

Working Paper  
2020/01 – Analysis  
of options if  
P2/N95 masks are  
no longer available

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# 1.0 Purpose

*Working Paper 2020/01 – Analysis of options if P2/N95 masks are no longer available* explores possible options for New Zealand in the unlikely event that P2/M95 masks are not available during the war against COVID-19 pandemic.

Once New Zealand's alert level 4 lockdown is removed or reduced in scope it is likely a large number of masks will be required (and in demand) in the short to medium term. The only point at which masks will no longer be required is when a vaccine has been developed, produced at scale, distributed throughout New Zealand and immunization has taken place. This will need to happen both within New Zealand and globally.

The time frame for developing a vaccine may be as short as six months or as long as two years, though many public figures, such as Melinda Gates, think the process may take about 18 months (Shontell, 2020).

Please note the Institute does not have medical expertise. This paper is explorative in nature, rather than analytical or academic. It records a number of ideas mentioned in the wider media at a particular point in time.

## 2.0 What is known about masks in the war against COVID-19?

Regular surgical masks filter between 62–65% of particles, whereas P2/N95 masks filter 95% of those particles (Edwards, 2020). There are arguably two reasons for this extra 30–33% filtration; the quality of the:

1. Fit (particularly around the nose), and
2. Fabric (the material/s provide better filtration).

Considerations for mask appropriateness include:

- (i) effectiveness (i.e. filter effectiveness and quality of fit),
- (ii) ease to put on and take off (without getting contaminated),
- (iii) comfort (particularly given nurses and doctors may need to wear one mask for an entire shift),
- (iv) sterilization (whether all or part of the mask are disposable and, if not, how the reused sections can be sterilized),
- (v) identification (if not fully disposable could they be personalized/named/numbered/colours), and
- (vi) supply chain risks (the extent raw material and manufacturing is fully independent of international supply chain requirements).

## 3.0 What strategic options exist (if there are no available P2 or N95 masks)?

This paper is intended to provoke lateral thinking to solve a potential problem for New Zealand as opposed to recommending specific solutions. It is important to emphasise, therefore, that many of the ideas listed below are not already tested for their appropriateness/efficacy for use by healthcare workers in the context of COVID-19. The gold standard must be that provided certified P2/N95 masks.

Given the idea underlying Plan Z (i.e. if P2/N95 masks can no longer be sourced), three strategic options (and different ways they could be carried out) are outlined below. The Institute will update this paper as further ideas are raised in the media. Broadly, the options can be categorised as repurposing/reusing existing surgical masks to create something close to a P2/N95; retrofitting existing masks such as snorkels; or making entirely new types of masks in New Zealand.

### 3.1 Repurpose or reuse existing masks (surgical)

This might mean adding something to existing surgical masks that aren't affected in good supply from China) that moves the existing surgical mask filtration from 65% to more like 80% or 90% (or even 95%).

#### Option 1: Double mask

Double mask using surgical masks (in much the same way some healthcare workers double glove). Put one with the wire at the top and the second with the wire at the bottom. Dispose of both at the end of shift. See image below for how the two masks sit over each other.



#### Option 2: Sock and mask

Create a fabric sock (e.g. out of wool) that goes over the bottom part of the head and meets the bottom of the glasses – the glasses add an additional seal to the sock and the sock adds an additional filter (see image below). While this mask would be comfortable to wear it would also get warm. This could be washed in diluted bleach between uses.



### Option 3: Envelope mask with replacement filter

Create a completely new outer mask and place the surgical mask inside an envelope (this is likely to give a better fit and has the advantage of an extra filter from the outer fabric). See images below. This would become a person's individual outer and could be washed in diluted bleach with scrubs (Danao, 2020). An additional filter could also be added here (made in New Zealand). This additional filter could be made from wool or paper.



### Option 4: Improve fit by replacing ear loops with elastic head ties

Repurpose existing surgical masks from ear to full head ties for a better fit. In the image below, it appears that a strong staple was used to secure the red rubber.



## 3.2 Retrofit existing masks (e.g. snorkel)

### Option 5: Snorkel masks

There is growing interest in this option internationally (see for example Skacel, Emmott & Herman, 2020; *DutchNews.NL*, 2020). *DutchNews.NL* states:

The snorkel masks are being fitted with a medical filter to block access to the windpipe and a 3D printed coupling piece made by Shell. The result is a mask that completely covers and protects the face. That makes it safer than a separate mask and goggles, particularly during the intubation of patients, a procedure which releases a cloud of virus particles. (*DutchNews.NL*, 2020)



### Option 6: Aeroplane masks and oxygen

Given that so many international planes are no longer in use (and unlikely to be used for a long time), could the masks and oxygen be repurposed?



#### Option 7: Asbestos removal gear/masks

As building sites are not open, the removal gear and masks could be repurposed.



### 3.3 Make a new type of mask in New Zealand

#### Option 8: Import rolls of fabric and make in New Zealand

Purchase the fabric from China or overseas and make the masks here (see possible stockists at (Hangzhou Jeenor Industrial Co., Ltd, n.d.; Dongguan Hendar Cloth Co., Ltd, n.d.). The Institute understand this is what QSi does (McGuinness, 2020, p. 2). The standard filter material is called nonwoven fabric, which is now in high demand globally due to the pandemic (Edwards, 2020). One option might be to purchase lower quality fabric but double-layer it to make a more effective filter.



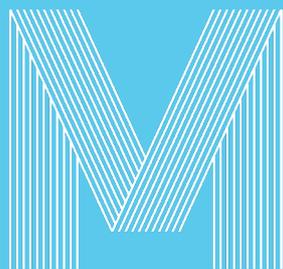
#### Option 9: Make P2 type fabric and manufacture masks in New Zealand

Make P2 mask fabric in New Zealand to then manufacture the masks here. This is currently being undertaken by Auckland-based company Lanaco (Lanaco 2020; McGuinness, 2020, p. 2).



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