Air Quality in Schools

An Interventions Toolkit

March 2022

ARUP

Contents

Document verification

This document takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job title	LAMBETH SCHOOLS
Job number	-
Document title	Air Quality in Schools: An Interventions Toolkit

	Date	Prepared by	Checked by	Approved by
Working Draft 0.1	16.02.2021	Z Olive/	M Jansson	J Bellinger
Final Draft 0.2	23.12.2021	A Hird	J Bellinger	J Bellinger
Final Draft 0.3	09.02.2022	A Hird	J Bellinger	J Bellinger
Final Draft 0.4	14.03.2022	A Hird	J Bellinger	J Bellinger

Keywords
Air Quality, public realm, sustainability

Introduction: Design Toolkit

This toolkit will provide guidance on ways that you can influence or directly implement air quality improvements for your school. This includes actions within your school grounds, surrounding streets adjacent to your school and bigger changes within your wider neighbourhood area.

The Global Action Plan (GAP) [Clean Air for Schools Framework](#) provides a useful tool to help you decide which actions are best to implement.

This toolkit is designed to work alongside the GAP framework and provide further detail on specific physical interventions. It has been developed as part of the Lambeth Schools Air Quality Project in partnership with Impact on Urban Health Charity, University of Surrey (UoS) and GAP.

Image: © Kelly Sikkema

Summary of Interventions: Effectiveness

This toolkit identifies actions which will have the greatest impact on local air quality. The boxes below show the actions which have been considered, categorised into measures which will have a direct impact on air quality (on the left) moving to those on the right which will have less of a direct impact but are equally important to consider. The key for any school is to take action and any of the measures below will provide benefits.

REDUCE TRAFFIC on roads near to schools	INFLUENCE TRAFFIC REDUCTION on roads near to schools	REDUCE CHILDREN'S EXPOSURE to existing pollution	PHYSICAL INFORMATION measures on pollution
• Car sharing	• Cycle lane creation	• Reconfiguration of school grounds	• Pollution information
• Non-idling areas	• Improved walking / scooting routes	• Barriers/ green screens	• Air quality monitoring
• Clean Air Zones (CAZ)	• Parklets	• Air purifiers	• Healthy schools London accreditation
• Street pedestrianisation	• Improved cycle/ scooter parking and changing facilities	• Indoor greening	
• 20mph zones	• EV charging points	• Sheltered waiting areas	
• Priority bus lanes	• Relocation of bus stops	• Improved ventilation systems	
• Modal filters	• Cycling training		
• School Streets and Play Streets	• Ride and stride options		

Summary of Interventions: Effectiveness

The main way to improve air quality is to reduce emissions at the source.

Around schools the largest source of emissions will typically be from road vehicles. The pollutants of concern are NO_2 and particulate matter (PM_{10} and $PM_{2.5}$), therefore reducing traffic will have the most effective impact. This filters down to anything that can influence reduction in emissions or reduce the existing exposure. It is also important to inform the public about air pollution, but this relies on behaviour change, and therefore is most effective at improving air quality when combined with other measures.

This toolkit presents a range of potential interventions most relevant for school environments. An indication is provided of the relative impact each intervention will have on air quality alongside indicative information on cost, timescales and ease of implementation.
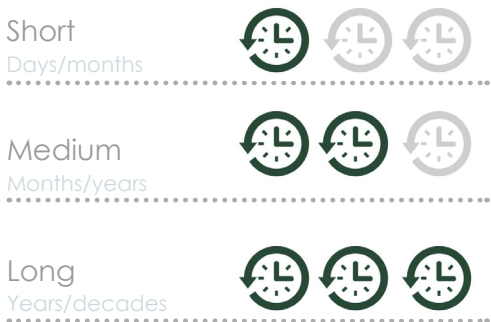
Where work has been carried out as part of the Lambeth Schools Project case studies have been added alongside the relevant intervention.
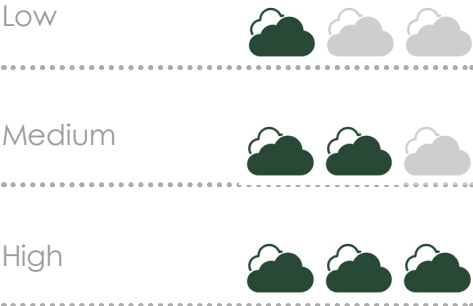
Assessment key

Cost
Cost of implementation

Low £100s			
Medium £1,000s			
High £10,000s			

Timescales
Timescales for impact

Short Days/months			
Medium Months/years			
Long Years/decades			

Air Quality
Air Quality Impact

Low			
Medium			
High			

Implementation
Ease of implementation

Easiest			
Medium			
Most difficult			
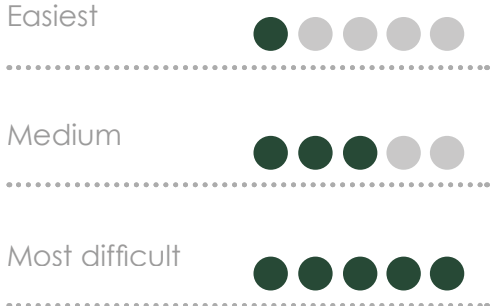
Summary of Interventions: Scale

The most impactful changes to improve air quality are those which affect the traffic **adjacent** or within the **wider area** around your school. Most of these will need to be implemented in partnership with your local council. Although you cannot implement this level of change yourself, you have a strong voice to campaign for change and to influence the form that some of these measures may take. By being aware of the different measures that exist, and informing the council of the specific challenges that you and your pupils face, you can have a direct impact. Interventions **within school grounds** can be implemented by yourself. The following pages look at each intervention in more detail.

Within school grounds

Here you can implement measures yourself (depending on building regulations). Whilst these interventions may be less impactful, in combination they can improve air quality. Funding may be available from your local council.

- Reconfiguration of school grounds

- Barriers/ green screens

- Improved cycle and scooter parking

- Pollution information

Adjacent to school

Interventions on streets adjacent to your school can affect very local traffic levels and behaviour change to encourage walking and cycling. These will need to be implemented by your local council.

- Improved walking / cycling routes

- Parklets

- School Streets and Play Streets

- Modal filters

- Non-idling areas
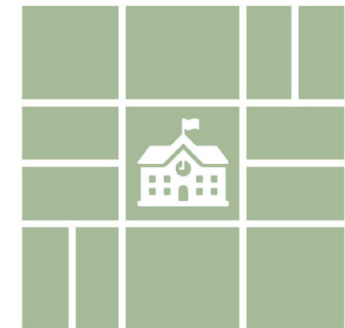
Wider area to school

The most impactful changes are those which impact the traffic in your school's local area, most of which need to be implemented by your local council.

- Car sharing

- Street pedestrianisation

- Clean Air Zones (CAZ)

- 20mph zones
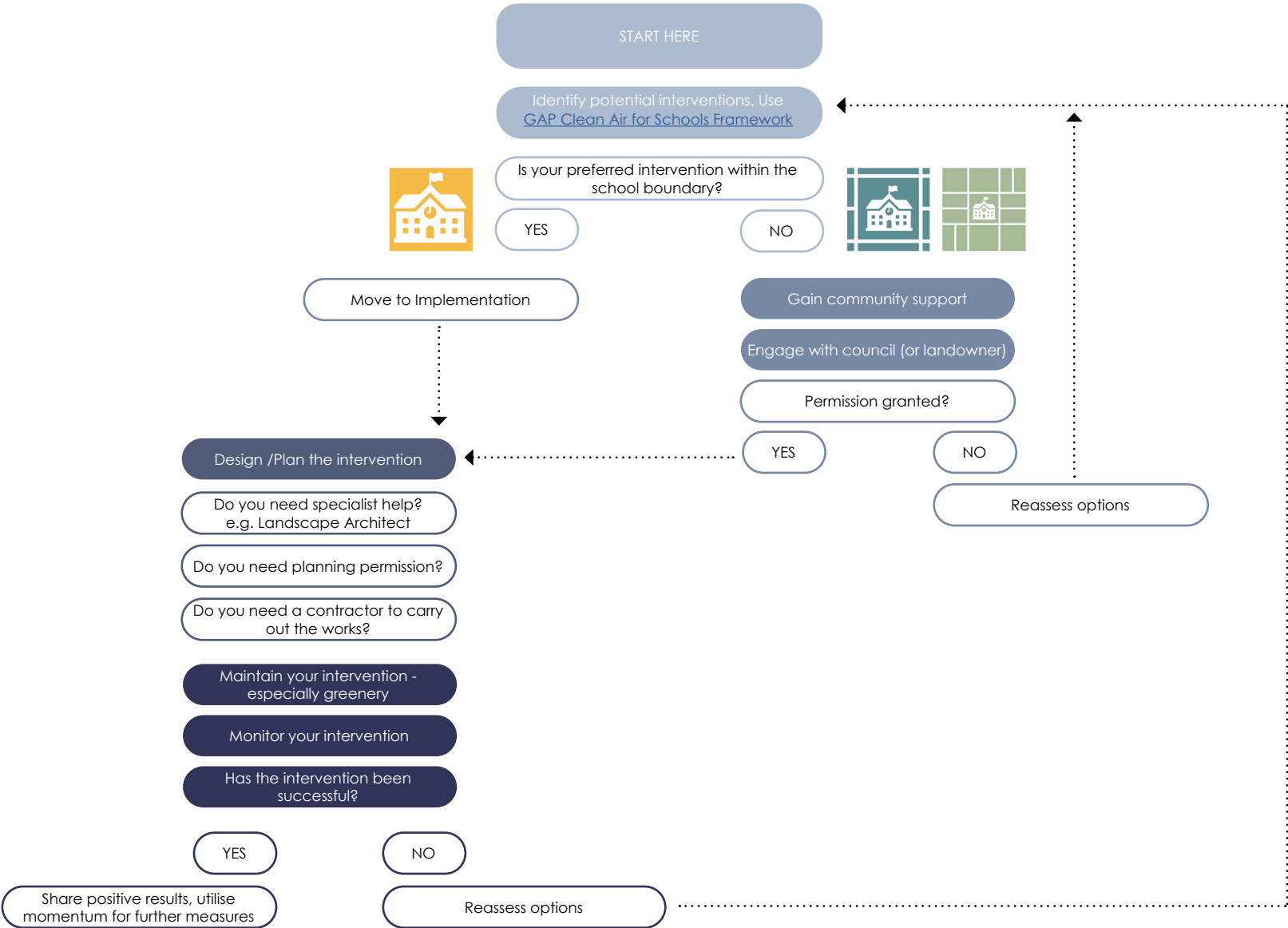
- Priority bus lanes

- Cycle lanes

Key Steps

Step One:
Preparation and Planning

Step Two:
Engagement

Step Three:
Design and Implementation

Step Four:
Monitoring, Management and Maintenance

Next Steps

START HERE

Identify potential interventions. Use GAP Clean Air for Schools Framework

Is your preferred intervention within the school boundary?

YES

NO

Move to Implementation

Gain community support

Engage with council (or landowner)

Permission granted?

YES

NO

Reassess options

Design /Plan the intervention

Do you need specialist help? e.g. Landscape Architect

Do you need planning permission?

Do you need a contractor to carry out the works?

Maintain your intervention - especially greenery

Monitor your intervention

Has the intervention been successful?

YES

NO

Share positive results, utilise momentum for further measures

Reassess options

INTERVENTIONS: WITHIN **SCHOOL GROUNDS**

Improved Cycle and Scooter Parking

Within School Grounds

Encourage parents, students and teachers to cycle to school by providing safe storage at school

Provide safe covered storage for bikes during the day, either within the school grounds or outside. By improving infrastructure it is possible to encourage pupils/parents/staff to be more active. There is a range of options/cost for implementation. To maximise effectiveness this could be done alongside student campaigns promoting active travel. You can find activities for our pupils here.

An additional measure is cycle safety classes for pupils, which would increase cycling skills and may encourage cycling to school rather than using vehicles. To make cycling more convenient, provide showering facilities for pupils and teachers.

A big challenge is to bring about a shift towards active travel, rather than private car use, and broaden the cycling population beyond existing cyclists.

Benefits

- Health benefits for people who take up walking or cycling as a result of campaigns;
- Promoting active travel to the school community may initiate a change in behaviour. Active travel reduces vehicle usage, lowers emissions and improves air quality; and
- Infrastructure which encourages active travel is likely to provide benefits for our individual health and the NHS in terms of cost savings.

© Davyn Ben

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Typical Cycle and Scooter Parking Options

© Broxap Limited

© Broxap Limited

© Raúl Lazcano

	Type	Detail/explanation	Cost per unit*	Constraints	Opportunities
Parking	Bike stands outside school gates	Range of cycle stand options, which are likely to require permission/ be implemented by your local council.	From £40 per cycle stand	Security

Users need to provide own lock | Cheap

Easiest access

Maximum users |
| Parking | Bike stands inside school gates | Range of cycle stand options, which can be implemented by yourself. | From £40 per cycle stand | Space within school grounds | Potentially more secure without extra cost

Accessible only by staff and pupils |
| Lock-up | Covered bike/ scooter stands | Shelter over cycle stands protect bikes from weathering and users from poor weather. | From £200 per cycle stand | More expensive than only bike stands | Protection from poor weather |
| Lock-up | Secure storage unit for bikes/ scooters | Gated cycle/ scooter storage. Number of locking options, including: padlock, code locks or swipe cards. | From £260 per cycle stand | Less easy access

Most expensive bike/ scooter storage option | Most secure bike/ scooter storage option |
| Next Level | Showers and lockers | Lockers to store cycle equipment e.g. within the building. Providing showers for pupil and staff makes cycling easier and more convenient. | | Space requirements within school building

Maintenance | Increases ease of cycling to school |
| Next Level | Cycle safety classes | Educating staff and pupils to cycle safely will encourage cycling to school rather than using vehicles. | | Cost | Encourages new cyclists (staff / pupils) |

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* Excludes delivery and installation

Case Study - Cycle Storage

Henry Fawcett Primary School

As part of the Lambeth Schools Air Quality Project, cycle and scooter parking was implemented at Henry Fawcett Primary School. Existing cycle and scooter parking within the school grounds was limited and mainly informal, with a small number of lockable bike stands.

Within the small space available, the two tier bike stand provided over 50% uplift in bike capacity. The top tier is reserved for adult bikes and the bottom tier for junior bikes. The shelter provides protection for bikes. No gates enables easy access, as the site was already fairly secure. A scooter rack was also installed to increase storage capacity. All bikes and scooters can now be locked individually for additional security if desired.

Things to watch out for:

- For safety, two tier bike stands are only suitable for areas outside playgrounds and where adults can supervise use at all times.

- Surface fixed cycle stands and shelters will typically require concrete foundations. These will need to be installed before the cycle shelter. Check with the supplier whether foundations are required, if it's a service that they provide or if they can suggest a preferred contractor.

- To provide a competitive price suppliers may leave out certain charges. Carefully check terms and conditions of quotations for any additional charges/ work not costed.

- A competent contractor or supplier can install most cycle storage systems within 1 - 3 days. Arrange in advance access arrangements/ times for the contractor to undertake work. This may affect access to the school, including staff parking.

- If possible, arrange the work well ahead of time within the school holidays to minimise disruption. These are very busy times of year for contractors and bookings fill up fast.

Installed cycle shelter at Henry Fawcett Primary School. © GAP

Henry Fawcett Primary School

2021

Project team: GAP, Impact on Urban Health Charity, ARUP

Budget: £11K

Barriers/Green Screens

Introduce a vegetated physical barrier between the school and the road

Green screens can take the form of hedges, green walls, climbing plants or a continuous line of trees. Green barriers do not improve overall air quality, but can reduce impacts locally when there is a barrier between the source of air pollution (e.g. a road) and a particular space (e.g. a school playground). The barrier reduces concentrations behind the barrier but can increase on the traffic side of the barrier. They can provide multiple other benefits, including urban cooling, water management, and improving biodiversity and health and well-being.

Benefits

- Can provide a barrier between main roads and locations of exposure;

- Can mitigate urban heat island effects;

- May contribute to sustainable urban drainage if planted solutions used;

- Encourages wildlife and increases biodiversity;

- Good for well-being; and

- Can improve amenity within the local environment.

Pollution concentrations are reduced behind the barrier

Pollution build up can increase on the traffic side of the barrier

Diagram demonstrating the effect of green screens on pollution adjacent to a road based on *Using Green Infrastructure To Protect People From Air Pollution,* GLA (2019) © ARUP

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Within School Grounds

Typical Barrier and Green Screen Options

Type		Detail/explanation	Cost *	Timescale	Implementation	Constraints	Opportunities
Supported	**Climbers**	Evergreen climbers, pre-grown on a structure can be planted in the ground or in planters for an instant screen. You can also grow climbers up an existing fence though they will take time to establish.	£75 - 200 (Per m²)	●○○○○	●○○○○	Requires some maintenance.	Multiple benefits from having a green solution: educational opportunities, well-being, biodiversity support.
	Living walls	Modular living wall systems can feature a wide variety of plant types, providing a beautiful, green and inspiring asset.	£2600 - £4000 (Per m²)	●●●●○	●●●●○	Requires maintenance. Very expensive.	
	Planted pockets	More affordable version of a living wall, useful for awkward spaces or for a feature wall. Generally a fabric backing with pockets to plant up.	From £120 (Per m²)	●●○○○	●●●○○	Requires maintenance and plant replacement.	
Free-standing	**Hedging**	A dense hedge is an excellent pollution barrier and provides many biodiversity benefits. They can also offer colour in summer and autumn.	£5 -£30 (Per m²)	●●●●○	●●●○○	Slow to impact. Requires maintenance.	Trees and hedges offer wide benefits to biodiversity and seasonal interest.
	Trees	Large, broadleaved trees are excellent air pollution dispersers and the added benefits of planting trees are widespread. The location of tree planting should be checked with an air quality expert, to maximise eventual air flow benefits.	£22 -£55 (Per tree sapling)	●●●○○	●●●○○	Slow to impact. May need council or planning approval.	Impactful long term solution potentially reducing air pollution well past the school gates.
Non-vegetated	**Bamboo/rush screens**	Bamboo, willow or rush rolls can be applied to existing fences. Ensure that no gaps are left for air to filter through. You may need multiple layers.	From £20 (Per m²)	●○○○○	●○○○○	Short term option as not very durable.	Quick, cheap and easy to install. Easy to source.
	Fences	Fences in wood or bamboo can provide protection provided there are no gaps between slats. Many varieties of steel reinforced security gates and fences are on the market.	£50 -£125 (Per m²)	●●○○○	●●●○○	Cost can vary greatly.	Good solution for school gates. Less maintenance than green solutions.

* Excludes delivery and installation

Barriers and Green Screens: Key Considerations

Preparation and planning

- **Feasibility study**

What are your current school boundaries? Do you have wire mesh fences with a playground behind?

Do you have permission from the landowner to amend your existing boundary or do you need to look at something free-standing?

Do you have a staff member or parent group who could maintain greenery in school holidays?

- **Draw up brief/plan**

You may need to work with the school site manager to do this.

Tips

Screens bordering busy roads should be a minimum of 2.5m tall and preferably over 3m tall.

Screens are only necessary where playgrounds, entrances and windows are exposed to the road.

Engagement

To gather funding and support for a green screen, engage with your parents and trustees (where relevant).

Think about the added benefits of a green screen such as opportunities to teach pupils about growing and biodiversity. Edible plants can be grown at ground or planter level and you could even have a school watering rota.

Check to see if your local or regional authority has any air quality or green infrastructure grants for funding support.

If you already have a high wall or solid fence a green screen is of limited value from an air quality perspective. However, it can offer many other benefits such as biodiversity, educational opportunities and the proven well-being effects of being close to greenery.

Implementation

Installation of most green screens will need to be carried out by a professional landscape contractor.

Gather 2-3 quotes before engaging anyone for the work and make sure you obtain examples of similar work that they have previously delivered.

Make sure that you agree the plant species. An evergreen base or a hedge such as beech should be used which retains its autumn leaves through the winter.

Tree and hedge planting should be carried out by a qualified professional. It is crucial that sufficient soil depth is available so that roots can grow unhindered.

Tree planting should be carefully considered in close proximity to buildings and utilities and should be approved by a Qualified Arboriculturalist or local tree officer.

Monitoring, management and maintenance

- **Maintenance**

Long term maintenance requirements for any planting and resources for this will need to be considered.

Considerations will need to be made for maintenance during the whole year including the school holidays.

- **Monitoring**

Monitor air quality levels behind the green screen, e.g. within the playground, where reduction is predicted to occur as a result of the intervention.

For more information on air pollution monitors, see page 18.

Case Study - Green Screen

St Andrews Church of England Primary School

As part of the Lambeth Schools Air Quality Project, a 61m long green screen was implemented at the school. The wider project provided interventions to tackle poor air quality in three schools close to busy roads within the London Borough of Lambeth. St Andrew's Church of England Primary School is bound by Lingham Street, a busy road frequently used by drivers as a cut through from the adjacent A road. The introduction of a green boundary provided an attractive barrier to help reduce the children's exposure to air pollution within the playground and sports court. A pre-planted 2m high screen with climbers was installed on the inside of the existing school fence, which also makes space for wildlife and provides educational opportunities. Monitoring before and after the screen was installed shows reductions in the concentrations of particulate matter of up to 44% in the school playground during cross-wind conditions (i.e. when the wind was blowing from the road, through the screen, towards the school grounds).

Things to watch out for:

- A competent contractor or supplier can install the green screen, planters and irrigation system within 1 - 3 days.

- Arrange in advance access arrangements/ times for the contractor to undertake work, if possible during the school holidays to reduce disruption.

- An accessible water supply will be required for the irrigation system and associated apparatus will require space. Water cables will also need to be installed between the water source and planters. Routing of water cables can be tricky in a playground context and may require ground works to cover them.

- Check mulch within the planters is correctly installed. This is important for water retention to stop the planters drying out.

- Living green screens are not appropriate for opening school gates as they need planters to support them which can't move regularly. Pocket planters or artificial ivy are alternative options in these areas.

Installed green screen at St Andrews Church of England Primary School © ARUP

St Andrews Church of England Primary School

2021

Project team: GAP, Impact on Urban Health Charity, ARUP

Budget: £50K

Reconfiguration of School Grounds

Reconfigure school ground layouts to increase the distance between outdoor areas used by children and busy roads

The design and layout of school grounds can be reconfigured to increase the distance from the areas where children spend the majority of time outdoors in the day from nearby main roads and local emission sources. This could also include establishing physical barriers, such as green screens, hedges and walls within the school grounds (for further information, refer to page 13).

Close off school entrances that are adjacent to busy roads or relocate the entrance further away from the road (source of emissions). Children and parents/carers spend a lot of time at the school gates, therefore moving them away from main roads will reduce exposure to traffic emissions.

Implementation is highly specific to each school site and will be highly dependant on available space. Careful consideration is needed in relation to the operational requirements of the school and potential impacts on movement and access within the school. Consideration should also be given to access and movement in relation to surrounding buildings/local structures.

© Arup

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Benefits

- Can increase separation between main roads and locations of exposure; and

- Reduces exposure to children/parents/carers within the school grounds.

Within School Grounds

Pollution Information

Within School Grounds

Provide real-time pollution information, including advertising episodes of high pollution online, via apps and in public locations

Publicising episodes of high pollution increases awareness of air quality issues. There are nationally available air pollution alerts that could be shared with the school community e.g. via existing televisions or interactive boards in the school, text alerts, emails or school newsletters. This information could be paired with local low pollution walking routes information and timetables for public transport (buses/tubes/trains). You can find activities for your pupils to make their own low pollution maps and other related air quality activities [here](#).

© Balázs Kétyi

Benefits

- Helps people to avoid high pollution events, which benefits individual health and the NHS in terms of cost savings;

- Awareness of the health impacts of poor air quality may initiate a change in behaviour to active travel, if they are available;

- May reduce car usage on days when high pollution alerts are given, lowering emissions and concentrations in the short term and increasing active travel;

- Possibility of increased support for air quality measures; and

- May initiate a change in behaviour and reduce general vehicle usage, lowering emissions and improving air quality, if there are good public transport and active travel options.

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Pollution Information: Key Considerations

Preparation and planning	Implementation	Monitoring, management and maintenance	Resources

Preparation and planning

- **Feasibility study**

What are the best communication methods at your school? Which methods will reach the most children, parents, carers and staff? Do you have an existing TV screen which is visible for everyone? Do you have an existing text or email alert system?

- **Data sources**

What data does the school have access to? Does the school have or desire to have their own pollution data collection equipment?

Tips

The main air pollutants in the urban environment which can be measured include nitrogen dioxide and particulate matter. These can be measured simultaneously.

Implementation

To gain support and funding, engage your parents and trustees (where relevant) on your pollution information proposal. Think about the educational opportunity to teach pupils about air pollution and the environment. These measure can also be used as a management tool to enable behavioural change on high pollution days.

- **Monitoring Equipment**

There are a number of different types and prices for real time air pollution monitoring equipment: indoors, outdoors, fixed or portable. Where are the main pollution 'hot spots' and where will provide maximum educational value?

Funding is often available for monitoring at schools via local council or city programmes. This should be investigated before considering what equipment to use.

Monitoring, management and maintenance

- **Monitoring**

Installation of monitoring equipment and setting up software will require specialist skills and may require periodic calibration.

Recording and storing air pollution information will provide a compelling case to your local council to implement measures within your wider local area that improve air quality. This can then lead to funding for other projects.

Real time air pollution monitors provide a great tool for education, with many curriculum links. If combined with other interventions, aiming to reduce air pollution levels, the school community can learn which interventions make an impact.

Resources

- **Airly:** Air quality monitoring solutions company providing 6 months free monitoring via #LetSchoolsBreathe campaign. Available at: https://airly.org/en/let-schools-breathe/

- **Breathe London**: Air quality monitoring equipment available to schools in the London. Available at: https://www.breathelondon.org/

- **Clean Air Walking Routes**: Route finder for low pollution walking routes in London. Available at: https://cleanairroutes.london/

- **Action for Clean Air:** Practical tools to help your school take action including educational resources and information on how air pollution affects children's health. Available at: https://www.actionforcleanair.org.uk/schools

INTERVENTIONS: **ADJACENT** TO SCHOOL

Improved Walking and Cycling Routes

© Danny Nee

Encourage walking, cycling or using scooters to get school by re-allocating space from vehicles and improving infrastructure

By improving infrastructure for walking and cycling it is possible to encourage pupils, parents and staff to be more active. Reducing space given to motorised vehicles or on street parking can increase the usability of the street for pedestrians and cyclists, whilst also increasing the distance between people and sources of pollutants (vehicles). This can be done by extending and resurfacing footways or introducing a vegetated strip between the footway and the carriageway. Improving lighting, crossings and way finding can also encourage more walking and cycling. Successful walking routes will be those perceived to be "safe" and make travel from home to school easier. Most of these interventions will need to be implemented by your local council, which you can influence by campaigning for change.

To maximise effectiveness, these measures should run alongside student campaigns promoting active travel and providing information on journey time and routes by foot/bike. You can find activities for your pupils here.

Benefits

- Footway widening can provide separation between main roads and locations of pollution exposure;

- Promoting active travel may initiate a change in behaviour and reduce vehicle usage, lowering emissions and improving air quality;

- Health benefits for people who take up walking or cycling as a result of campaigns;

- Infrastructure which encourages walking is likely to provide benefits for our individual health and the NHS in terms of cost savings; and

- Incorporation of green verge could improve sustainable urban drainage, encourage wildlife, and increase biodiversity.

Adjacent to School

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

20

Improving Walking and Cycling Routes: Typical Design Options

	Type	Detail/explanation	Constraints	Opportunities
Widen footway	**Footway widening**	Hard landscape solution, footway permanently widened and the surface raised. Could be combined with green verge solutions.	Council approval needed Construction required	Increases usable space for pedestrians
	Fixed bollards	Permanent bollards at the edge of the pavement. Different types offer different levels of physical protection from traffic e.g anti-terrorist measures.	Limits access outside school Council permission needed Construction required	Offers protection from traffic, and anti-terrorist measures
	Moveable barriers	Temporary barriers, e.g. cones or weighted cut outs, can be used to block vehicles and increase pedestrian space at the school entrance when required.	Not always physical protection from road Council approval needed	Quick and affordable
Greening elements	**Moveable planters**	Planters on wheels which can be kept inside the school gates and wheeled out when required.	Council approval needed	Greening offers multiple other benefits Flexibility
	Fixed raised planting beds	Solid raised beds which prevent parking/idling and give a physical barrier to road traffic.	Council approval needed Limits access outside school Construction and maintenance required	Offers protection from vehicles Benefits for wildlife
	Ground level planting bed	Planting beds at ground level offering a physical gap between traffic and pavement. Potential to also collect rainwater to reduce flooding risks.	Council approval needed Limits access outside school Construction and maintenance required	Can contribute to drainage solutions/flooding issues Benefits for wildlife
	Tree planting	Tree planting into reclaimed area. Take time to offer green benefits but are instant barriers to vehicle access.	Surveys of below ground services may be required Long growing time Council approval needed	Potential to reduce air pollution past the school gates Benefits for wildlife

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Case Study - Footway widening and ground level planting

Pretoria Avenue and Greenleaf Road School Routes, Waltham Forest

As part of the Waltham Forest's Mini Holland Programme, a number of school route improvements have been implemented to encourage walking and cycling to school whilst also making space for wildlife.

At Stoney Down Primary School, the school and Friends of Stoney Down Park partnered with Waltham Forest Council to create an improved school route along Pretoria Avenue with a narrowed road carriageway and widened pavements and a planting bed to create some separation between the pavement and the road.

At Greenleaf Primary School, which is adjacent to the busy Forest Road, a new cycle lane was introduced alongside resurfaced paving indicating the priority of pedestrians crossing at the road junction. The scheme also included bollards that double up as signage, playful objects, tree planting, greening and bike parking.

Pretoria Avenue footway widening and rain garden planting.
Image photo credit: © Alexander Christie. Scheme design: LBWF Highways in collaboration with what if: projects Ltd.

Modal Filters

Introduce features to limit through-journeys along a street by certain modes of transport

Modal filters are permanent features that restricts vehicular movement, prioritising pedestrian and cyclist access through an area. Typically they comprise of permeable barriers such as bollards, planters or planted strips with gaps to restrict vehicular movement. They are often used as part of low traffic neighbourhood schemes. As for other interventions that restrict or alter traffic movement, careful assessment is needed of potential impacts. These features will usually need to be agreed with and implemented by the council.

Benefits

- Encourages active travel and reduces car usage, lowering emissions and improving air quality;
- Increases the open space available to the public (where physical infrastructure includes planting and street furniture);
- Reduces traffic accidents;
- Increases sense of community by bringing neighbours together and provides space for children to play;
- Reduces congestion;
- Contributes to enhancing the public realm;
- Optimises existing road infrastructure to effectively improve urban accessibility; and
- Improves opportunities for walking and cycling due to a quieter urban area.

Adjacent to School

Fixed bollards and planting limits vehicles to one way and retains two way cycle access at Greenleaf Road, Wathamstow. Image photo credit: © Alexander Christie. Scheme design: LBWF Highways in collaboration with what if: projects Ltd.

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Typical Modal Filter Options

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© Paul Carstairs/ Arup

	Type	Detail/explanation	Constraints	Opportunities
Create a barrier	**Raised planters**	Physical barrier to vehicles also offering street greening. Gaps between planters provide access for cyclists and pedestrians only.	Council approval and permissions needed Requires maintenance	Easier and quicker to implement than ground level planting
	Fixed bollards	Permanent bollards offer a physical barrier restricting access to vehicles, whilst allowing cyclists and pedestrians.	Council permission needed Construction required	Removable bollard option for servicing/ emergency access
	Moveable barriers	Temporary barriers e.g. wands, cones can restricting access to vehicles for short periods of time.	Not always physical protection from vehicles	Quick and affordable
Greening elements	**Tree planting**	Tree planting within ground-level planting area. Take time to offer green benefits but are instant barriers to vehicle access.	Surveys of below ground services (utilities) may be required Long growing time	Long term solution potentially reducing air pollution past the school gates
	Ground-level planting beds	Planting beds at ground level surrounded by a raised kerb offering a physical gap between the road and non vehicle areas.	Requires construction and maintenance Council approval and traffic orders may be needed	Offers protection from vehicles Greening offers environmental benefits
Increase footway	**Footway widening**	Hard landscape solution, footway permanently widened and the surface raised. Could be combined with green verge solutions.	Council approval needed Surveys and construction required	Increases usable space for pedestrians
	Parklets	Temporary or permanent interventions which reallocates space to pedestrians e.g. removal of parking spaces. Increases in pedestrian space can include pathway, seating and planters.	Council approval and traffic orders may be needed Requires construction and maintenance	Less complex and quicker to implement than footway or planting beds Flexible: temporary or permanent

Modal Filters: Key Considerations

Preparation and planning

- **Partnerships**

It is likely that your local council will be responsible for implementing the works if the roads outside your school are public roads. However, you can work with them in planning the proposed changes outside your school.

Things to consider when deciding whether this intervention is suitable for your school include:
Are traffic issues on the roads outside of the school contributing substantially to emissions?
Would preventing through traffic on roads outside the school reduce the issues?

- **Input into the brief/plan**

Work with your local council to establish the optimal location for the modal filter.

Can the installation be permanent or does it need to be temporary?

Is there scope to integrate planting and seating to improve the amenity value?

Engagement

- **Take plan to council**

Your local council will need to provide direction and advise on the suitability of the intervention at an early stage. It will also need to undertake assessments to establish the appropriate location and design of the intervention with input from the transport specialist.

- **Stakeholder engagement**

Your local council will advise on the process for stakeholder consultation in your area. Plans may need to be refined or adjusted during this process.

Resources

- **Sustrans:**
  https://www.sustrans.org.uk/

Implementation

The local council will need to grant the appropriate permissions and traffic orders. They are also likely to be responsible for the development of the designs and the procurement for the installation of the proposals.

However, depending on the type of intervention selected, there may be an opportunity for you to be involved in the implementation of the scheme. For example, if using planters you and your pupils can be involved in plant selection, planting up the planting beds and ongoing maintenance such as watering.

Monitoring, management and maintenance

- **Maintenance**

There is often an opportunity for pupils or the school community to become involved in the long term maintenance. There may be learning opportunities that can be linked to these activities.

- **Monitoring**

Monitor air quality on the main roads where reduction in traffic is predicted to occur as a result of the intervention. Real time portable air pollution monitors can be used to take quick readings in multiple locations.

For more information on air pollution monitors, see page 18.

Case Study - Raised Planters

Henry Fawcett Primary School

As part of the Lambeth Schools Air Quality Project, removal of car parking at the schools gates with 6 large raised planters was proposed at Henry Fawcett Primary School. The scheme was not implemented by the project due to a lack of local council resource at the time, however, the school have continued to pursue this beyond the project's time-scales.

Bowling Green Street, adjacent to the main school gates, receives heavy traffic during school drop-off and pick up times. The proposed solution was to incorporate planters in car parking spaces adjacent to the school in order to move traffic away from the gates and provide a physical barrier to stop drop-off's at that location. A theoretical modelling scenario was developed to test the possible reduction in emissions at the schools gates.

The traffic data for the road was estimated in discussion with transport experts and the flows modelled at a speed of around 20kph. Planters were represented in the model as a low barrier (1.5m in height) and concentrations were predicted at 0.8m to represent exposure to a child in a pushchair. The results show that the annual average concentrations are reduced by up to 50% at the gate location. It is important to note that this is a modelled scenario which comes with some inherent uncertainty and there would be significant variation in daily concentrations based on traffic and weather conditions. Also traffic is only one component of total concentrations so this reduction would not represent a 50% drop in the total, just the change from the traffic on that road. However, this does show that there will be benefits from even small measures such as planters when used to move traffic sources away from key drop off and pick up locations.

Things to watch out for:

- Show your proposals to your local council promptly, as public road works will require permissions which can take a long time to process.

- Temporary interventions are easier and quicker to get local council permission for if you are wanting fast action.

Illustration of proposed planters on Bowling Green Road. © ARUP
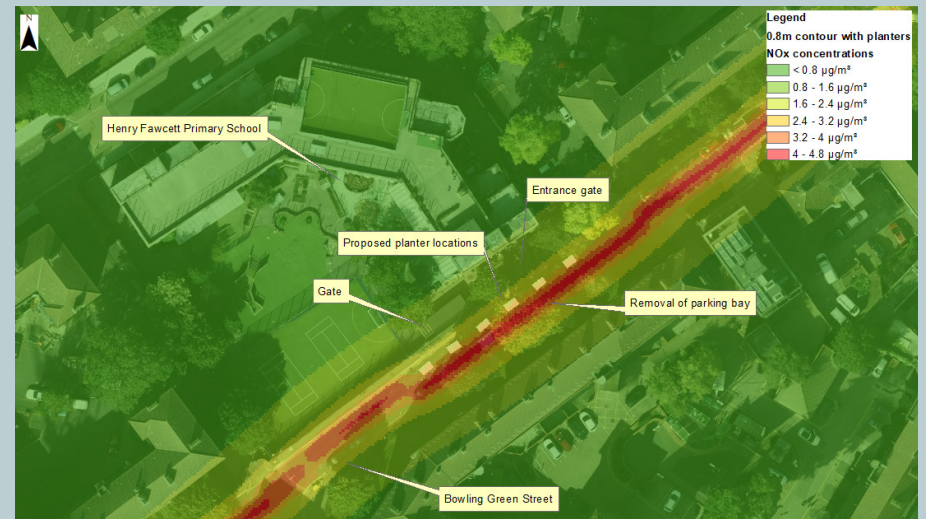
Modelling of predicted NOx concentration levels on Bowling Green Street following installation of planters. © ARUP

Case Study - Modal Filter

St Marks Church of England Primary School

As part of the Lambeth Schools Air Quality Project, a modal filter was proposed to restrict through traffic to Kennington Oval Road, which provides the main entrance to the school. The road is a main pollution source for the school, which is regularly used as a cut through to avoid nearby busy roads and traffic often comes to a stand still. The intervention was not delivered as part of the project due to insufficient local council resource, however the scheme received positive feedback and may be delivered when additional funding becomes available.

The proposed modal filter comprised of two large raised planters on the existing raised table. This would block access to vehicles but allow free movement of cyclists and pedestrians. Fixed signage posts on either side of the road would clearly notify users of the limited access. Providing an opportunity for greening, the planters would enhance the street scene. The intervention would reduce traffic congestion and unlock additional public realm improvements outside the school e.g. widening the pavement.

Things to watch out for:

- Approval is required by your local council which will take time. Start engaging with your local council as soon as possible. This process would include public engagement, which is likely to influence the exact form of intervention, and whether it is granted permission.

- Your local council is likely to need to undertake assessments to ensure there are no adverse impacts for traffic and congestion on other local roads, with input from a transport specialist.

- Limited budgets within your local council may increase the time-scale for implementation, as they are likely to have their own schedule of works.

Illustration of proposed modal filter on Kennington Oval Road. © ARUP

St Marks Church of England Primary School

2021

Project team: GAP, Impact on Urban Health Charity, ARUP

Estimated cost: £10 - 25k (Not implemented)

Anti-Idling Areas

Exclude a radius around the school for idling vehicles

Idling is when cars with engines on stop for 30 seconds to one minute, which significantly contribute to air pollution. Unnecessary idling may be discouraged by a student run anti-idling campaign, creation of no idling zone around the school marked with signage, or if required a monetary fine. Street changes could use painted kerbside/road markings/planters. You can find activities for your pupils here.

Under The Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002 it is an offence to leave a vehicle engine idling unnecessarily while stationary within an area which is designated as an Air Quality Management Area (AQMA). An AQMA is a location with particularly poor air quality, with levels above those required by legislation, which is required to make improvements.

Adjacent to School

Benefits

- Reduces vehicle exhaust emissions and improves air quality;
- Can improve the safety of pedestrians;
- Minimises noise nuisance to the public; and
- Reduces congestion.

© Mike Knell

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Anti-Idling Areas: Key Considerations

| Preparation and planning | Engagement | Implementation | Monitoring, management and maintenance |

Preparation and planning

Identify what type of measure you want to aim for, would the anti-idling measures be linked to an engagement activity or a formal scheme?

- **Site analysis**

You could carry out a survey during drop off times to identify the scale and location of the issue. This is a good opportunity to involve the pupils, as part of an educational learning activity for anti-idling.

Engagement

- **Anti-idling student campaign**

Use the data on idling collected from your site analysis to show the problem to other pupils and parents. You could hold a special assembly, ask parents to pledge not to idle engines near the school, or organise non idling event. Talk to your local councillor to see if they will support your campaign and come to any events. You can find activities for your pupils here.

- **Creating a anti-idling zone**

Your local council will need to provide direction and advise on the suitability of the intervention at an early stage, with input from a transport specialist.

Your local council will advise on the process for stakeholder consultation in your area. Plans may need to be refined or adjusted during this process.

Implementation

Anti-idling signage and other changes to the street will have to be completed by a council approved contractor.

Monitoring, management and maintenance

- **Monitoring**

Monitor air quality at the school gates or on the key roads where reduction in traffic is predicted to occur as a result of the intervention. Real time portable air pollution monitors can be used to take quick readings in multiple locations.

For more information on air pollution monitors, see page 18.

School Streets

Adjacent to School

Restrict access within a radius around the school during drop-off and pick-up times, making the streets safer for walking and cycling, and enable streets to be used as a play space

School Streets, Play Streets and Car Free Day are all initiatives that exclude traffic around schools at certain times, usually during drop off and pick up. These are aimed to create safer streets for children and parents, and encourage the streets to be used as a play space. During these times, streets may not be closed completely e.g. people living on the street may still be able to drive to and from their homes at a low speed.

These can be permanent or temporary interventions, dependant on the agreement with the local council. Several features can be used to stop traffic, including cones, planters, signage, and bollards.

A Controlled Parking Zone can be created, to prohibit parking on streets near schools. This can be complemented with a 'drive and stride' initiative, which encourages parents and carers to park well away from the school gate and walk the last section.

Benefits

- Reduces congestion around the school, lowering emissions and improving air quality;
- Smoother car travel may reduce road traffic emissions of NOx and PM_{10};
- Increases child safety around the school, reducing traffic casualties;
- Improves opportunities for walking/cycling/scooting, encouraging active travel;
- Increases the open space available to the public (can add planting and street furniture); and
- Increases sense of community by bringing neighbours together and provides space for children to play.
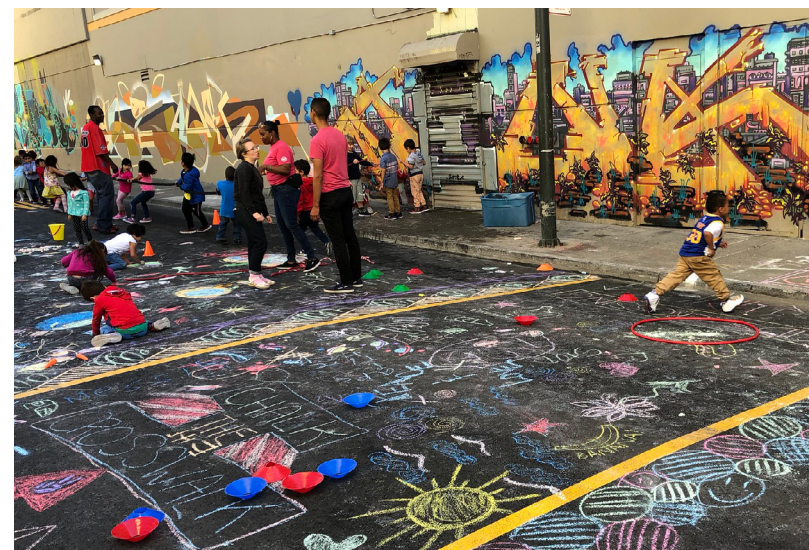
© Patrick Race

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

School Streets: Key Considerations

Preparation and planning

- **Feasibility study**

What regulations are there on the road outside the school at present? Are road users adhering to them? Is there space for parents and children to meet at the gates? Is a physical barrier required?

You could get your students involved in the feasibility study, for example by carrying out active travel surveys or parking surveys. You can find activities for your pupils here.

- **Draw up brief/plan**

What is the most beneficial day/time for temporary closure of the street?

- **Access requirements**

Is emergency access required? If so a permanent verge or barrier may not be possible.

Engagement

- **Take plan to council**

Your local council will need to provide permission, and is likely to need to consult everyone on the street to gain support.

Your local council will provide support and advise on suitability of the intervention and establish the appropriate location with input from a transport specialist to avoid any adverse impacts on the surrounding road network.

Resources

- **Playing Out:**
https://playingout.net/
- **School Street Initiative:**
http://schoolstreets.org.uk/
- **Analysing Air Pollution Exposure in London:**
https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/analysing-air-pollution-exposure-london

Implementation

Some councils will provide temporary 'road closed' signs, whilst others will ask you to arrange your own.

For temporary barriers enforcing existing rules regarding parking and idling, you may be able to carry this out yourself. If using planters, think about who will water them and move them, and where you will source them from.

Monitoring, management and maintenance

- **Maintenance**

Long term maintenance requirements for any planting and resources for this will need to be considered.

There is often an opportunity for local groups or the school to become involved.

- **Monitoring**

Monitor on the main roads where reduction in traffic is predicted to occur as a result of the intervention. Real time portable air pollution monitors can be used to take quick readings in multiple locations.

For more information on air pollution monitors, see page 18.

Case Study - Car Free Day

Henry Fawcett Primary School

On 22nd September 2021, the three schools participating in the Lambeth Schools Air Quality project celebrated Car Free Day by closing the road outside their school to vehicles: Henry Fawcett Primary School, St Marks Church of England Primary School and St Andrews Church of England Primary School.

At Henry Fawcett Primary School, they celebrated with a vibrant street party, where they played games, had face painting, a DJ, and even a Bolivian dance group and a West African drumming group! They also had a food bus and Dr Bike from Cycle Confident who helped the school community service their bikes so that they were in good working condition for the school run. Lots of parents and children stayed after school to enjoy the festivities, particularly parents who normally do not get the opportunity to engage with school activities.

Things to watch out for:

- Ask your local council about closing the road as soon as possible, as this can be a long process.

- To support the road closure, you will need to follow the council's health & safety protocols and ensure there are sufficient adults to meet these requirements e.g. stewards to monitor the road closure locations.

- Reach out to local active travel organisations e.g. Sustrans, who may be working with your local council to assist schools wishing to take part.

- Consider any organisations/funders to throw a fun street party/event by providing food, activities and/or entertainment.

- Ensure a full risk assessment is carried out and there are enough staff and adult helpers working at the event to keep everyone involved safe.

- Provide all adult helpers with training prior to the event, so that everyone is clear on their roles and responsibilities.

Low pollution map installed at Henry Fawcett Primary School. @GAP
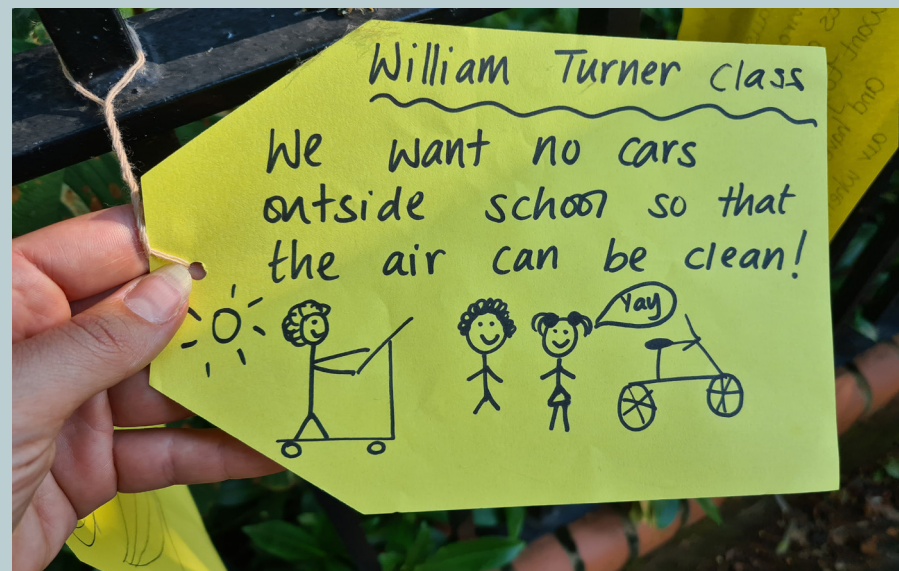
Pupil artwork from Car Free Day activity. @GAP

Parklets

An extension to the pavement, typically providing seating and planting for the community, resulting in a space for parents and pupils to gather and play

Re-locating parts of residential streets, such as re-purposing parking spaces or sections of the carriageway as a parklet, can encourage active travel and influence movement through an area as part of a strategy to reduce traffic on streets surrounding schools. They can take the form of modular units incorporating planters and seating for the community to enjoy and can vary in scale and simplicity of implementation. They can be temporary or permanent interventions.

Adjacent to School

© Paul Carstairs/ Arup

Benefits

- Gives uplift to the local economy through transformation of the urban realm;

- Encourages active travel and reduces car usage, lowering emissions and improving air quality;

- Increases the open space available to the public (can add planting and street furniture);

- Increases sense of community by bringing neighbours together and provides space for children to play;

- Contributes to transformation of the public realm;

- Optimises existing road infrastructure to effectively improve urban accessibility; and

- Improves opportunities for walking and cycling due to a quieter urban area.

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

INTERVENTIONS: **WIDER AREA** TO SCHOOL

Car Sharing

Exclude a radius around the school available only to those who car-share or introduce high occupancy vehicle lanes

Encouraging car sharing can reduce the volume of traffic on roads around the school. It can take the form of road width changes to accommodate dedicated lanes, work schemes, signs and/or painted road markings. For example, car sharing lanes, commonly known as 2+ lanes or High Occupancy Vehicle (HOV) lanes are specifically for cars with 2 or more people in them.

An exclusion zone can be established around the school where only car-sharing is allowed within it. The measures could be enforced by CCTV.

© Jan Baborák

Benefits

- Increases the open space available to the public (can add planting and street furniture);
- Makes walking more accessible - safer with fewer obstacles;
- Reduces traffic casualties;
- Cost savings to individuals as they are using cars less;
- Improves opportunities for walking and cycling due to a quieter urban area;
- Designed to reduce single occupancy car use and increase the uptake of car sharing;
- Reduces the number of vehicles and can reduce congestion;
- Reduces car exhaust emissions and improves air quality; and
- Effectively penalising lone drivers can increase the use of public transport.

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Wider Area

Street Pedestrianisation

Pedestrianise the streets around the school

Permanently pedestrianising the streets around the school or a selection of streets could contribute to significantly reducing traffic movement and emissions in the immediate area if carefully designed. This intervention has the potential to provide many benefits, including creating space for active travel and public realm improvements. Effects of displacing traffic would need to be carefully assessed and community consultation undertaken to ensure adverse effects are limited. Advertising alternative routes would be beneficial.

© Arup

Benefits

- Encourages active travel and reduces car usage, lowering emissions and improving air quality;

- Improves opportunities for walking and cycling due to a quieter urban area;

- Increases the open space available to the public (including for planting and street furniture);

- Reduces traffic casualties around the school;

- Increases sense of community by bringing neighbours together and provides space for children to play;

- Contributes to transformation of the public realm; and

- Optimises existing road infrastructure to effectively improve urban accessibility.

Wider Area

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Priority Bus Lanes

Introduce priority bus lanes on larger roads around the school

Bus lanes can be created around the school on larger roads through road layout changes so buses have priority over other traffic on certain days and times. They are designed to keep buses moving, allowing them to avoid congestion and delays, and therefore encourage use of public transport. This intervention is similar to car sharing and would be implemented using CCTV.

An additional measure would be to assess the distance between bus stops and the school gates, and if practical move them further away to reduce emissions close to school gates. This is due to a large amount of air pollution caused by buses idling at bus stops.

Benefits

- Smoother driving of buses can save fuel and reduce road traffic emissions of NOx and PM_{10}; and
- Increased reliability of bus services encourages public transport use to school.

© Andrew Nash

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Wider Area

Clean Air Zones (CAZ)

Establish a Clean Air Zone (CAZ) around the school, limiting vehicular access other than for pupils and deliveries

In a Low Emission Zone (LEZ) vehicle access will be controlled on the basis of the vehicle emissions category (e.g. Euro class), In a CAZ vehicle access is restricted on the basis of emissions or vehicle class e.g. no HGVs/private cars. The CAZ may or may not involve charging. A CAZ is different from a LEZ in that access restrictions are complemented by further measures such as: reducing exposure, bus partnerships, public procurement, business recognition, infrastructure and planning etc. Could be enforced by CCTV/tolls and allocated by signage.

© Citytransportinfo

Benefits

- Reduces road traffic emissions of NOx and PM_{10};
- Encourages a move to active travel and reduced vehicle usage;
- Aim to accelerate the transition to a low carbon, low emission economy; and
- Gives uplift to the local economy through transformation of the urban realm.

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Wider Area

20mph Zones

Implement a 20mph zone in the roads surrounding the school

The implementation of 20mph zones on the roads surrounding the school can both reduce congestion and can impact on certain pollutants. The restrictions can be permanent and continuously enforced or limited to drop off and pick up on weekdays. They are usually denoted using physical signage and enforced with the use of cameras.

© House Buy Fast

Wider Area

Benefits

- Reduces congestion around the school;
- Smoother car travel may reduce road traffic emissions of NOx and PM_{10};
- Increases child safety around the school;
- Increased safety could encourage more active travel (walk/cycle/scoot);
- May improve air quality if emissions are reduced; and
- Reduces traffic casualties.

Cost
Cost of implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Cycle Lanes

Encouraging parents, students and teachers to cycle to school by improving cycling infrastructure

Provide a cycle lane on the most common routes around the school. By improving infrastructure it is possible to encourage pupils/parents/ staff to be more active. Successful cycling routes will be those perceived to be "safe" and those making travel from home to school easier. Implementation can vary from cheap and fast changes, such as a line of paint marking the cycle lane, to full road re-design. To maximise effectiveness this could be done alongside a student campaign promoting active travel. You can find activities for your pupils [here](#).

A big challenge is to bring about a shift towards active travel and broaden the cycling population beyond existing cyclists. To allow cycle safety to be practised by pupils, put road markings in the school playground which can be used informally or during cycle safety lessons.

Benefits

- Health benefits for people who take up cycling as a result of campaigns;

- Promoting active travel to the school community may initiate a change in behaviour. Active travel reduces vehicle usage, lowers emissions and improves air quality;

- Infrastructure which encourages cycling is likely to provide benefits for our individual health and the NHS in terms of cost savings; and

- Optimises existing road infrastructure to effectively improve urban accessibility.

© Geoff Henson

Cost
Cost range for implementation

Timescale
Timescale for impact

Air Quality
Air quality impact

Implementation
Ease of implementation

Wider Area

Image References

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