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Group of National Experts on Effective Learning Environments

DEMOGRAPHICS TRENDS AND USE OF SCHOOL FACILITIES

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This paper presents the main issues that arise with the population increase/decrease in countries or regions and the decisions that need to be made by policy makers.

This document is presented to the Group of National Experts on Effective Learning Environments at the 4th meeting on 6-7 November 2016 under agenda item #15.

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Schools' Responses to Demographic Trends

Introduction

1.   Despite a continuing slowdown in the rate of population growth, it is "almost inevitable" that the number of people on the planet will rise from 7.3 billion in 2015 to 9.7 billion in 2050, according to a United Nations projection (World Population Prospects, the 2015 Revision).

2.   General population growth will impact on education provision, including the number of school places, where these places are and how they are provided. However, where the actual increases occur may be down to more localised factors.

3.   Education systems have to cope with changing numbers of students regionally within countries but also nationally, as national populations rise or fall, and local school age populations shift. The **reasons behind changes of school age population** are complex and vary from both inward migration to internal migration around a country. For example:

- Population movement towards cities/urban areas, although the shift in OECD countries has slowed (Governing the City, OECD 2015);
- Regional shifts in a country's population to wealthier parts of the economy;
- Government policy encouraging people to move by promoting industry in certain areas of a country;
- Migration from troubled parts of the world, more recently North Africa and Middle East to Europe. In OECD countries just over 9% of OECD country population are migrants (Trends Shaping Education, OECD 2016);
- Adults having children at an older age.

4.   As people move to another part of a country and in particular cities there is an increased pressure to provide supporting infrastructure including transport, health and not least education for **the increased student population**. However, when building schools, authorities face problems with the availability and cost of land, each of which will have been affected by the growth and increasing prosperity of the city. Therefore infrastructure planners have to look to other sometimes less conventional approaches to providing the physical infrastructure for schools from re-use of existing buildings, to building high-rise schools (for example at Parametta, Sydney).

5.   In many countries and regions the movement of people has had an intense effect on rural populations and therefore results to **declining numbers** of school age students. This leaves some rural communities with schools with very few students. However, the function of a school stretches beyond merely providing education to being a focus of the community –often a place where parents meet, or that provide local services that cannot be provided including healthcare. Therefore merely closing the local school and expecting students to travel to a neighbouring village or much further may have consequences far beyond education. This raises questions about policies for school closure, provision of transport, support for local communities, equity and well-being of students and how the use of ICT may facilitate education in different ways.

6.   Such issues may impact on different countries in different ways. Developed economies are no less affected by the complexity of population movement than developing economies. For example
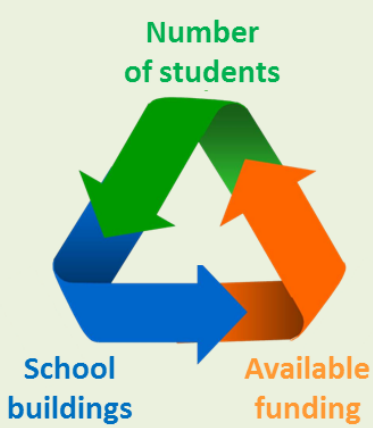
England's secondary school age population is predicted to rise by 20% from 2.7m in 2015 to 3.28m in 2024 (Department for Education), the primary school population is predicted to rise across the country by 6% over the same period.

Aim of the paper

7.   This paper was prepared after the proposal of the Bureau of the OECD Group of National Experts on Effective Learning Environments.

8.   Changing demographics creates a capacity issue that needs to be addressed, taking into account a number of factors. The number of students, the number of existing school buildings and the available funding are the three main elements that frame the problem. What is more important is that these three elements are interconnected and related in a way that if any of them changes, this also affects one or both other elements.

9.   The following table presents a process framework for any capacity/accommodation issue in education and especially for issues resulting from demographics changes. A number of different strategies have to be considered and evaluated, keeping in mind factors such as effectiveness, efficiency, sufficiency, equity, well-being and learning outcomes. Some additional factors to weigh are time related [what is the response time?], the socio-economic context [regional characteristics and reasons of demographic change?], the political dimension [political reasons to pursue an option vs another?] and the procurement methods [decide on build or design-build contracts; PPPS; etc?].

Changing demographics		
Process to tackle changing demographics in regards to school buildings		
How to frame the problem	**Available strategies**	**Additional factors to consider**
Number of students **School buildings** **Available funding**	Contemplate on different strategies & their results on: ▪ Effectiveness ▪ Efficiency ▪ Sufficiency ▪ Equity ▪ Well-being ▪ Learning outcomes	▪ Time dimension ▪ Socio-economic context ▪ Political dimension ▪ Procurement methods

10.   The aim of this paper is dual: on one hand, it presents the **main issues** that arise with population increase or decrease in countries or regions, the decisions that need to be taken in different stages of the process, as well as the advantages and disadvantages associated with each decision. The first part of the paper covers the issues arising from decreasing population, while the second part covers the inclining population issues. The last part is a consolidation of all different research and academic papers reviewed for this purpose.

11.   Each policy option presented below is designed to accommodate infrastructure needs for increasing and decreasing student populations respectively, however has advantages and disadvantages in relation to effectiveness, efficiency, sufficiency and equity. The Learning Environment Evaluation Programme has set out the three principles as follows: achieving effective learning environments (**effectiveness**); enabling more efficient use of space with regard to resource and space planning, use and management (**efficiency**); and providing sufficient to meet the minimum requirements to ensure users' comfort, access, health, safety and security (**sufficiency**). Educational effectiveness looks at the quality of learning taking place (Abalde, 2014). It is usually measured by student outcomes, but also includes areas concerned with well student well-being, as the latter usually has a large impact on student outcomes. Education efficiency is "educational effectiveness with the additional requirement that this is achieved in the cheapest possible manner" (Schreens, 2000). Education **equity** means "ensuring that personal and social circumstances should not be an obstacle to achieving educational potential" (Field et al, 2007).

12.   On the other hand, the main goal of the paper is to **trigger a discussion** amongst the Group of National Experts on Effective Learning Environments during the 4th annual meeting of the GNE in 2016. Some of the key questions that GNEELE may wish to discuss are:

- How can education planners address infrastructure and supply issues that arise from quickly growing urban areas and in parallel the potential shrinkage in rural zones?

- For growing student population, what is the best option: To build new facilities or increase capacity of existing schools? To use other existing buildings or provide temporary accommodation? To share spaces between schools?

- For falling student population, should policy makers close some schools and build one new school or share facilities between existing schools using a number of different operations? Should they use part of the existing building for other services or use ICT for remote learning?

- What is the effect on student population for each of these options and what is the effect on the communities?

- How to address the issue in the fastest possible way? What is the best procurement method for any strategy selected? How to plan and co-ordinate with other agencies and services e.g. transport?

13.   The GNEELE should reflect on the possible directions for further exploration of the issues raised (for example, a more analytical review or a specific research) during the 4th annual meeting.

1. Decreasing student population

14.   When there is decrease in student population, the decision makers consider ways to tackle the problem in regards to school facilities' usage optimisation, with temporary or permanent solutions. This chapter focuses on analysing the advantages and disadvantages of the following strategies:

- School consolidation
- School clustering
- School federations
- Schools as community centres – Community schools
- Use of Information and Communication Technologies (ICT)
- Specialised mobile (transportable) classrooms

Please note that the above list is not exhaustive. Re-use of existing buildings and construction of high-rise schools are two additional options already mentioned in par. 4 of the current document. The different options are neither mutually exclusive, therefore a mixture of any of the above strategies can also create new strategies.

- **School consolidation** is the process of combining/merging schools and centralising their management to increase education efficiency. The main advantages are (possibility for) economies of scale and better utilisation of resources. This paper will discuss in detail the effect of school consolidation on educational efficiency and effectiveness, as well as the areas for policy makers to consider when contemplating this policy option.

- **School clustering** is the process of bringing together groups of small schools, allowing them to maintain their individual identity and administration, while sharing resources, experiences and best practices. Schools are reorganised by providing more opportunities for teachers and staff to collaborate and share resources amongst the cluster. This paper will primarily discuss how this relates to school effectiveness. Since each school still keeps their physical building, schools mainly save on operational costs as they can share resources instead of investing in one for each school site.

- **School federations** occur when two or more schools join together and not only share resources, but also share an administration and a common vision. No schools are closed with school federations; the administration travels between the different school sites. Since school buildings remain open, educational efficiency is mainly affected by utilising the administration in a more efficient way.

- The creation of a school as a community centre, as **Community schools** refers to a type of joint use partnership where school buildings are shared with other organisations. This part will explain some of the financial benefits and drawbacks of Community schools and go over some positive outcomes that can lead to an increase in educational effectiveness and opportunities within the community on a broader scale. It will also highlight some issues to consider before adopting this policy.

- The **use of Information and Communication Technologies (ICT)** affects both the educational efficiency and effectiveness of a school. Using ICT for distance learning may result in curriculum enhancements to schools otherwise forced to cut certain classes based on low enrollment. The relevant part will examine some of the advantages and limitations of using ICT in areas with a declining population.

- **Specialised mobile (transportable) classrooms** are solutions for decreased population to specifically promote educational effectiveness by widening the curriculum offered in schools. Specialised mobile classrooms are designed to move between schools and with a specific type of curriculum in mind. This is a form of resource sharing that enables schools to come together to decide on a type of space that all parties need and then share this space by transporting the unit between different sites. This could be a less expensive option for schools rather than building permanent classrooms at individual school sites.

a. School Consolidation

15.   One reaction countries have to decrease in population is school consolidation. School consolidation means "merging schools or districts and centralising their management in the means of increasing efficiency" (Howley, Johnson & Petrie, 2011).

Advantages

16.   Fiscal efficiency and high educational quality are stressed by scholars as the two predominant advantages for school consolidation. In regards to fiscal efficiency, many believe that creating larger districts results in economies of scale (Howley, Johnson & Petrie, 2011). Specifically, schools would be able to buy larger quantities of materials at a lower unit cost, and use facilities to a greater capacity avoiding underutilisation. Also, operating costs for certain resources -like administrative and maintenance staff- do not increase, but are actually better utilised by more students. However, some of the negative aspects that are often overlooked are increased transportation costs and increased commuting time for students and staff. Staff costs may also increase since school consolidation provides an opportunity for comparison groups and collective negotiation, specifically amongst teachers (Abalde, 2014).

17.   When reviewing the empirical research on the efficiency of school consolidation, economies of scale are not guaranteed. Several studies discover a negative relationship between school size and cost, indicating that average spending falls as school size increases. However, others find a u-shaped relationship between size and cost, meaning that economies of scale can be achieved up to a certain enrolment point. However, if enrolment increases past this cut off, diminishing economies of scale begin to emerge.

18.   Research on education effectiveness related to school size has mixed results as well. Some studies have found that larger schools may be more effective because they offer more opportunities to staff and students. For example, they tend to offer a larger variety of classes and more extra-curricular activities. Larger schools also have more possibilities to group students in homogeneous learning groups. Teachers in larger schools typically have more specialised courses and more specialised staff for specific subjects or students, like students with disabilities.

19.   There are also several areas that small schools appear to be more effective than large schools. A number of research studies have concluded that small schools generally result in greater student wellbeing and learning outcomes, although these results are highly influenced by the socio-economic makeup of students (Roberts, 2002; White, 2005; Cotton 1996; Raywind, 1999; Cotton, 2001). Teachers and students appear to have stronger relationships in small schools, where teachers can provide more individualised attention to students; this also helps them quickly identify at-risk students to prevent them from repeating a grade or dropping out. Students in small schools also report a greater sense of belonging and some studies find that teacher satisfaction is also higher. Parents and community members near small schools also typically feel more closely linked to the school.

Disadvantages

20.   Some of the negative aspects in school consolidation that are often overlooked are increased transportation costs and increased commuting time for students and staff. Staff costs may also increase since school consolidation provides an opportunity for comparison groups and collective negotiation, specifically amongst teachers (Abalde, 2014).

21.   Empirical research on the effectiveness of small schools reveals that small schools may be particularly more effective for younger students and students from lower socio-economic backgrounds because of the increased individual support. Larger schools appear to have a polarising effect for many students, but older students with high socioeconomic status may benefit the most from the additional advantages of specialised study and extra-curricular programs despite the lack of personal attention. Large school created from school consolidation could result in a less equitable system where more affluent students benefit the most from the advantages of larger schools whereas students from lower socio-economic backgrounds are hindered because of them (Howley, 2001).

School consolidation
Combine smaller schools into one larger school | Closing of schools | Common school site

	advantages	disadvantages
effectiveness	**Effectiveness** ▪ Larger variety of courses offered, including specialised courses ▪ More extracurricular activities offered ▪ Specialised staff can be hired (i.e special education) ▪ More professional development opportunities	**Effectiveness** ▪ Decreased community cohesion ▪ Negative impact on local economy ▪ Forced to cut other community resources that were provided by the school ▪ Less individualised attention to students ▪ Weaker student-teacher relationships ▪ Greater teacher dissatisfaction ▪ Higher dropout rates/ more attendance issues ▪ Increased commute time ▪ Empty school buildings
efficiency	**Efficiency** ▪ Possibility for economies of scale ▪ Better utilisation of human and physical resources	**Efficiency** ▪ Increased capital expenditure if new schools are being built ▪ Increased transportation costs ▪ Possible increase in teacher salaries
equity		**Equity** ▪ Polarising effect for disadvantaged students and primary aged students

b. School Clustering

22. Since school closures and consolidation can be associated with negative consequences for a community, a less extreme option is school clustering. School clustering brings together groups of small schools, allows them to maintain their individual identity while also sharing resources, experiences and best practices (Moulton, 2001). Depending on the context, some school clusters choose to also share management or a common vision for their schools (Moulton, 2001).

Advantages

23. Other ways that school clusters increase education effectiveness is by maintaining the advantages that may come with small schools: increased student wellbeing and learning outcomes; stronger student-teacher relationships; greater teacher satisfaction; students, parents and wider community feeling more connected to the school; and more individualised instruction for students. This arrangement helps to overcome professional isolation and pool resources to increase efficiency (Rule, 2005; O Slatara and Morga, 2004; Roberts, 2002; White, 2005; Cotton, 1996; Raywind, 1999; Cotton, 2001). In addition, since schools are kept at small numbers, this may improve the equity within a school, as students from lower socio-economic backgrounds feel more polarised in larger facilities. Creating school clusters also allows the students to maintain the original commute times, instead of increased travel distances of some other solutions.

Disadvantages

24.   One downfall for school clustering is that it does not cut significant costs, but it is instead primarily focused on increasing education effectiveness. Lastly, this arrangement would not be as beneficial to schools that are located in extremely remote areas where the sharing of physical resources is difficult (Sigborsson and Jonsdottir, 2005).

School clustering	
A group of small schools decides to collaborate and possibly share a common vision	
advantages	**disadvantages**
Effectiveness • More individualized attention to students • Stronger teacher- students relationships • Greater teacher satisfaction • Maintain local commuting time for students and teachers • Decrease feelings of professional isolation	**Effectiveness** • Extra time required for teachers and staff to collaborate
Efficiency • Teachers can pool/share resources instead of investing in separate sets for each school	**Efficiency** • Does not focus on education efficiency and reduce costs significantly
Equity • Research has shown that smaller schools usually result in more equitable student performance	

c. School Federations

25.   School federations are created when two or more schools are closed to create a single split-site school with one principle and one governing body (Rural Development Sub-Committee, 2008).

Advantages

26.   Unlike school clusters, schools in school federations do not function as independent units. However, the school administration can choose to organise them in such a way. School federations enjoy the same education effectiveness advantages as school clusters -such as sharing resources, overcoming professional isolation- while maintaining some of the benefits of smaller schools (Rule, 2005). In federations, school teams do not integrate with others in one large facility, but instead keep some of their own identity at split-site schools.

Disadvantages

27.   One challenge that comes with school federations is deciding where the principle and administration should be based (Rule, 2005). Sometimes parents perceive the school where the principal and administration are based as the best school in the federation. This could lead to unbalanced enrollment between the different sites (Rule, 2005). Another challenge is that new buildings may have to be

constructed to create split site schools. This would lead to increased costs for construction and transportation, and empty school buildings in smaller communities. Similar to school consolidation, this can have a negative impact on the economy, especially in small communities. Some of the advantages of split site schools are that a large variety of courses and extra-curricular activities are offered. For teachers and staff members, split site schools can result in more professional development opportunities as well as an increased number of specialised staff being hired that could be shared between the different sites. The administrator will also be shared between the different sites, which cuts down on the schools overhead.

School federations	
Possible closing of school buildings | Construct split site school	
advantages	**disadvantages**
effectiveness **Effectiveness** ▪ Larger variety of courses offered, including specialized courses ▪ More extracurricular activities offered ▪ Specialized staff can be hired (i.e special education) ▪ More professional development	
efficiency **Efficiency** ▪ Sharing of administration, which can cut down on operating costs.	**Efficiency** ▪ Increased investment cost, because buildings may have to be constructed
equity	**Equity** ▪ Site where administration is based is preferred amongst parents

d. Community Schools

28.   Another solution for a student population that is falling is for schools to use part of their building for other community services (Public Health Law & Policy Network, 2009; Vincent, 2010). This type of joint use sharing would imply that a single building is being used as a school and one or more purposes such as a recreation center, auditorium, etc.

29.   In order to determine whether this type of joint use agreement is appropriate for a school and community, schools first must conduct a needs' assessment and research the program costs, maintenance, insurance, and operations necessary for an agreement. Next, a school would need to evaluate potential partners in the community that are open to the idea of sharing resources. Once one or more partners are found, a school board has to adopt a policy that is aligned with the district's vision for the school, broader community and goals of the partnership. Last, the partners should develop a formal joint use agreement that outlines the conditions and responsibilities for each group sharing the space (California Project LEAN, 2010).

Advantages

30.   Some benefits of these arrangements include increasing the amount of services for the school and the wider community, and capitalising on existing infrastructure to cut down on costs. This method could

improve community health by sharing athletic facilities, and foster a stronger relationship between schools and their surrounding community (California Project LEAN, 2010). This could also help increase student wellbeing by being able to provide extra services to students depending on the organisation that agrees to partner with the school. The extra services that are offered at the school through the partnership could increase the equity, because this could provide services for all students that some may have been unable to afford.

Disadvantages

31.   Despite the numerous financial and social benefits there are some arguments against these partnerships. Concerns about liability, vandalism and maintenance of the school for additional hours of operation can deter some schools from agreeing to a partnership (California Project LEAN, 2010). Other arguments against Community schools are related to increased budget and staffing needs. A cost benefit analysis should take into account both cost savings (by sharing of facilities) as well as additional operation and maintenance costs due to extension of hours of operation.

Community schools	
Conduct a needs assessment and research maintenance, insurance and operations costs | Evaluate potential partners and form a single vision for the space | Develop a formal agreement outlining the responsibilities for sharing the space	
advantages	**disadvantages**
Effectiveness ▪ Increases the amount of services offered to school and community	**Effectiveness** ▪ Concerns about liability, vandalism
Efficiency ▪ Investment cost does not incur by using existing infrastructure	**Efficiency** ▪ Additional costs for longer operating hours
Equity ▪ Services that students may have been unable to acquire based on socio-economic status are made available	

e. Use of Information and Communication Technologies (ICT)

32.   Using ICT for distance learning can be an option for some schools facing declining enrollment.

Advantages

33.   One of the main advantages of ICT are the curriculum enhancements, that are provided to schools otherwise forced to cut certain classes based on low enrollment (Hobbs, 2004; Mulcahy, 2009). This could give students the opportunity to take advanced placement courses to earn University level credits and/or find specific courses that are aligned to a student's particular interest. In addition, other student services

requiring specialised staff such as speech therapy, psychological testing, and individualised academic assessment can be done through ICT which would help increase overall student wellbeing. If schools have to cut some of these services due to decreased funding -because of lower student numbers- this could be a cost effective way to still provide services for those individual students.

34.   When students use ICT, they are also connected to a broader and more diverse audience (Reading, 2009). This can be a way to hold students accountable for the work that they produce. Teachers can also benefit from ICT because it provides an opportunity to collaborate with other teachers and have access to more professional development opportunities through webinars.

Use of ICT	
Buy and install technology equipment for students and teachers | Ensure uninterrupted internet access to all school computers | Train a staff member to be the technology personnel	
advantages	**disadvantages**
effectiveness — **Effectiveness** - More diverse curriculum options - Increase the amount and quality of information exposed to students - Virtual teacher collaboration - Increased professional development opportunities	
efficiency — **Efficiency** Does not create additional cost, as new staff are not required for students who take specialised courses online	**Efficiency** - Increased technology budget for quality products that do not fail - Additional staff for ICT support
equity	**Equity** Highly motivated students benefit more (unequal achievement)

Disadvantages

35.   While there are many benefits to ICT, one drawback is that the amount that students benefit from these experiences largely depends on the students' natural disposition (Mulcahy, 2009). Students who are "highly motivated and independent learners" seem to benefit the most from this type of instruction, implying that it could result in unequal achievement (Mulcahy, 2009). In addition, students that have access to a computer at home will have an advantage, creating a less equitable system and a possible achievement gap between students who do and do not have access to computers at home. Another drawback from using ICT is that many schools make technology decisions based on the least expensive option which can be detrimental to the program's success if the technology fails and does not meet the needs of the distance learning program (Hobbs, 2004).

36.   Lastly, distance learning programs are more effective if a school has a person who can act as the point-of-contact to assist teachers with ideas of technology utilisation and remedy any connection problems (Hobbs, 2004).

f. Specialised mobile (transportable) classrooms

37.   While relocatable prefabricated classrooms are considered an option for areas where the student population is increasing (presented in the next section of this paper), they can also be used in certain ways for declining populations. Portable classrooms can be used to increase the curriculum offered by viewing these classrooms as resources to be shared.

Advantages

38.   In this case, mobile classrooms are designed to move between schools and with a specific type of curriculum in mind (Matichuk, 2010). For example, if schools do not have a space conducive for science experiments, a portable classroom could be equipped for this particular type of instruction. Then, the classroom could travel between the different schools that plan to conduct experiments. This is an option adequate for situations of limited financial resources and public spending (instead of building classrooms with the necessary equipment). Mobile classrooms could be designed for a variety of specific purposes depending on the needs of the particular schools that would share the unit/s. This would add to the education effectiveness of the school by providing a wider curriculum to students (Hobbs, 2004).

Specialised mobile (transportable) classrooms	
Find schools interested in sharing classroom & decide on a common use for the classroom | Find a space to park the classroom at each school site | Account for transportation cost | Create a system for sharing the space between different school locations	
advantages	**disadvantages**
effectiveness **Effectiveness** ▪ More diverse curriculum options ▪ Collaboration of teachers for local schools to decrease professional isolation	**Effectiveness** ▪ Shared space could create scheduling conflicts ▪ Schools must be fairly close in proximity to share the mobile classroom
efficiency **Efficiency** ▪ Possibility to save money compared to building additional permanent classrooms at each school	**Efficiency** ▪ Increase operational costs, because of classroom transportation
equity	**Equity** ▪ Since the unit is not permanent, some students may not have access to the courses being taught in the space

Disadvantages

39.   Nevertheless, there are some points to consider before investing in a specialised mobile classroom. First, the schools that are sharing the unit would need to agree on a common use for the mobile classroom. If interested schools lack different types of educational facilities, this solution may not be appropriate. Schools would also need to develop a process to share and transport the classroom and to find somewhere to park the unit at each site. The schools that are planning on sharing the classroom need to discuss the costs sharing mechanism (for manufacturing and transportation costs), compared to the cost of building a permanent classroom at each site, or renovating an existing classroom. Many times, schools use

mobile classrooms because they are cheap solutions, although that also often means they lack in quality. These mobile classrooms need to be of the same high quality as permanent classrooms in order to ensure that educational effectiveness is maximised (Matichuk, 2010). This would also result into additional investment cost in comparison to a stereotypical portable classroom (Matichuk, 2010). These units may decrease the equity in a school, because the classroom and the related course would not be offered to as many students in the school, given its' temporary nature.

2. Increasing student population

40.   When there is an increase in population the policy makers are looking for solutions in order to accommodate the additional student population. This chapter focuses on analysing the advantages and disadvantages of the following strategies that can tackle the problem:

- Construction of larger schools
- Extension / Increase capacity of existing schools
- Use of relocatable prefabricated classrooms
- Double-shift operation

A common issue when contemplating the different options in order to accommodate rising student population is the optimum school size. Both research and countries' experience show that a universal solution does not exist. There is not even one commonly agreed definition of what is a small and what is a large school. In addition to the above, there is a huge debate about the benefits of both small and large schools. Some of the above strategies encompass issues of economies of scale and better learning outcomes if implemented at the optimum school size, whereas the optimum size might be country or context specific.

- **Constructing larger schools** for increasing populations is one option for policy makers. New larger schools can be built to accommodate larger student population. This would address issues of education sufficiency but would involve additional investment costs.

- **Extension/increase capacity of existing schools** can take two forms: existing schools can increase their capacity either by (infrastructure) extensions or by increase in the amount of students they accept to reach their maximum capacity.

- **Relocatable prefabricated classrooms** are transportable units that can be installed at a school to provide additional classroom space. Communities experiencing an increase in student population, particularly a sudden increase, may find the relocatable classrooms to be decent and worthy solutions. The benefits of relocatable classrooms will be highlighted as well as some points policy makers should consider before implementation.

- Schools that utilise **double shift** classrooms organise their teaching timetable into two different shifts of teaching. This can be done in a variety of combinations; in each arrangement, about half of the students are taught in the morning and the other half in the afternoon. There can be significant advantages and disadvantages to this system which policy makers must consider.

41.   An additional focus in this chapter refers to the integration of immigrants and refugees in the education system of a receiving country.

a. Construction of new (larger) schools

42.	One strategy for policy makers in areas that experience an increase in student population is to construct new -even larger- schools, a strategy that involves a significant investment cost [capital expenditure].

Construction of new (larger) school	
Find & purchase adequate plot of land | Secure funding | Design school, run the tender, construct | Rezone region | Organise transportation to new school	
advantages	**disadvantages**
effectiveness	
Effectiveness - Diverse curriculum - Variety of extra-curricular activities - Teachers have more choice over subjects they teach	**Effectiveness** - Stricter discipline, higher drop-out rates - Weaker student-teacher relationships
efficiency	
Efficiency - Economies of scale, when compared to a number of smaller schools	**Efficiency** - Increased investment cost (land purchase & construction) - Empty ex-school buildings - Increased transportation costs
sufficiency	
Sufficiency - Satisfies sufficiency requirements	
equity	
	Equity - Student achievement gap: students from lower socio-economic backgrounds do not reap the benefits of large schools compared to affluent students

Advantages

43.	Construction of a new larger school satisfies the principles of sufficiency and equity for the student population. Constructing new schools also comes with the added advantage of using the latest design, materials and technology to promote educational effectiveness within the facility.

44.	Larger schools are known for creating economies of scale. Larger schools are also able to provide more diverse curriculum options for students. This can add to the educational effectiveness of a school by allowing students to focus on subjects of interest and take higher level, specialised classes.

Disadvantages

45.	In periods of limited public spending constructing a new school may become a major investment decision in many countries. The investment cost [capital expenditure] involves both the construction of the building, as well as the cost of land. The scarcity of available land that is adequate for a new school - especially in urban areas- is another issue that has to be factored in. If decision makers choose to build a

new, larger school building, transportation costs also need to be accounted for to understand how far away the student body would be commuting from when outlining the bus network.

46. Constructing a new school to accommodate increasing student population might result in empty ex-school buildings. Post-school use of these buildings can become a headache for the local authorities.

47. It is important to consider how large student numbers effect education effectiveness. In some research, larger schools are associated with stricter discipline policies, higher dropout rates, and weaker teacher-student relationships (Abalde, 2014). In addition, parents and community members report less communication and interaction with teachers and staff members in large schools (Abalde, 2014.) While these drawbacks are largely based on context and are not apparent in all large schools, these negative aspects seem to be particularly harmful to students from lower socio-economic statuses (Abalde, 2014).

b. Extension/increase capacity of existing schools

48. Involving a smaller capital expenditure than the previous strategy of constructing a new school, extension/increase of capacity of existing schools is cost efficient and can have a number of benefits. The creation of larger schools in this context is achieved by using existing schools and their current resources - both physical and human- to the fullest extent, and it may take two forms: increase in the amount of students or infrastructure extensions.

Extension of existing schools (more students)	
Rezone region to have more students come from further away | Re-organise transportation	
advantages	**disadvantages**
Effectiveness ■ Broader curriculum ■ Teachers can specialise in subjects they teach	**Effectiveness** ■ Stricter discipline, higher drop-out rates ■ Higher student-to-teacher ratio ■ Weaker student-teacher relationships
Efficiency ■ Use existing infrastructure; possibility for economies of scale ■ No investment cost	**Efficiency** ■ Increased transportation costs ■ Rezone student feeder patterns
Sufficiency ■ Satisfies sufficiency principle	
	Equity ■ Student achievement gap: students from lower socio-economic backgrounds can be polarised in large schools compared to affluent students

(Row labels left margin: effectiveness, efficiency, sufficiency, equity)

Advantages

49.   When the first option is employed, schools are utilised in their legal maximum capacity by increasing student numbers and there is no need to hire additional staff: the current class sections that exist in a school are increased so that each class is filled. Changing the school zones in an area might be required, so that students are redistributed to certain areas not operating at their maximum capacity. There may be significant advantages for education sufficiency and efficiency because of the saving in costs, but the educational effectiveness of a school might be negatively impacted.

50.   When school facilities are extended by building additional permanent classrooms, students are able to choose from a broader curriculum and teachers can teach specialised subjects that are of particular interest to them and their students. In terms of education efficiency, adding permanent extensions to school buildings means using the existing land to its fullest potential, instead of having to buy a new, larger plot of land to construct an entirely new school. There is also the possibility for economies of scale. Lastly, this option meets the sufficiency requirements of the school with more spaces available for an increasing student population.

Extension of existing schools (infrastructure)	
Secure funding | Design additional learning space, run the tender, construct | Rezone region | Re-organise transportation	
advantages	**disadvantages**
effectiveness **Effectiveness** ▪ Broader curriculum ▪ Teachers can specialise in subjects they teach	**Effectiveness** ▪ Stricter discipline, higher drop-out rates
efficiency **Efficiency** ▪ Use existing land ▪ Possibility for economies of scale	**Efficiency** ▪ Increased transportation costs ▪ Rezone student feeder patterns ▪ Investment cost
sufficiency **Sufficiency** ▪ Satisfies sufficiency principle	
equity	**Equity** ▪ Student achievement gap: students from lower socio-economic backgrounds can be polarised in large schools compared to affluent students

Disadvantages

51.   The two options outlines above share many of the same disadvantages. One point to consider when increasing enrollment numbers is the effect it could have on transportation costs. If more students are coming to an existing school site that live further away, the transportation budget and schedule must be rearranged to accommodate these students (Abalde, 2014). Some research has found that there is a threshold to the economies of scale created in large schools. This means that after a certain limit of students and staff, schools create diseconomies of scale (Stiefel et al. 2009).

52.   While there could be significant cost benefits of increasing school enrollment, it is important to consider how large student numbers effect education effectiveness. In some research, larger schools are associated with stricter discipline policies, higher dropout rates, and weaker teacher-student relationships (Abalde, 2014). In addition, parents and community members report less communication and interaction with teachers and staff members in large schools (Abalde, 2014.) While these drawbacks are largely based on context and are not apparent in all large schools, these negative aspects seem to be particularly harmful to students from lower socio-economic statuses (Abalde, 2014).

53.   Lastly, one disadvantage that applies to extending schools by building permanent classrooms is the increase in construction and operating costs for the school. This solution would require new teachers to be hired to teach the additional classes that are created in the new spaces, whereas extending the existing school through increasing student numbers would not require hiring any additional staff. However, this could be more of a long term solution to the local student demographic changes.

c. Use of relocatable prefabricated classrooms

54.   There are different definitions when it comes to relocatable prefabricated classrooms. Different countries and scholars may even use different names: portable or relocatable or transportable or mobile classrooms and modular transportable buildings or units or classrooms are a few examples. These classrooms refer to light constructions that may be easily transported. They are usually assembled on the site.

Use of relocatable prefabricated classrooms	
Find adequate space in the school site | Issue building permits and/or other permits	
advantages	**disadvantages**
Effectiveness ■ Readily available	**Effectiveness** ■ Low quality construction which can negatively impact student outcomes ■ Teacher dissatisfaction ■ Negative parent and student perceptions
Efficiency ■ Relatively inexpensive ■ Transportable if needs change	
Sufficiency ■ Helps provide a sufficient amount of classroom space	
	Equity ■ Achievement gap may be created between students in relocatable units and students in permanent classrooms

Advantages

55.   The main advantages of relocatable prefabricated classrooms are that they are "readily available, relatively inexpensive (when compared to brick and mortar classrooms) and can be quickly relocated as needs change" (Gore, 2012). In the United States, it is estimated that a relocatable classroom costs 20% of the cost of a permanent classroom (Gore, 2012).

56.   These classrooms can also be beneficial because of the flexibility they provide. If student population changes in a community, these can be moved to the location where they are needed the most. In addition, they provide a temporary solution for schools after a natural disaster to address education sufficiency concerns. In areas where there is a sudden influx of migrants, these classrooms could also be used. However, there are some limitations and other points to consider when addressing education of migrant students which will be explained further in an upcoming section.

Disadvantages

57.   Unfortunately, one of the biggest problems with relocatable prefabricated classrooms is that once in place, many continue to be used as classrooms for years on end. They lose their temporary element and become a permanent feature of the school.

58.   While they may be a cost efficient solution, there are many negative consequences associated with using traditional relocatable classrooms year after year, particularly in regards to educational effectiveness. Relocatable prefabricated classrooms are an inexpensive option for schools, but this is because "they have not been designed for maximum educational effectiveness and instead have prioritised transportability and rapid deployment" (Gore, 2012). Other issues that may arise when using relocatable prefabricated classrooms include poor energy performance, high life-cycle costs, compromised safety and security, teacher dissatisfaction, and negative teacher, parent and community perceptions (Gore, 2012). Cheap construction is also a result of the cheap prices of relocatable prefabricated classrooms. This results in "thinner wall assemblies, less insulation value, less efficient and nosier HVAC systems, lower quality exterior finishes, fewer and smaller windows leading to decreased daylight and lower quality doors with less-effective weather-stripping" (Gore, 2012). These deficiencies can lead to decreased student well-being and learning outcomes.

59.   The student learning in these spaces could be negatively impacted because of the low quality of construction of these units. This could result in an achievement gap between students who are assigned to classes in the relocatable units versus in the permanent rooms.

d. Double shift operation

60.   When the student population is growing, schools can share spaces with other schools to meet the increased demand. This could also mean having students come in different shifts so the space is ultimately used for more than the typical eight hour school day. This solution helps meet the sufficiency demands, because twice as many students are educated at a school site.

61.   Double shift classrooms can have their own advantages and disadvantages depending on the education level and the way the school chooses to organise the different shifts. This could be done in two distinct ways: by running parallel sets in the morning and in the afternoon or by accommodating half grades in the morning and half in the afternoon.

Advantages – parallel sets in the morning and in the afternoon

62.   Schools could have one complete set of grades in the morning and then a parallel set in the afternoon. The advantage of this solution is that twice as many students are getting educated in the same school building (Bray, 2008). This could also be beneficial if two different schools are coming together under one partnership, but still want to maintain their original identity. Children can also stay in the same shift for the duration of their enrollment, so there are not as many schedule transitions between years and siblings can be on the same time schedule.

Disadvantages – parallel sets in the morning and in the afternoon

63.   One of the biggest disadvantages is that the afternoon sessions are often less popular for parents and teachers (Bray, 2008). This system may seem unfair to some, when students allocated to the morning classes keep their position for the entirety of the enrollment. Another disadvantage is that teachers have less opportunity to collaborate across individual grades, as they are not in the building for the same hours. When education efficiency is considered, this solution would increase transportation and maintenance costs, since twice the amount of people will be using the facility.

Double Shift Classrooms (parallel sets in the morning and afternoon)	
Design a system to allocate students and teachers to the different schedules | Organise additional transportation and maintenance | Hire additional staff	
advantages	**disadvantages**
Effectiveness ▪ Children can stay in the same shift for multiple years, less schedule transitions ▪ Siblings can be at the same time	**Effectiveness** ▪ Less opportunity for all teachers to collaborate within grades/levels
(effectiveness)	
(efficiency)	**Efficiency** ▪ Increased transportation cost ▪ Increased maintenance cost
Sufficiency ▪ Twice as many students are educated *(sufficiency)*	
(equity)	**Equity** ▪ Afternoon session is less favourable for parents and teachers which could lead to a less equitable system

Advantages – half grades in the morning, half in the afternoon

64.   Another option would be to have half of the grades in the morning and half in the afternoon. This system is fairer since all students experience both morning and afternoon schedules. Also, teachers in the same grade can easily plan and collaborate, as they are all in the building at the same time (Bray, 2008).

Disadvantages – half grades in the morning, half in the afternoon

65.   Some disadvantages of this arrangement are that siblings could be on opposite schedules, and students will have more transitions during their time at the school, going from one time session to the other (Bray, 2008). Another disadvantage is schools would have to buy multiple copies of the curriculum since all students at each level will occupy the building at the same time, whereas in the first option the materials could be shared (Bray, 2008).

66.   Regardless of the specific schedule that a school chooses, it is important that the school has support from the principal, teachers and community. Since they will be the people implementing the policy, it is important for them to feel that their voices have been heard and opinions considered. Also it is imperative to define in advance the additional operational and maintenance cost with the extended school hours.

| Double Shift Classrooms (half grades in the morning and half in the afternoon)	
Organise additional transportation and maintenance | Hire additional staff	
advantages	**disadvantages**
effectiveness **Effectiveness** ▪ Teachers in the same grades can collaborate	**Effectiveness** ▪ More schedule transitions for students ▪ Siblings could be on opposite schedules
efficiency	**Efficiency** ▪ Purchase of multiple copies of curriculum ▪ Increased transportation cost ▪ Increased maintenance cost
sufficiency **Sufficiency** ▪ Twice as many students are educated	
equity **Equity** ▪ System is fairer and more equitable since all students experience both schedules	

e. Migrants and Refugees

67.   Migrants and refugees' education is addressed in this chapter, because they may account partly or entirely for the increase in student population in a country or region. One vital point that must be considered when educating migrants, refugees and asylum seekers, is integration.

68.   Depending on the context and the number of people crossing a country's border, this could look very different. Countries affected by the refugee crisis experience a sudden and overwhelming number of refugees, and need to consider short term and long term solutions to tackle not only the increase in population, but also the issue of integrating this particular group with non-immigrants.

69.   In the short run, options like relocatable prefabricated classrooms could be used to host education in camps and/or communities with a large amount of refugees. Nevertheless, using relocatable prefabricated classrooms in this way does not address the issue of integration and actually works to keep these students separated from non-immigrant students.

70.   Another element that needs to be factored in the equation has to do with the actual preference of the refugees for their long term plan in comparison to the host country they may temporarily reside. In some host countries such as Turkey and Greece, it seems like most of the migrants and refugees do not wish to reside there permanently: these countries are their first country of asylum, and are seen as a transition point, as a stepping stone which will help them eventually go to the country where they hope to permanently reside. Countries in this situation might not need to be as concerned with long term integration, but do still need to be prepared for the possibility of refugees staying in the country anywhere from a couple months to a couple years, making it imperative that education issues be addressed.
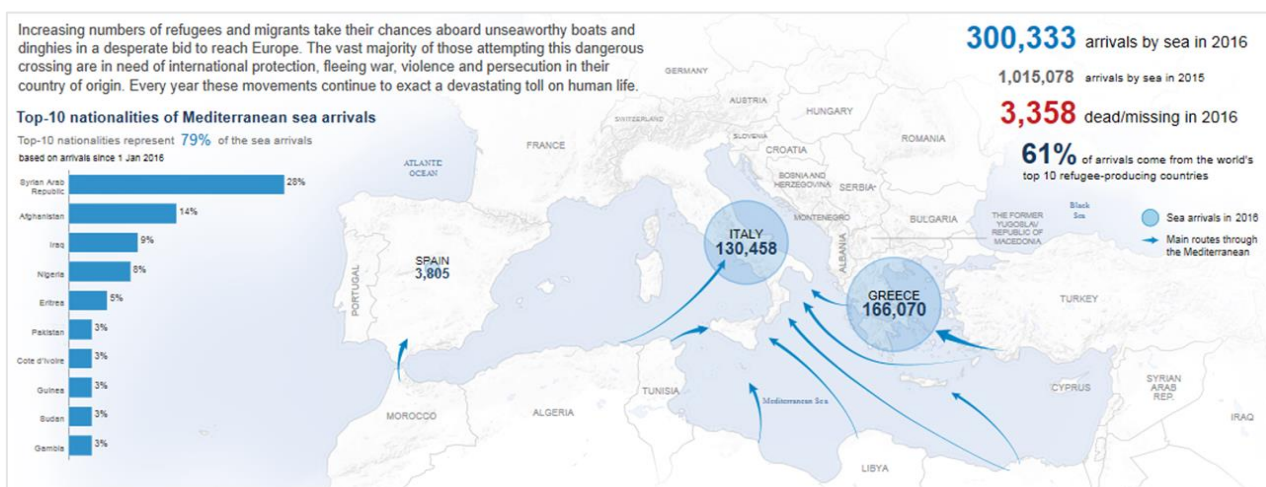
71.   For countries that receive migrants and refugees who wish to reside there permanently, the issue of integration is absolutely essential. These countries also have different needs for school buildings. To promote integration, using large school buildings may be a better option. This would allow migrant and refugee students to have more opportunities to be in classes with non-immigrant students who live in the wider community. Unfortunately, one of the drawbacks of large schools is the lack of individualised attention students receive, which research has shown is particularly negative for low-income students (Abalde, 2014). While large schools may provide more opportunities for integration, schools need to be conscious of this potential negative effect for migrant and refugee students.

72.   The new project of OECD "Strength through diversity - the Integration of immigrants and refugees in school and training systems" will start in January 2017. This project will examine the role education systems can play in promoting the integration of migrants and refugees as well as promoting positive attitudes towards migration among host communities.

3. Conclusion

73.   The purpose of this paper was to give an overview of different options infrastructure planners, policy and decision makers are presented to address demographic changes in student population relating to school facilities. After examining the various options for school facilities, it is important to note that there is not a one-size-fits-all solution. Context plays a vital role in determining the way to address demographic changes in student population and assessing an individual education system's needs and priorities. What is also important is to assess what is the most appropriate solution and what is the next best alternative. Some

options are better relating to education efficiency while others prioritise education effectiveness; some options involve larger capital expenditure while others might have a social "cost" for the school community. When policy makers choose a solution, it is important that the pros and cons are evaluated to get a more balanced picture of the overall effect these policies will have on students, parents, teachers, administrators and the community.

	School consolidation	School clusters	School federations	Community schools	Use of ICT	Specialised mobile classrooms	Construction of new school	Extension of existing school	Relocatable prefab classrooms	Double-shift operations
Educational effectiveness	◐	●	●	●	●	●	●	●	◐	○
Educational efficiency	●	◐		●	◐			●	●	◐
Educational sufficiency				●	●	●	●	●	●	●
Equity	○	●	○	●	◐	◐	●	●	○	○
Investment cost	◐		◐		◐	◐	●	◐	◐	

● positive impact   ○ negative impact

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