Executive Summary

This measure involved the use of static and mobile air quality monitoring equipment to record and analyze the impact of vehicle emissions. The data from this equipment was displayed in real time in the premises of nearby schools, participating in the project, and used as the basis for an educational initiative in the schools on the effects of emissions and pollution. Three schools in Brighton selected for participation in the trials.

At two of these schools, Balfour Junior School and Elm Grove School, air quality monitoring equipment was installed at road side locations to monitor emissions and pollutants from passing vehicles. At the third school, St Bartholomew's School, a permanent installation was not possible, so a mobile air quality monitoring unit was used on local roads.

The roadside data was then compared to the ambient air quality data obtained from fixed air quality units installed as part of the project on the premises of the three schools, which collected details of the ambient pollutant levels for the area.

The data which was gathered from these various sources was then displayed, either in real time or recorded, in the school premises on screens in public area of the schools for the benefit of the children, teachers and other interested stakeholders.

The evaluation for this measure focused on the recorded air quality and emissions data, and the impact on children's awareness and acceptance of the project and the themes involved.

- The school survey from St Bartholomew's School showed 100% awareness, and 70% acceptance of the project in the term following the monitoring activities. A similar survey from Elm Grove School produced 100% awareness and 92% acceptance, while Balfour Junior School produced 100% awareness and 63% acceptance.
- The sample base was not large enough to quantify modal shift to more sustainable forms of transport following the Walk to School week and the work that took place during the project. However, it may be that similar work in the future at these and other schools could produce more significant and robust results.
- The amount of monitoring data available has meant that it has not been possible to quantify a statistically significant difference between the before and after emissions and air quality data.

The following lessons were learnt:

- The work undertaken has been successful in proving the new equipment development exponent of the project and has thus been a success.
- The project has informed and assisted the pupils at the three schools involved in understanding the effects of emissions on pollution. By educational measures such as this project, changes in the travel to school mode to more sustainable means may be encouraged.
- The measure as originally designed was intended to provide instant feedback on the emissions from their vehicles to drivers. This project was thought to not be deliverable and was changed to a more educational one linked to schools in the Civitas corridor. This proved to be very popular with the children and the teachers at the schools involved.

Measure title: **Emission VMS**

City: **Brighton & Hove** *Project:* **Archimedes** *Measure number:* **3**

A Introduction

A1 Objectives and Target Groups

A1.1 Objectives

The measure objectives are:

(A) High level / longer term:

- To improve the management of traffic within the city centre.
- To reduce emissions within the city centre.

(B) Strategic level:

- To inform travel choice via active information.

(C) Measure level:

- To improve quality of travel information in order to impact on travel choice.
- To raise public awareness in order to encourage people to consider travel alternatives.

A1.2 Target groups

Target group is city level. Principally car users of the city - especially those who we know regularly make short trips using their private cars. The main focus is on schoolchildren and their parents in three selected schools.

A2 Description

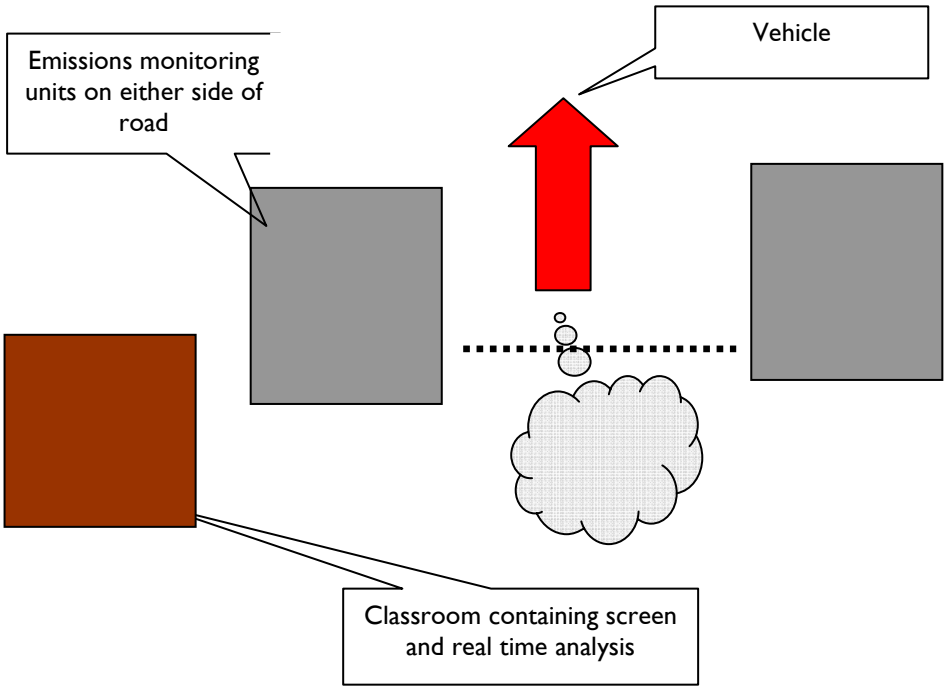
This measure has assessed the impact of a national travel initiative - Walk To School (WTS) week from several perspectives. Firstly emissions from passing vehicles in close proximity to a local school were monitored with innovative open path technology; the data was then displayed in the school dynamically through Variable Message Signage (VMS) in order to raise awareness of the impact that individual vehicles can have on local air quality. Additional to this, ambient air quality within the local vicinity of school grounds was monitored with accompanying educational programs to educate young students about their environment and how local transport activity might affect it.
Specific resources have been invested in initiatives to encourage a reduction in car journeys to and from school through the national Travel to School[1] initiative (TTSI). In the last two

[1] see http://www.brighton-hove.gov.uk/index.cfm?request=c1227814

years, CIVITAS funding has enabled the reach of this to be extended to independent schools and younger age groups (i.e. nurseries) primarily through encouraging the development of school travel plans within CIVITAS Archimedes Measure 32.

The Emissions VMS project sits alongside this work. The primary objective of this measure was to monitor vehicle emissions and ambient air quality around selected schools in order to educate pupils about their environment and how local transport activity can affect this.

Figure 1: Diagram Showing Basic Set up of the OP2 Technology (*Source: Based on information supplied by Duvas Technologies Ltd)*



The project utilised OP2 (Open Path unit, 2nd generation) technology which was installed at the road side, and was based on a beam of light being directed to another unit across the street. The light was then reflected back to the original unit, where it can be analysed. From this analysis it is possible to determine the emissions and pollutants emitted from the car going through the optical path at that time. This is all done in real time and the resulting information can be displayed on a variable message sign or other form of visual display. One screen was displayed at each school.

In addition a 006 closed path unit (where the air to be analysed is drawn into the unit) was also installed in the open air at each of the schools participating in the Emissions project. This unit sampled the ambient air in the school grounds and provided a base line against which the emissions from vehicles on nearby streets could be measured.

A weather station which would measure temperature, humidity, wind speed and direction was also installed in the grounds of each of the schools. The data from both the 006 unit

and the weather station could also be displayed on the screen inside the school to provide additional sources of information.

B Measure implementation

B1 Innovative aspects

- **New conceptual approach** – This project will be using innovative technologies in both traffic emissions and ambient air quality measuring and combine it with a bespoke educational package for school children.
- **Use of new technology/ITS** - This will be using specific technology, ambient air quality will be measured using state of the art portable units and traffic emissions will be measured using innovative Open-Path technology.
- **Targeting specific user groups** – Private car/van drivers and school children
- **New physical infrastructure solutions** – introduction of VMS at specific locations

The innovative aspects of the measure are:

Innovative aspect 1 – This project will be unique in that both traffic emissions and ambient air quality will be measured simultaneously in order to gain greater insight into the dynamics of local pollution episodes and their coupling with the neighbouring environment.

B2 Planning of Research and Technology Development Tasks

Not applicable.

B3 Situation before CIVITAS

There were no VMS signs in the city prior to the start of the project. Almost all schools in Brighton & Hove take part in the annual Walk to School Week, where issues concerning sustainability and the environment are taught. The 3 schools participating in this measure all take part in Walk to School Week and had strong links to our walk to school team. This formed part of the reason for their selection, along with their location and interest in the scheme.

As with most urban areas of the UK, traffic-generated emissions are a significant contributor to poor air quality. Thus, improving this in Brighton & Hove is a major commitment for the city council. The city council already delivered many projects and campaigns to encourage residents and visitors to use more sustainable travel modes (e.g. JourneyOn, www.journeyon.co.uk).

The council also routinely carries out its statutory air quality[2] duties to monitor certain pollutants using fixed monitoring stations in the city. The measures taken, however, did not – until the advent of CIVITAS funding, which enabled the installation of two VMS (variable message sign) cycle counters – include any variable message signs.

[2] see http://www.brighton-hove.gov.uk/index.cfm?request=b1000293

B4 Actual implementation of the measure

The measure will be implemented in the following stages:

Stage 1: Preparation (*16/02/09 – 12/06/09)*

The original proposal as outlined in the original MDF focused on displaying an indicator of a vehicle's emissions quality to drivers; however, this proved to be problematic to deliver. This followed detailed feasibility work which showed that the project as outlined was not deliverable for a number of reasons. The most significant problem was that technology is not suitably advanced to enable the emissions created by specific cars to be accurately measured, especially in areas where general residual levels of pollution are likely to be quite high. This was enabled through the revised project which used innovative technology and fostered the research and development process that was required to advance this..

Associated with this, it was apparent that the project would cost significantly more than anticipated if the technology was developed further, which was not felt to represent good value for money. In order to overcome these issues, an amended project was devised and successfully implemented, thus enabling the original objectives to be met.

It was decided that the project would have a more educational element and would focus on school pupils in the Civitas corridor. Therefore the project team approached local schools and spoke to education providers who had experience of delivering projects in this area.

Stage 2: Decision *(12/06/09 – 23/01/10)*

Choosing the Schools for implementation; and choosing the supplier of the equipment.

Three schools were chosen on the basis of their location within the CIVITAS corridor as well as their close links to the city council's school travel team and their commitment to participate and contribute to the project's objectives.

Schools selected: Balfour Junior
Elm Grove
St Bartholomew's

Figure 2: Map of participant schools and CIVITAS area

Note: Not to scale; shaded area represents CIVITAS corridor in Brighton & Hove

Trials were carried out at the three selected schools and designated junctions nearby in order to make longer-term comparisons.

Imperial College, London was appointed in October 2009 to work in partnership with the City Council, using innovative technology developed by Duvas Technologies. Imperial College demonstrated a proven ability to oversee and deliver the educational component of the project through its leadership of the OPAL[3] and outreach programme[4], while Duvas Technologies was able to research and provide the equipment required.

Stage 3: Implementation *(23/01/10 – 15/01/12)*

Implementation of on-road tailpipe emission measuring, with real time information on VMS signs along with promotional campaign and subsidised checks.

Between November 2009 and March 2010, Duvas Technologies developed the technology that enables both traffic emissions and ambient air quality to be monitored simultaneously

[3] OPAL is a national initiative led by Imperial College London that aims to encourage people to investigate study, enjoy and protect their local environment. See: http://www.opalexplorenature.org
[4] Imperial College London's Reach Out lab links public engagement and outreach initiatives at the university. See: http://www3.imperial.ac.uk/outreach/reachoutlab

using two forms of equipment sited on both sides of the adjoining road (the "Open Path (OP2)" system, pictured in Figure 2), and on the school buildings respectively (through monitoring equipment known as "006"). A weather station, which will remain at the school after equipment decommissioning, was also installed, together with a real-time plasma screen to display the VMS data, which was installed in the school's ICT suite. Finally, two portable units (shown in Figure 3) were provided so that children could take the equipment out of the school for home/school journeys and monitor air quality on those journeys.

The first trials and development of the technology took place at the first school from February 2010, initially in preparation for Walk to School Week in May 2010), but after further development full deployment took place during October 2010, again connecting with the Walk to School initiative.

Using the first site (Balfour Junior) as an example, the first step of the implementation process is the monitoring of emissions from passing vehicles in close proximity to the participating school using innovative "open path – or OP2". The data were then displayed in the school in real time using Variable Message display equipment installed in the school in order to raise awareness of the impact that individual vehicles can have on local air quality.
The initial work at Balfour Junior School took place between February and summer 2010. Significant progress was made during this time on the development, calibration and testing of the open path technology. A further, full scale, deployment then took place in October 2010. In addition to numerous site visits as part of the process of developing the innovative technology, staff from OPAL attended Balfour Junior to deliver the educational programme (see Figure 3). The overall educational objective was to allow pupils to develop an understanding of air quality, pollutants, and their causes and effects.

Year 5 and Year 6 students from Balfour Junior attended Imperial College in September 2010 for a site visit and meeting with education staff.

Additional to this, ambient air quality within the local vicinity of school grounds was monitored with accompanying educational programmes to educate young students about science, their environment and how local transport activity might affect it.

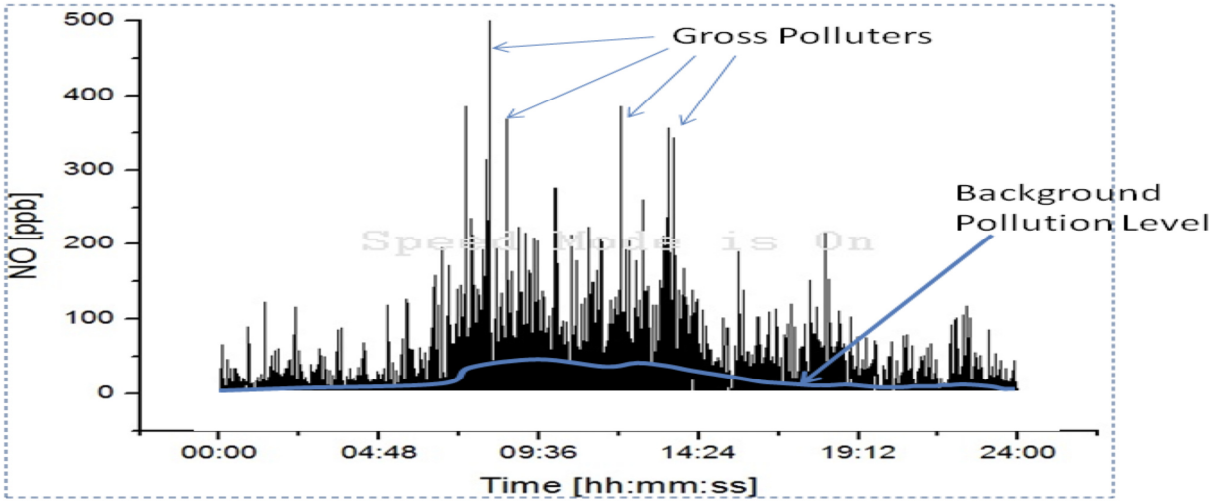
Figure 3: Pictures of Emissions Monitoring Technology and Educational Programme

Clockwise from top left: Dr Mark Richards (Duvas), Cllr Vanessa Brown (BHCC Cabinet Member) and pupils of Balfour Junior School adjacent to OP2 unit and showing portable Black Carbon Monitor

Balfour Junior pupils attending Imperial College Reach Out Laboratory

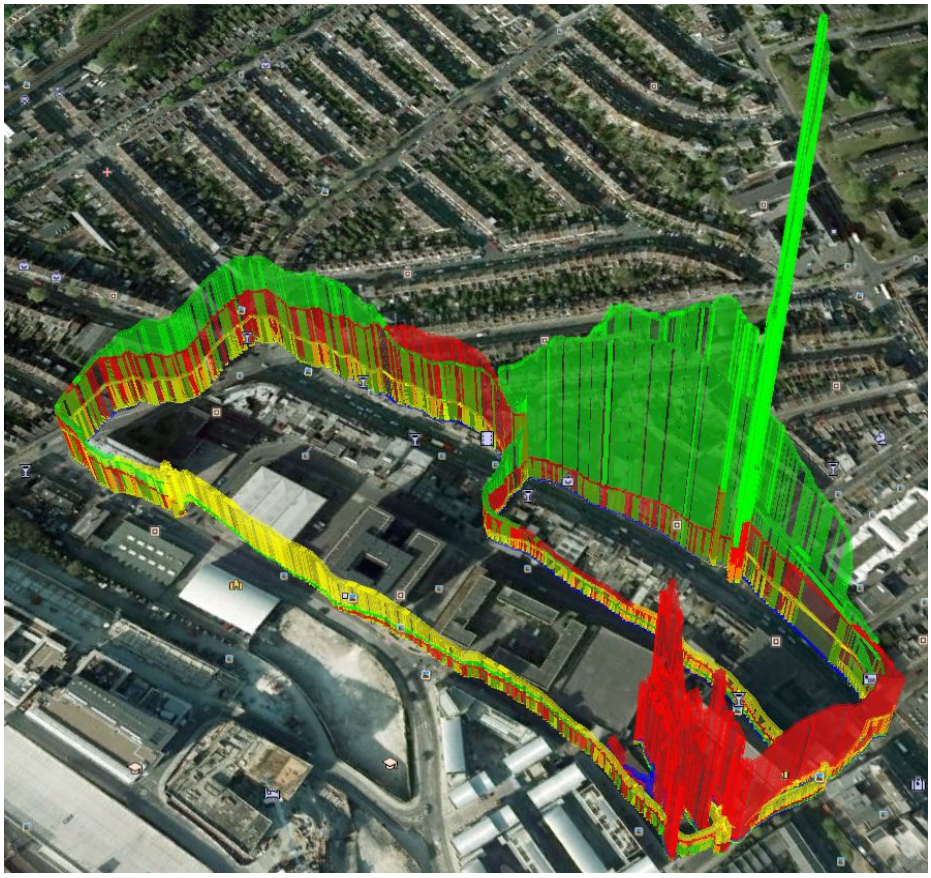
The second stage of the project took place in 2011 with the participation the second school (Elm Grove) when children and teachers took part in the air monitoring trials both in and around the school. A visit to Imperial College by children and teachers from the school then took place in June 2011. The open path unit (OP2) was decommissioned at Balfour Junior and re-installed at Elm Grove after several technical upgrades by Duvas. This resulted in the collection of more reliable real-time emissions data at roadside. An example of data collected over a 24h period is shown below, where each peak is caused by emissions from passing vehicles. A key thing to note is that whilst averaged background levels remain fairly low throughout (blue line), a number of emission spikes caused by 'gross polluters' had been detected. Fortunately the frequency of such spikes was fairly low and so did not have a significant impact on the nearby school grounds – as confirmed by the fixed ambient monitoring unit.

Figure 4: Plot showing vehicle emissions detected by OP2 sensor at roadside over 24h period (May 2011)



The third stage of the project involved the participation of St Bartholomew's School. This took place in June 2012 and also involved the use of mobile air monitoring equipment, in addition to the static monitoring equipment, installed on the school's premises. The figure below shows a plot of data taken with a Duvas D1000 mobile pollution sensor during a mapping exercise carried out by the schoolchildren in the vicinity of St Bartholomew's Primary school. Elevated pollution levels can be observed at key points along the route, and students were encouraged to explore the reasons behind this.

Figure 5 Mapping pollution data collected (using a Duvas mobile sensor) around St Bart's Primary. The pollutants measured were NO (green), NO_2 (red), SO_2 (blue), Ozone (yellow).



It was agreed that OP2 would remain at trial site 2 in order to collect some longer-term data for further analysis and correlative studies. Again, a visit was arranged to the Imperial College Reach Out Laboratory by students and teachers who were working on the project which occurred on mid- September 2012.

Stage 4: Evaluation (15/01/12 – 15/03/12

Much of the data analysis and evaluation work was completed by Imperial College, and individual reports returned to Brighton & Hove City Council for use by each school in their own curriculum.

In addition, ongoing traffic and air quality monitoring took place to support the findings from the above evaluation.

Acceptance and awareness monitoring took place at each school to test the long-term education benefits of the programme.

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

Clear Zone (measure 21)

Freight vehicles, buses, coaches, large vans and minibuses reaching only a POOR standard would be targeted in order to improve emissions. Eventually, free entry into the Clear Zone could be restricted only to FAIR/GOOD or just GOOD freight vehicles, other vehicles would be charged.

Electric Vehicle Charging Points (measure 2)

Electric vehicles would show as GOOD due to low tailpipe emissions.

Efficient Goods Distribution (measure 64)

Freight vehicles, buses, coaches, large vans and minibuses reaching only a POOR standard would be targeted in order to improve emissions. Eventually, free entry into the Clear Zone could be restricted only to FAIR/GOOD or just GOOD freight vehicles, other vehicles would be charged.

Personalised Travel Plans (measure 31)

PTP could be used to raise awareness of the measure, plus promote subsidised emissions tests and improvement work.

Travel plans (measure 32)

Businesses should be encouraged to ensure that all their fleet vehicles reach the "GOOD" standard, and also to encourage staff to ensure their private vehicles reach the same standard. The portable VMS technology could be positioned at various workplaces in order to facilitate this.

C Planning of Impact evaluation

C1 Measurement methodology

C1.1 Impacts and indicators

C1.1.0 Scope of the impact

The indicators chosen in the table below were selected as directly related to the introduction of the measure.

Economy: Economic costs will be recorded and measured against social and environmental benefits.

Environment: Air quality and emission levels will be monitored to assess the extent to which active traffic information affects travel choice and improves the environment. Measuring CO and CO2 emissions via the real time on-road emission monitoring has experienced technological barriers, and is not currently measured by the city council. This also applies to measuring particulate emissions, of which monitoring has recently commenced within the city.

Society: Monitoring the awareness and acceptance of the scheme will demonstrate how and where people's travel choices are being altered, and explore what factors encourage travel alternatives. Monitoring people's awareness and acceptance of this measure will enable us to rate the effect active emission information has on changing travel behaviour.

Transport: Monitoring traffic volumes will assess the extent to which the measure has improved the management of traffic in the area, as well as impacting of travel choices. On peak and off peak traffic levels can be taken from the real time on-road emission monitoring.

C1.1.1 Selection of indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	ECONOMY					
2b		**Costs**	Capital Costs	Capital costs	Cost per annum	Euros/annum, quantitative, measurement
	ENVIRONMENT					
5		**Pollution/Nuisance**	Air Quality			
6				NOx levels	NOx concentration	Ppm or g/m3, quantitative, measurement
8			Emissions			
10				NOx emissions	NOx per vkm by type	G/vkm, quantitative, derived
	SOCIETY					
13		**Acceptance**	Awareness	Awareness level	Awareness of the policies/ measures	Index (%), qualitative, collected, survey
14			Acceptance	Acceptance level	Attitude survey of current acceptance of the measure	Index (%), qualitative, collected, survey
	TRANSPORT					
21		**Transport System**	Traffic Levels	Traffic flow - am peak	Average vehicles per hour - peak	Veh per hour, quantitative, measured
22				Traffic flow - off peak	Average vehicles per hour– off peak	Veh per hour, quantitative, measured

C1.1.2 Methods for evaluation of indicators

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
2b	**Capital Costs**	Budget figures	Examination of financial records compared to budget figures.	
5	**Air Quality**			
6	NOx levels	To educate on vehicle emission to increase awareness	Via existing air quality monitors and innovative portable units	3 times Annual
8	**Emissions**			
10	NOx emissions	To educate on vehicle emission to increase awareness	Via the real time on road emission monitoring	3 times Annual
11				
13	Awareness	School	Bespoke educational work with school children – following participation in the monitoring trials, a class survey to establish levels of awareness	After
14	Acceptance	School	Bespoke educational work with school children – following participation in the monitoring trials, a class survey to establish levels of acceptance.	After
21	Traffic Levels Traffic flow - peak	Impact on private vehicle use	Via existing traffic level monitors	Before and after
22	Traffic flow - off peak	Impact on private vehicle use	Via existing traffic level monitors	Before and after

C1.2 Establishing a baseline

The approach used in establishing a baseline for this measure was to analyse the profile of congestion and emission levels in the city, and to build upon the educational programme already in place for the annual Walk to School week.

Emissions and Air Quality monitoring

Air quality monitoring and historical data on emissions levels will describe the situation prior to the implementation of the electric vehicle charging points in Brighton & Hove.
This will involve analysing historical data of:

Air Quality

- NOx levels

Emissions

- NOx emissions

Traffic monitoring

Monitoring of traffic levels in Brighton & Hove, and specifically surrounding the target schools, will create a picture of the current situation prior to implementation. Typically this will involve monitoring the 'school run' in both the morning and afternoon of week days.
This will involve analysing historical data of:

- Peak and Off Peak traffic flow levels

C1.3 Methods for Business as Usual scenario

The Business as Usual (BAU) scenario will focus around the travel behaviour of school children and their parents. Without this measure we can assume that the same level of knowledge of travel choice from initiatives such as Walk to School week would continue. The overall Travel to School data for the city can be monitored alongside the target schools in order to assess the relative impact of the measure, and therefore separate out the BAU scenario.

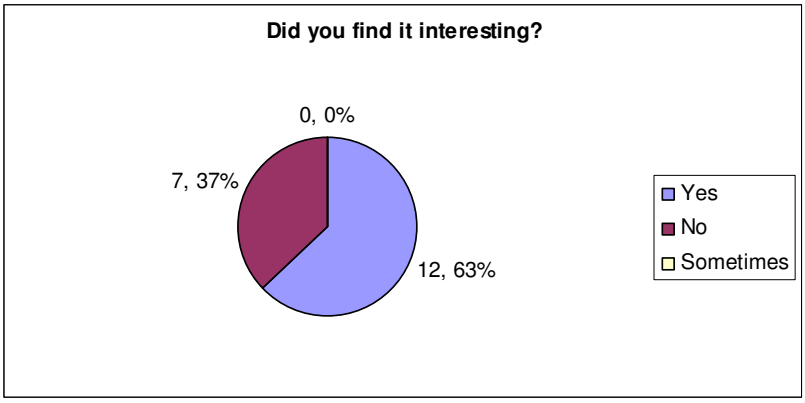
C2 Measure results

Following the work on the project a hands-up survey was undertaken by the class teacher at each school. The results from these surveys are presented in this section. A copy of the survey is provided as Appendix 1.

October 2010 at Balfour Junior School of the class that had taken part in the project to evaluate the impact of the project. The first school to participate in the project was Balfour Junior School which undertook a survey in October 2010. A total of 19 children, boys and girls aged 10 to 11, were present, who took part in the survey with 100% recalling the

project and also saying that that they had the opportunity to take part. The majority of pupils also found the project interesting as shown in Figure 6.

Figure 6- Interest in the Project- School 1



The same survey was undertaken in May 2011 at Elm Grove School following its participation in the project. A total of 25 children, boys and girls aged 10 to 11, were present and all took part in the survey. As shown in Figure 7, the majority of pupils could recollect the project, whilst Figure 8 shows that the majority found it interesting.

Figure 7- Recollection of the Project- School 2

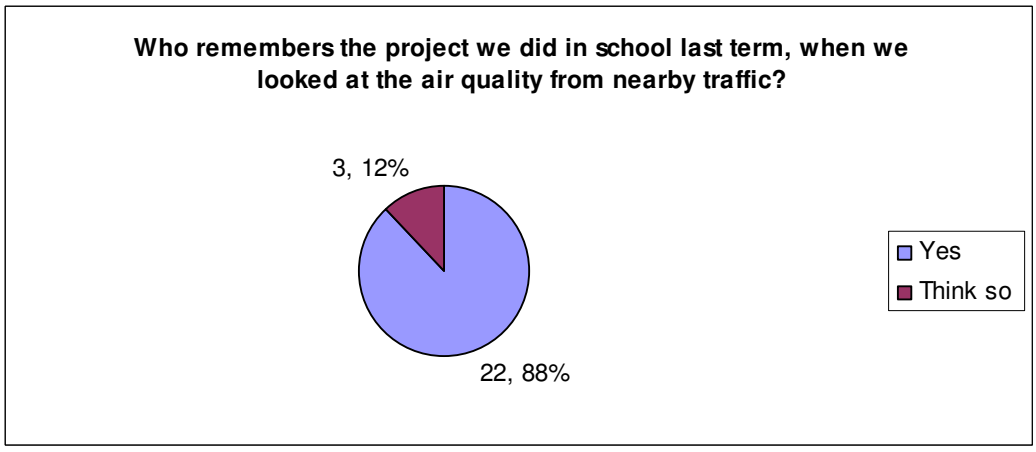
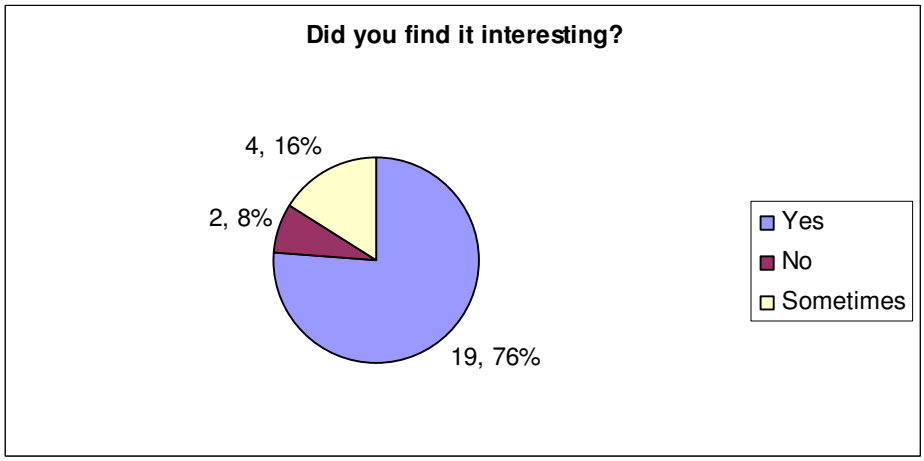


Figure 8- Interest in the Project- School 2



Finally, following the visit to St Bartholomew's school to Imperial College in September 2012, a hands-up survey was undertaken by the class teacher. A total of 20 children, both boys and girls aged 10 to 11, were present, out of a class of 30, who took part in the survey.

The survey firstly sought to identify how many children remembered the project which had been studied during the previous term. The results shown in Figure 9 shows that the majority (80%) could recall the project. 100% of the children surveyed confirmed that they did have the opportunity to take part in the project.

Figure 9: Recollection of the Project- School 3

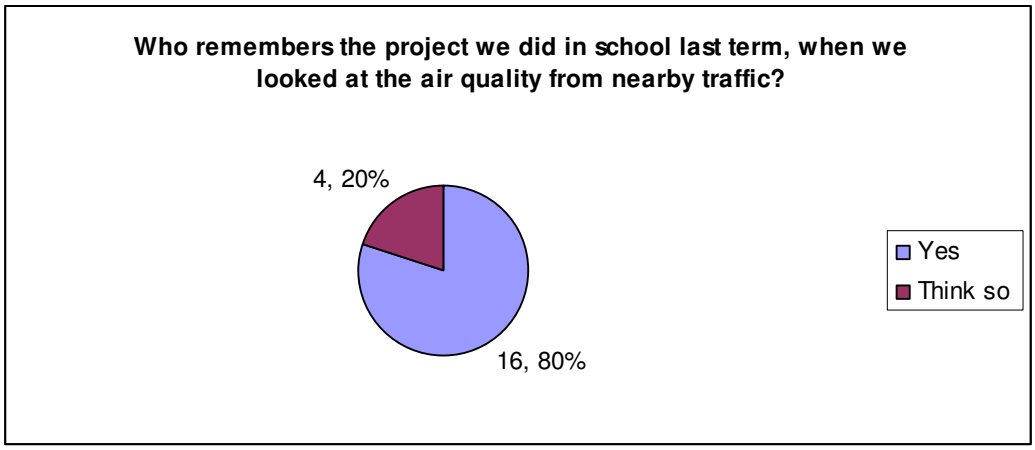


Figure 10: Interest in the Project- School 3

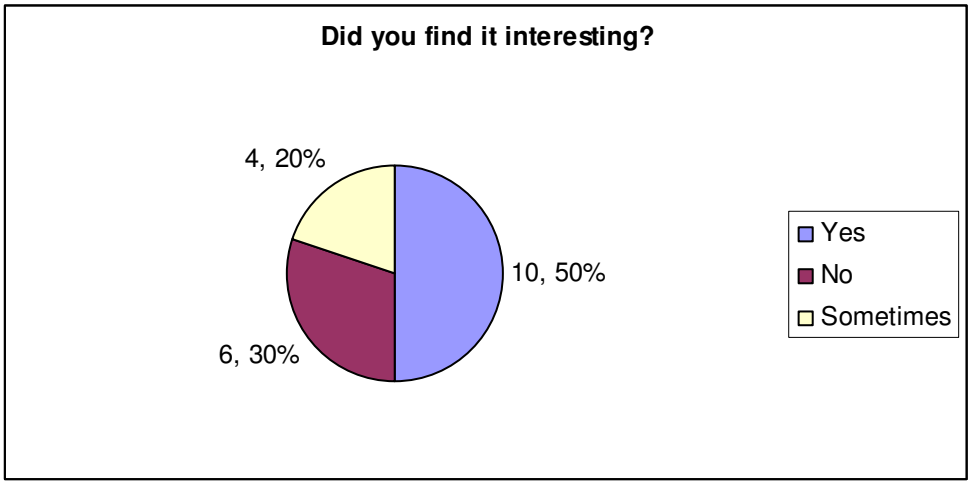


Figure 10 indicates greater numbers of children were interested in the project than were not whilst a selection of the comments provided by pupils on what they learnt are as follows:

- About pollution
- How much pollution there is in the environment
- Where most of the pollution is
- What vehicles give out the most pollution

The results from the three surveys are generally consistent and positive in terms of pupils' recollection of the project and their interest in it.

C2.1 Economy

C2.1.1 Costs

Indicator	Before 15/09/2008	B-a-U 15/09/2008	After 14/09/2012	Difference: After-Before	Difference: After-BaU
2b Capital costs Balfour Junior	0	N/A	33,433Euros	33,433 Euros	N/A
St Barts	0	N/A	33,433Euros	33,433 Euros	N/A
Elm Grove	0	N/A	33,433Euros	33,433 Euros	N/A

C2.2 Environment

Air Quality and Emissions data has been collected and analysed for each school by undergraduate and postgraduate students at Imperial College London. For each of the three trials, some data was collected before and after the intervention. A full evaluation over all three trials has not yet been completed and further findings will be reported back and included within the Evaluation Results in the near future.

In terms of the qualitative outcomes, it would appear that there was no statistically significant difference between aggregated emissions before and after respective walk to school weeks. Similarly, the same could be said for ambient air quality. The table below summarises the main conclusions – please note that for the case of air quality (table C2.2.1).

'Ambient" implies less than 100ppb over at least a 1 hour average. This is generally considered to be a legally safe level (although there are variances between different pollutants).

In the case of emissions (table C2.2.2), a more thorough analysis must be carried out in order to provide a meaningful value. For example a useful comparison might be to calculate the aggregated 'dosage' imparted over a specific time period and then compare this to overall traffic flow levels. What we can say, based on the preliminary, results is that no significant change in the averaged background emissions or frequency of emission spikes before and after walk to school week was observed.

In the case of particulate levels, some measurements were carried made with portable black carbon monitors throughout trialling, however the data was sporadic and it was deemed insufficient to draw any meaningful conclusions with respect to overall ambient levels, and this has been reflected in the tables. A separate report on BC monitoring around Balfour Junior School is included as an appendix however.

C2.2.1 Air Quality

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
CO levels	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
6 NO levels	<10ppb (24hr average)	N/A	<10ppb (24hr average)	negligible	N/A
7 NO_2 levels	15 ± 8 ppb (24hr average)	N/A	20 ± 10 ppb (24hr average)	negligible	N/A
7 Particulate levels	Insufficient data to conclude	N/A	Insufficient data to conclude	Insufficient data to conclude	N/A

C2.2.2 Emissions

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
8 CO2 emissions	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
9 CO emissions	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
10 NO emissions	40ppb (8hr daytime average)*	N/A	TBC (pending further data processing by Duvas)	negligible	N/A
11 Particulate emissions	Insufficient data to conclude	N/A	Insufficient data to conclude	Insufficient data to conclude	N/A

* *Several pollution episodes exceeded 200ppb during this time period however, they were relatively short-lived due to the fact that they were produced from passing vehicles (see OP2 Plot) and also that they rapidly convert to NO2 in upon being produced.*

C2.3 Society

An Awareness and Acceptance level was conducted at St Bartholomew's School in September 2012

C2.3.1 Acceptance from the St Bartholomew's School survey

Indicator	Before (date) 15/09/2008	B-a-U (date)	After (date) 19/09/2012	Difference: After-Before	Difference: After-BaU
13 Awareness level	0	N/A	100% (20)	+ 100% (20)	N/A
14 Acceptance level	0	N/A	+ 70% (14)	+ 70% (14)	N/A

An Awareness and Acceptance level was conducted at Balfour Junior School in October 2010

Indicator	Before (date) 15/09/2008	B-a-U (date)	After (date) October 2010	Difference: After-Before	Difference: After-BaU
13 Awareness level	0	N/A	100% (19)	+ 100% (19)	N/A
14 Acceptance level	0	N/A	63% (12)	+ 63% (12)	N/A

An Awareness and Acceptance level was conducted at Elm Grove School in May 2011

Indicator	Before (date) 15/09/2008	B-a-U (date)	After (date) May 2011	Difference: After-Before	Difference: After-BaU
13 Awareness level	0	N/A	100% (25)	+100% (25)	N/A
14 Acceptance level	0	N/A	92% (23)	+ 92% (23)	N/A

C2.4 Transport

C2.4.1 Mode of travel survey from School Census Data for Travel to School

Indicator	Before (date) 2009/10 data	B-a-U (date) 2011/12	After (date) 2011/12 data	Difference: After-Before	Difference: After-BaU
Balfour Junior - Walking	80% (334)	79.92% (307)	75.66% (547)	213 (-4.34%)	-4.26% (240)
Balfour Junior - Cycling	1.5% ((6)	1.51% (6)	0.69% (5)	-1 (-0.81%)	-0.82% (-1)
Balfour Junior - Driving	17% (72)	20.4% (74)	22.54% (163)	91 (5.54%)	2.14% (89)
Balfour Junior – Car Share	1.5% (6)	N/A	1.11% (8)	2 -0.39%)	N/A
St Barts - Walking	82% (117)	81.92% (108)	59.47% (113)	-4 (-22.53%)	-22.45% (5)
St Barts - Cycling	1% (2)	1.01% (2)	1.58% (3)	1 (0.58%)	0.57% (1)
St Barts – Driving	17% (24)	20.40% (25)	23.16% (44)	20 (6.16%)	2.76% (19)
St Barts – Car Share	0% (0)	N/A	15.79% (30)	30 (15.79%)	N/A
Elm Grove - Walking	86.5% (362)	86.42% (333)	80.15% (323)	39 (-6.35%)	-6.27% (-10)
Elm Grove - Cycling	0% (0)	.01% (0)	1.74% (7)	7 (1.74%)	1.73% (7)
Elm Grove - Driving	13.5% (57)	16.9% (59)	16.38% (66)	9 (2.88%)	-0.52% (7)
Elm Grove – Car Share	0% (0)	N/A	1.74% (7)	7 (1.74%)	N/A

Prior to 2011/12 the school travel data was gathered by the Department for Transport (DfT). However, the DfT stopped gathering this data this year and the 2011/12 data was gathered by the Brighton & Hove City Council School Travel Team. The Car Share figures were not collected separately and would have been incorporated within the Car Travel/Driving figures.

For the Business as Usual data, changes in the mode of travel to school in similar primary schools city-wide were analysed and the percentage change city-wide over the period 2009/10 to 2011/12 was calculated. These percentage changes were then applied to the 2009/10 data from the three schools to produce the BaU figure. The difference between the 2011/12 figures for the three schools and the BaU baseline then was used to arrive at the Difference after BaU.

Before and after data was collected from Automatic Traffic Counters in the vicinity of each of the schools regarding AM and PM hourly traffic flow figures.

Traffic levels – St Bartholomews School initiative

Indicator	Before - May 2012	After – July 2012	Difference – After - Before
Traffic Flow AM peak flow	1,095	1,097	+2 (0.00%)
PM flow	1,019	1,084	+65 (0.06%)

Traffic levels – Balfour Junior School initiative

Indicator	Before – August 2010	After – October 2010	Difference – After - Before
Traffic Flow AM peak flow	553	640	+87 (+15.7%)
PM flow	640	693	+53 (+8.3%)

Traffic levels – Elm Grove School initiative

Indicator	Before - Aug 2011	After – October 2011	Difference – After - Before
Traffic Flow AM peak flow	853	854	+1 (0.01%)
PM flow	994	877	-117 (-11.7%)

The traffic flow levels from Automatic Traffic Counters (ATC) which are situated on roads close to the schools taking part in the project were monitored. The AM and PM Peak Hour figures showing the number of vehicles counted by these traffic counters for the periods

immediately before and after the project were recorded for Balfour Junior, Elm Grove and St Bartholomew's Schools and are shown in the above table.

C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
1	Improve the management of traffic within the city centre.	0
2	Reduce emissions within the city centre.	0
3	Inform travel choice via active information.	*
4	Improve quality of travel information in order to impact on travel choice.	*
5	Raise public awareness in order to encourage people to consider travel alternatives.	*
NA = Not Assessed O = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded		

C4 Methods for up scaling

If the educational programmes and variable message signs proved successful then the same/similar schemes could be developed in a number of ways:

- Similar impact analysis could be applied to other initiatives such as Bike Week, Car Free Day, Walk to Work Week etc. with educational programmes tailored to each event and varying audiences. VMS could be used at work places and or public domains in order to raise awareness.
- Emission data could be displayed via VMS on busy routes within the city, or at popular tourist locations. General educational leaflets could be mailed to residents or made available online.
- The Initiative as it currently stands could be rolled out at many other schools across B&H.
- The educational programmes could become a fixed part of school curriculum.

A more detailed approach to the suggestions above could be formulated on the basis of the measure evaluation.

C5 Appraisal of evaluation approach

- The evaluation would have benefited from more in the way of emissions and air quality data recorded and more detailed results generally from the impact of the project on the school children involved. However, the trials did facilitate the development and proving of the equipment, and the response of the schoolchildren involved at all three schools was extremely positive.

- It would probably have been better for the city council to have retained responsibility for the gathering of this information and not to have included this in the sub-contracted elements of the project.

C6 Summary of evaluation results

- The school surveys from St Bartholomew's School, Elm Grove School and Balfour Junior School all showed 100% awareness, of the project in the term and 70%, 92% and 63% respectively for acceptance following the monitoring activities.
- The proving of the technology over the period of the three trials which could now be utilised at other locations for similar projects.
- It has not been possible from the data gathered to determine evidence for modal shift to more sustainable forms of travel at the schools which took part in the project.

C7 Future activities relating to the measure

There are no plans for the expansion of this measure in Brighton & Hove currently. The contract between Imperial and Brighton & Hove City Council was for a fixed period of time and there is not currently the funding to renew it.

However as part of the measure Imperial University developed new emissions monitoring technology. This technology will be used by the university for future research. The university's school engagement unit will also continue to operate and will offer similar programmes to other schools in the country.

D Process Evaluation Findings

D0 Focused measure

X	0	No focussed measure
	1	Most important reason
	2	Second most important reason
	3	Third most important reason

D1 Deviations from the original plan

- The original proposal as outlined in the original MDF focused on displaying an indicator of a vehicle's emissions quality to drivers; however, this proved to be problematic to deliver. This followed detailed feasibility work which showed that the project as outlined was not deliverable for a number of reasons. The most significant problem was that technology is not suitably advanced to enable the emissions created by specific cars to be accurately measured, especially in areas where general residual levels of pollution are likely to be quite high. This was enabled through the revised project which used innovative technology and fostered the research and development process that was required to advance this..

  Associated with this, it was apparent that the project would cost significantly more than anticipated if the technology was developed further, which was not felt to represent good value for money. In order to overcome these issues, an amended project was devised and successfully implemented, thus enabling the original objectives to be met.

- There were delays associated with changes in personnel and lack of equipment which caused the project at St Bartholomew's School to be delayed. It was not possible to arrange the trials to coincide with Walk to School in May 2012 and took place in June 2012.

- The highways around St Bartholomew's School carry little vehicular traffic. As a result of this it was thought that the location was not suitable for the open path OP2 static monitoring equipment which would have monitored emissions from passing traffic. Mobile measuring devices were used instead to access local roads carrying a greater volume of traffic, for the air quality monitoring trials by Imperial College and Duvas Technology.

- Although the initial trial at Balfour Junior School took place and the OP2 equipment worked satisfactorily initially, there was a failure to provide data due to communication/data recording problems, and signal deterioration due to damage caused by condensation.

- The second trial at Elm Grove School used an improved design for the OP2 equipment, with re-aligned optics, mirrors recoated, weatherproofed design, traffic boxes insulated and a mirror heater employed (reducing condensation). This established the principle of the unit performance, however, data which had been collected during this trial was mostly lost due to a hard disk failure.
- The technology employed did not allow the gathering of data on C0, C02 and Particulates as originally was planned, and therefore it has not been possible to report on these as part of the project.

D2 Barriers and Drivers

D2.1 Barriers

Preparation phase

- **Organisational** Need to engage with education professionals to deliver the educational element.

- **Technological** Extensive site preparation is required as the equipment requires siting in specific environmental conditions.

- **Technological** Local power and wifi supply required- caused problems when this was not readily available.

Implementation phase/Operational phase

- **Technological** Technology is not yet sufficiently flexible to be used without extensive adaptation as accurate measuring of open path car emissions at different sites

- **Organisational** There is no similar project by other Civitas partners with which to share knowledge/experience.

- **Organisational** Continuity issues due to change of project manager at key point of measure.

D2.2 Drivers

Preparation phase

- **Organisational** School partners keen to work on the project as it offers real advantages to their pupils.

Implementation phase

- **Technology** Technology worked well once installed in good position.

Operational phase

- **Organisational** Very constructive and flexible partnership working with Imperial College and other partners.

- **Technological** The project will be able to test new technologies in different city environments

- **Political** Tackling pollution and promoting sustainable mobility is a key driver for each stakeholder.

D2.3 Activities

Preparation phase

- **Political** The amendment of the original measure from the direct measuring of vehicle emissions and feeding this back to drivers to a more education of schoolchildren and parents basis.

Implementation phase

- **Technological** The modifications made over a period of time to the OP2 road side monitoring equipment to enable the progressing of the project.

Operational phase

- **Planning** The decisions on the siting of the OP2 roadside monitoring equipment in suitable locations and to leave it at the Elm Grove sites where the infrastructure was in place to continue to gather data.

D3 Participation

Measure Partners

- **1. City, 1. Lead: Brighton & Hove City Council**- Sustainable Transport Department- Project lead and overall management.
- **1. City, 3. Occasional Participant: Brighton & Hove City Council**- Air Quality Team – Advice and information regarding air quality data for the city
- **1. City, 3. Occasional Participant: Brighton & Hove City Council**- Corporate Communications Team – Advice and information on the promotional campaign
- **3. Knowledge Institution 2. Principal participant: Imperial College (London)** – Management of the academic and monitoring phase of the project.
- **5. Private Company 2. Principal participant: Duvas Technology**- Delivery of the technical side of the project and the installation and maintenance of equipment used in the project.

- **3. Knowledge Institution 3. Occasional Participant: OPAL**- Partnership of educational (universities) and other non-governmental organisations to help people explore study and use local environment – Offered input to the project in association with Imperial College.
- **3. Knowledge Institution 3. Occasional Participant: Balfour Junior School**- Participated in the project and was one of the three schools at which the air quality monitoring and involvement of schoolchildren took place.
- **3. Knowledge Institution 3. Occasional Participant: Elm Grove Primary School** - Participated in the project and was one of the three schools at which the air quality monitoring and involvement of schoolchildren took place.
- **3. Knowledge Institution 3. Occasional Participant: St Bartholomew's Primary School** - Participated in the project and was one of the three schools at which the air quality monitoring and involvement of schoolchildren took place.

D4 Recommendations

D.4.1 Recommendations: measure replication

- **Transferability -** The measure is easily capable of being transferred to other cities, and would have particular benefits where a major part of travel journeys to school are by car and/or where there are significant issues associated with vehicle emissions and pollutants.

- **Technology options -** Technology developed by Duvas Technology has been tested during the course of this project and is likely to be appropriate for similar projects in other cities. However, there may also be alternative ways to monitor vehicle emissions and the communication of this information, to partners and stakeholders, which could be investigated.

- **Alternative approaches –** The measure in its original form involved the monitoring of individual vehicles emissions and feeding this information back in real time to the driver of the vehicle via a Variable Message Sign. This was subsequently thought that this would not be deliverable in Brighton at this time, but with possible advances in technology and in other contexts this could still prove to be a worthwhile area to pursue.

D.4.2 Recommendations: process (related to barrier, driver, and action fields)

- **Monitoring technology -** Ensure that the monitoring technology used is capable of producing the results required for the evaluation of the project.

- **Data gathering -** The availability of suitable tried and tested technology should be established before it is used in field trials to ensure that robust data gathering is possible.

- **Communications and Power -**Check that the selected locations are suitable and have available power and data communication (Wi-Fi etc) in advance.

- **Data Retention and Control** - Retain control of the data gathering during the project and of all before and after surveys

- **Project Management -** Strive to minimise changes to project management staff during the life of the project to maintain continuity

- **School involvement -** Ensure that school partners are involved at an early stage as their participation and enthusiasm are essential.

Appendix 1: Pupil Survey

Brighton & Hove

For classes who took part in the Emissions Project

Please carry out this survey on 17/09/2012 or as close to this date as possible.
You will need one survey sheet per class who took part in the project
To be completed by the whole class, by a show of hands:

1. Date .....

3. School Name .....

4. Year Group, and class name .....

5. Number of pupils present ☐ absent ☐

Questions to ask children:

'Who remembers the project we did in school last term, when we looked at the air quality from nearby traffic'

Yes ☐ Think so ☐

Did you all get to take part ? **yes** ☐

Did you find it interesting? Yes ☐
No ☐
Sometimes ☐

Can you tell us what you think you learnt?
(Teacher to list all the children tell them)

Without prompting it would be helpful to know if they mentioned:

Air Quality
Pollution/Pollutants
The environment
Traffic

Which bit did you like best?

Thank you very much for taking the time to complete this survey