MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Education Report: School ventilation approach under COVID-19

To:	Hon Chris Hipkins Minister of Education		
Date:	19 November 2019	**Priority:**	Medium
Security Level:	In Confidence	**METIS No:**	1277412
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Messaging seen by Communications team:	No	**Round Robin:**	No

Purpose

This report provides you with a coordinated approach to ensuring students receive face-to-face education in appropriately ventilated teaching spaces – in line with public health expectations.

Summary

- The decision to progress with a return to face-to-face teaching while regions are still under level 3 restrictions is consistent with public health advice. This includes the recommendation that the entire school population does not to return at the same time.
- As there is still COVID-19 in the community under level 3, there is a genuine concern that a COVID-19 positive person could be in a classroom at any point in time, and that steps need to be taken to limit the transmission risk within the school environment.
- The Ministry is taking a layered approach to the protective behaviours and systems that are being introduced to deliver education while managing down the risks of transmission. This reflects the importance of vaccination and management layers, ahead of ventilation and air treatment technologies.
- The important contribution of ventilation is air flow. Defining a path of air flow ensures that exhalled air spends minimial time in the room before it exits the building and is replaced by fresh air coming in.
- There are three phases within our ventilation approach:
  - ensure that schools returning to face-to-face teaching under level 3 can identify and consistently use the best ventilated teaching spaces;
  - motivate schools currently delivering face-to-face teaching under level 2 to review their ventilation and adjust their thinking on risk management approaches; and
  - prepare for 2022, including the scenario that all schools under the traffic light system may have different levels of COVID-19 in the community, and the concern this may generate amongst staff, students and parents.

- To ensure all schools have well ventilated teaching spaces for 2022, the Ministry are working on property solutions and are determining the need for supplementary air treatment approaches, in the acknowledgement of the longer international manufacture and delivery timeframes.

Recommended Actions

The Ministry recommends that you:

a. **note** that to support a return to face-to-face teaching under level 3, and to assist future teaching situations where there is COVID-19 present in the community, the Ministry is reviewing the physical ventillation of schools and teaching spaces;

b. **note** the Ministry is taking a layered approach to the protective behaviours and systems to lower the risk of transmission and this includes vaccination and management layers, in addition to ventilation and air treatment technologies;

c. **note** that the intention of well-ventilated spaces is to ensure that exhaled air spends minimal time in the room before it exits the building and is replaced by air coming in;

d. **note** that the proposed approach is to address school ventilation in the following phases:

- ensure that schools returning to face-to-face teaching under level 3 can identify and consistently use the best ventilated teaching spaces
- motivate schools currently delivering face-to-face teaching under level 2 to review their ventilation and adjust their thinking on risk management approaches
- prepare for 2022, including the scenario that all schools under the traffic light system may have different levels of COVID-19 in the community, and the concern this may generate amongst staff, students and parents

d. **note** that while the Ministry will work to ensure the ventilation of school property, there may be a case for supplementary air treatment solutions as an extra layer of protection in some circumstances;

e. **agree** that the Ministry pursue opportunities to identify, negotiate and prepare to order appropriate air treatments solutions now – given the delivery and production times, these might only arrive in the first quarter of the 2022 school year;

Agree / Disagree

f. **note** that the Ministry will provide you (by the end of November) with a costed work programme including further details of our intended order (in numbers and cost) and implementation plan; and

Proactive release

g. **agree** that once decisions are made, this Education Report can be proactively released.

Agree / Disagree

Scott Evans
Hautū | Deputy Secretary
Hanganga, Matihiko | Infrastructure & Digital

19/11/2021

Hon Chris Hipkins
Minister of Education

21/11/21

Background

1. In the past, if New Zealand has had COVID-19 in the community, our response has been to close schools and move into national or regional lockdowns. This has ensured there has been minimal (if any) chance for transmission to occur through schools or education sites, however it has necessitated offsite responses to maintain the continuity of teaching and learning.

2. As we are now moving towards the next phase of responding to COVID-19, we will increasingly see schools and other education sites continuing the delivery of face-to-face learning during periods where there is an active presence of COVID-19 in the community.

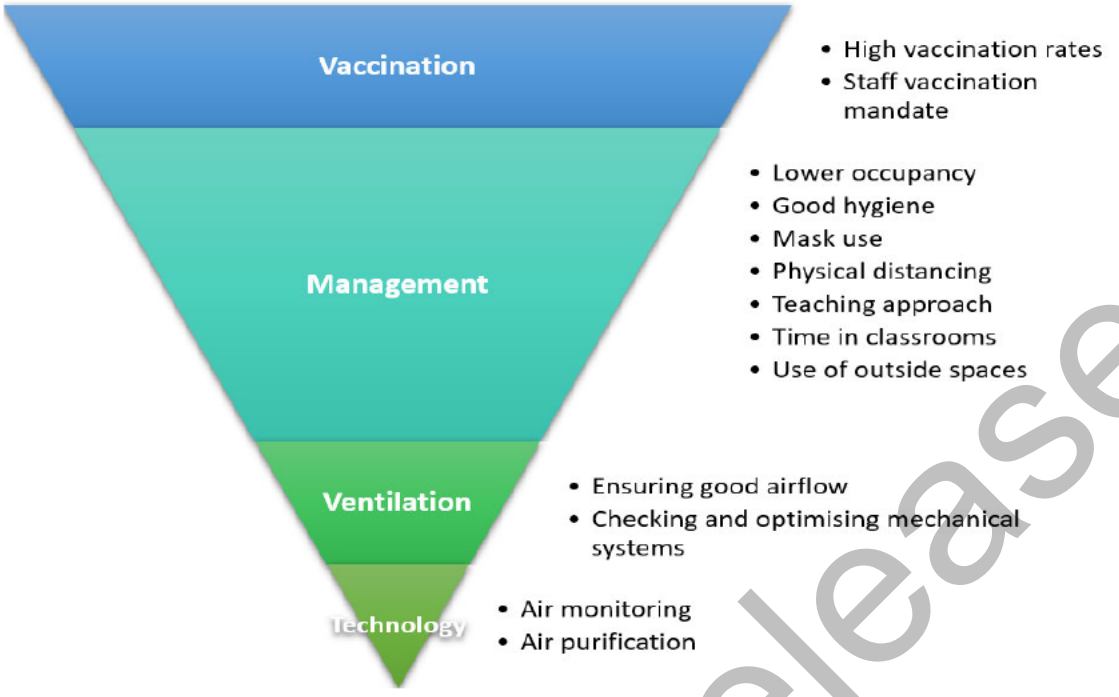
3. To maximise the safety of both staff and students during these uncertain times, the Ministry and the education system in general are working together to implement a layered approach of protections. These layers will cumulatively strengthen our ability to minimise the spread of the virus. This paper seeks to place the tangible infrastructure interventions within the context of the much wider protections being introduced in the schooling sector.

The layered approach

4. While there is no single way to keep COVID-19 out of schools, the global evidence that has accumulated from education systems on *how to minimise transmissions* has provided us with strong indicators of approaches to take.

5. The layered approach below identifies that (as with many sectors across New Zealand) **vaccinations** provide the first line of defence in ensuring a protective and robust environment for education continuity.

6. The **management** layer is the widest and most effective way to minimise transmission. This takes a public health approach to changing and adapting personal and professional behaviours to reduce the chances of transmission. Over time these practices will become part of the *new normal*, but in their initial implementation it may take some time for staff and students to start to respond automatically.



7. In the lower layers, **ventilation** responds to the evidence that air flow is important in diluting and removing exhaled air from a space and replacing it with fresh air from outside. The evidence also indicates that recirculated (unfiltered) air is problematic and may support transmission occurring within spaces. Maintaining good ventilation can be as simple as opening windows, limiting the numbers in a class or regularly alternating between spaces. While it has been shown that COVID-19, particularly the Delta variant can be airborne, it should be acknowledged that the management layers (including masking and physical distancing) have a much larger influence on the more predictable transmission risks.

8. The **technology** layer is a constantly evolving area where innovation and opportunity are regularly stimulating new products and claims towards positive and protective benefits. At this end of the scale the real contribution to protective outcomes is often modest and unproven in terms of return on investment.

The ventilation contribution

9. It is widely acknowledged in ventilation, that access to fresh air cannot be beaten (or even equalled) and that mechanical approaches to ventilation (though more consistent) will always be inferior to fresh air. In appreciation of this, both the World Health Organisation (WHO)[1] and the Centre for Disease Control (CDC)[2] have recommended natural ventilation in their school advice for managing COVID-19.

> …ensure adequate ventilation and increase total airflow supply to occupied spaces, if possible. Clean, natural ventilation (i.e., opening windows) should be used inside buildings where possible, without re-circulating the air. (WHO)

10. In the New Zealand education system, all of our teaching spaces are built to meet the building code of the time for ventilation. As most of our school property stock is single storey and able to use natural ventilation methods our initial estimate is that up to 80% of our teaching spaces are able to meet the WHO and CDC recommendations for

[1] https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19-schools
[2] https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html

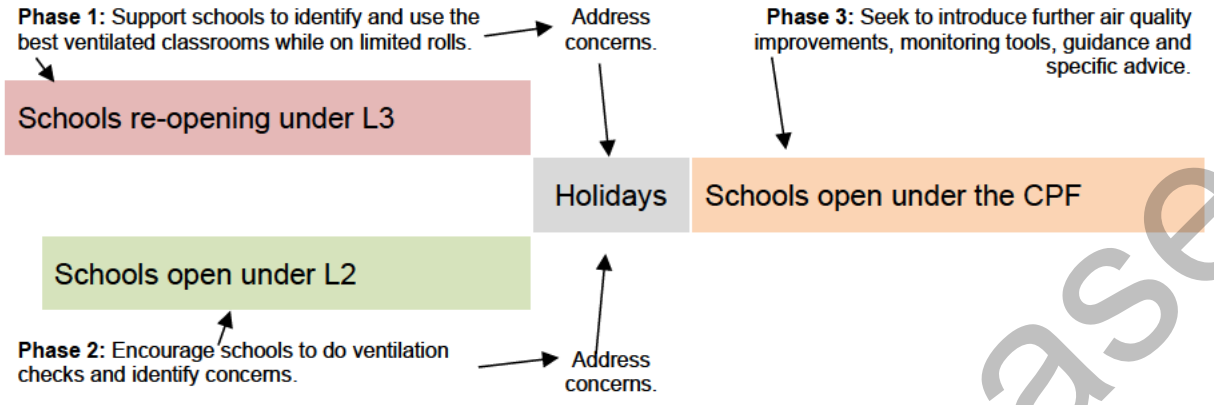
naturally ventilated spaces. This estimate can be further improved with management practices like opening windows, limiting strenuous activities, reducing occupancy and instituting regular out-of-classroom breaks.

11. We also estimate that there may be up to 10% of our teaching spaces where additional property interventions and behavioural practices in usage can easily turn them into spaces that present low risk. We expect that feedback from schools and additional modelling will help us refine this early estimate.

12. The remainder of internal spaces may need systemic changes to their engineering or design to sustainably meet the protective expectations of teaching with the ever-present risk of COVID-19 in the community. We will need to assess and balance the demand versus the cost when developing ventilation solutions for these spaces. We will work with schools to schedule targeted work for the Christmas holiday break.

Supporting schools through the phases

13. In reviewing the ventilation challenge we have identified three phases of school support.[3]



Phase 1: *Work underway now*

14. While there is ventilation advice we have provided for schools,[4] [5] the management of ventilation is further enabled by the reduced numbers returning to face-to-face learning through the cohort-based planning. With less than the full school roll present, there are a wider range of teaching spaces to choose from. The focus for schools returning under level 3 is identifying the best ventilated spaces and opening the windows, vents and doors to ensure airflow.

15. In addition to identifying the best ventilated teaching spaces, adapting to mask wearing, adopting teaching strategies that preserve physical distancing, and supporting regular handwashing/ sanitising – the aim is also to identify those teaching spaces that are less well ventilated. We are currently working get these spaces reviewed and where appropriate, begin to schedule remedial work for the Christmas holiday period. Solutions to increasing ventilation will vary from work on existing windows and vents, to decisions on mechanical HVAC and other air circulation approaches. At the same time, it may be possible to review options to support additional heating to spaces ahead of the cooler seasons.

16. Planning for actions over the Christmas holidays is a crucial role for November as the availability of resources, building materials and trades people is expected to be in high demand. This also extends to booking the reviewing, filter replacement and maintenance of mechanical ventilation system where fitted.

17. As part of expanding our evidence base, to inform the right responses to presenting issues we are working with the National Institute of Water and Atmospheric Research (NIWA) to rapidly gather data on the air quality and performance of school buildings and in-use teaching spaces.

Phase 2: *Work prior to Christmas*

18. In the parts of New Zealand that have been delivering education at level 2 this has continued to occur as it has under our elimination strategy. This has meant education without masks, and without specific attention to ventilation or physical distancing. As vaccinations rates rise and the Government considers lifting lockdowns as a tool, all schools need to prepare themselves for a new operating environment that includes the presence of COVID-19.

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[3] Further detail on the strategic timeline across these phases can be found in *Appendix One*

[4] https://www.education.govt.nz/school/property-and-transport/health-and-safety-management/ventilating-schools/#sh-ventilating

[5] https://assets.education.govt.nz/public/Documents/Primary-Secondary/Property/Health-and-Safety/Self-assessment-tool-for-classroom-ventilationt.pdf

19. In order to confirm the ventilation aspects for all schools and to organise any work for the Christmas holidays, we will be actively engaging and encouraging schools to self-assess[6] the ventilation of their spaces. We anticipate that this work will occur in the next three weeks and inform our scheduling of work in the Christmas Holidays.

Phase 3: *Work in the new year*

20. It is clear that by February 2022 when students return to school, we are likely to be operating under the COVID-19 Protection Framework (CPF). Schools will be balancing a wide range of new mandates, requirements, approaches, and strategies and will also be aware of the contribution that ventilation plays to minimising transmission.

21. As much as ventilation is a property approach, some of the biggest differences can be made through management practices. These include the obvious opening of windows, vents and doors, but also more subtle approaches including the numbers of people in rooms, alternating between rooms, air purge processes or periods with no usage and the choice of different spaces for different activity types. We plan to engage with schools around behaviours that support teaching spaces to maintain good ventilation levels.

22. Early in the new year the temperatures will still be mild and natural ventilation will be an easy response for many schools, however as it starts to get cooler more guidance will be required. We plan to introduce CO_2 monitors to enable school staff to visualise CO_2 levels and to trigger for changes in practice or room occupation (so CO_2 can dissipate and the air in the space can be replaced). We are also scoping portable air cleaning devices that we intend to order and will arrive in the first Term of 2022.

Advice on other technologies

23. Although there are a lot of emergent products providing protections, there are two in-room technologies that we are considering at the moment as part of our initial COVID-19 protection activities:
    - CO_2 monitors – as a proxy for identifying stagnant air, and as an indicator for staff and students to modify behavioural practices; and
    - Air treatment technologies - that provide some additional confidence and protection, particularly in response to transmission events.

CO_2 monitors

24. Appropriate CO_2 monitors are around 9(2)(j), and we have experience with them in teaching spaces. To aid behavioural changes in relation to ventilation, we intend to order an additional 9(2)(j) units for distribution across the education portfolio. This will be consistent with the deployment of Internal Environmental Monitoring (IEM) devices that the Ministry has been doing in the *Te Haratau* programme[7] to monitor the quality of learning environments as part of the *Te Rautaki Rawa Kura – School Property Strategy 2030*.[8]

25. While we have existing IEM devices that monitor CO_2 (in addition to thermal comfort, lighting and acoustics) that we can use, these require network configuration, are slower to deploy and are not as flexible as simple CO_2 devices. An order of single

CO_2 monitoring devices provide a simple way for teachers and students to visualise low ventilation rates in their spaces and modify

[6] https://assets.education.govt.nz/public/Documents/Primary-Secondary/Property/Health-and-Safety/Self-assessment-tool-for-classroom-ventilationt.pdf
[7] https://www.education.govt.nz/school/property-and-transport/projects-and-design/design/designing-learning-environments/#minimum-standards
[8] https://www.education.govt.nz/our-work/overall-strategies-and-policies/te-rautaki-rawa-kura-the-school-property-strategy-2030/#sh-school%20property%20strategy

function CO_2 devices will assist us in rapidly helping teachers visualise ventilation characteristics within their spaces.

occupancy and behaviours accordingly

26. The *Te Haratau* programme will continue to roll out devices over the next 18 months with an order of 9(2)(j) devices in scope for deployment.

Consideration of air treatment supports

27. From our review of products and alternatives, the advice of the expert panel[9] has been that **portable air cleaning units**[10] provide the best balance of reach, minimal noise, and support for air quality. To support the identification of the right products for the school environment, we have developed criteria and expectations on where they can best provide additional protection.

Air cleaning units work by filtering particles from the air and producing cleaned air (the extracted particles remain in the filter). They do not remove CO_2 or impact CO_2 levels.

28. Prior to negotiations, it is estimated the most economical units that meet our expectations can be sourced for around 9(2)(j) per unit,[11] and on top of this we will need to confirm the freight, warrantee, filters and ongoing maintenance costs.

29. We are also aware that in addition to ordering devices from overseas suppliers there are also other options that we will continue to explore. We have indications that within the next few months the Ministry of Health (MoH) may no longer require all their air cleaning devices. While discussions are still underway, we have signalled that we would be interested in having a right of first refusal in any disposal discussions.

30. While overseas orders are the first response, there is the potential that New Zealand-based business may be able to manufacture portable air cleaner units here and this would be a strong preference for a follow up order if this approach is shown to be feasible. In addition, there may also be an option (supply-chain allowing) to produce Corsi-Rosenthal units[12] as do-it-yourself air cleaners, potentially assembled in schools.

Volumes of units

31. In the development of initial thinking on volumes that we should order we have thought through the use of these devices. While recognising that the best application of filters is when there is a presence of particulate matter to filter out, we propose to assemble a fleet of around 9(2)(j) portable air cleaners that can deployed to schools, for example immediately after the identification of a positive case.

Given the unpredictability of forecasting COVID-19 rates in early 2022, we are proposing an initial order of 9(2)(j) units (or enough for 9(2)(j) of teaching spaces). This would enable us to cover 9(2)(i) simultaneously with 9(2)(j) each.

32. As a distribution, we would probably commit 9(2)(j) air cleaners to the North Island and 9(2)(j) to the South Island dependant on the patterns of demand. We would also have the ability to further divide the pool of air cleaners to the regional level.

33. Having a mobile fleet of air cleaners will support the transition to the CPF and the expectation that although cases may emerge in schools and a class or cohort may be temporarily removed pending testing, schools will not close. The ability to rapidly deploy portable air cleaners to schools where positive cases have been identified would provide

[9] Our expert panel has contained members from MoH, NIWA and building sector experts, and university specialists in air quality

[10] Portable air cleaners are often called portable *air filtration units* (AFU's) in the health sector and have been used in Hospitals and MIQ facilities

[11] 9(2)(j) [redacted]

[12] https://en.wikipedia.org/wiki/Corsi-Rosenthal_Box

confidence in the return to school for staff, parents and other students. This would also incentivise their active use over the period they were loaned to the school and ensure on return that filters were changed, and any repair/maintenance was undertaken.

34. Deploying on a "needs" basis would mean that we can be far more thorough in our positioning and coverage of devices across the school site than we could be with permanent placements. In deploying to a school site with a recent positive case(s) for example we would be able to introduce portable air cleaners to classrooms, hallways, admin spaces and staffrooms.

Global supply and pre-ordering for 2022

35. Our proposal is to place an initial order while still in November. By progressing this work now, we aim to pre-empt the long freight times and enable delivery before April 2022. In addition to shipping delays, we are also aware of a range of materials shortages and supply chain holdups emerging globally that may have an impact on manufacturing.

36. Given the speed in which government decisions, vaccination rates and community behaviours are changing, the value proposition is also rapidly evolving. By mid-2022 we could have settled in into a protective pattern that may or may not require additional technology however, based on the current assessment we believe the following is a necessary investment.

37. We in intend to order **CO_2 monitors** (around 9(2)(j)) at approximately 9(2)(j) each as part of a basic ventilation assessment toolkit for schools. This would result in a purchase of 9(2)(j) (without consideration of freight or maintenance).

38. While the confirmation of the total cost of an order of **portable air cleaners** is unable to be determined until after a procurement process, our estimation is that 9(2)(j) at 9(2)(j) per unit would indicate a commitment of 9(2)(j) and this would also need to be supplemented by an allowance for freight, warrantees, filters and maintenance resulting in an overall cost of 9(2)(j).

Indicative costs:

9(2)(j)

39. Within New Zealand there is the potential to discover schools and spaces where the best ventilation decisions may be to move to add additional windows, vents and fans for some spaces and ducted mechanical ventilation for others. **Investments in the current school property portfolio** could occur under Health and Safety (Priority One) funding from the 5-year allocation (5YA) and supplementary funding although this will put pressure on baselines. The extent of these costs is likely to emerge in December 2021.

40. It has also been recognised that running air cleaners, mechanical ventilation on *full fresh air mode*, heat pumps and other heating solutions to compensate for open window ventilation will all come at an energy cost to the education portfolio. Some adjustment to the **electricity funding** may need to be sought.

41. We intend to come back to you by the end of November with a costed work programme that includes aspects of all these considerations.

42. There are a lot of uncertainties in this predictive work, so we plan to review the status of vaccinations, transmission rates, locations and other measures of effectiveness in January to ensure our approach remains aligned to the pattern of need.

43. It should be noted that while a coherently planned school environment can greatly reduce the risk of super spreader events, it is accepted that schools will mirror the

external community transmission rates, and that despite the layered approach events of transmission at school will occur.

Appendix One: Strategic timeline

The Ministry approach to ensuring appropriate ventilation for schools is outlined below: