw, March 23, 2021