



CATCH
(Clean Accessible Transport for Community Health)

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BEST PRACTICE REPORT

August 2005

CATCH Best Practice Report

Introduction

CATCH (Clean Accessible Transport for Community Health) was a demonstration project supported by the European Commission through the LIFE-Environment Programme. CATCH aimed to support the Community's Sixth Environmental Action Programme by promoting sustainable mobility through an innovative, partnership-based approach to transport-related environment policy in Liverpool - a UK city which has been undergoing radical structural change linked to economic regeneration. CATCH also transferred knowledge and experience to Accession Countries and to Southern Europe through the participation of partners from Romania (the city of Suceava) and Italy (CTP Napoli, working with the town of Potenza). CATCH is driven by the desire of the partners to improve the quality of life for their citizens.

This report is a working document aimed at drawing together the elements of best practice explored within the project, together with some of the barriers that were experienced in the implementation phase. Solutions targeted at how some of these barriers might be overcome to encourage and enhance future implementations of sustainable transport initiatives and some more general recommendations about enhancing the support structure for sustainable transport are presented.

A separate report providing more details of the project measures and a summary of the project results has been produced and is available for download at the CATCH website:
www.cleanaccessibletransport.com

For further, more detailed information about the project please contact the project coordinator, Dr Karen Booth at Merseytravel or the project manager, Dr Alan Lewis at TTR. (Contact information can also be found at the CATCH website.)

Project Activities

The following table presents the content of the technical tasks, including their location and a brief summary of the activities involved. When considering the nature of the implementation it is important to remember that what is appropriate and also innovative can vary significantly from location to location depending upon pre-existing local circumstances. This is particularly the case in certain of the New Member States and Accession Countries. In this respect the authorities in Suceava must be congratulated on their willingness to invest and experiment in order to try to improve the quality of life and environment for their citizens, under what are sometimes taxing economic conditions.

Task Number and Title	Location	Activities
1: Emissions reduction - existing vehicles	Liverpool	The installation of particulate traps on 104 buses within Arriva's fleet in Liverpool. The installation of additional exhaust gas recirculation equipment on 16 of these buses aimed at reducing NOx emissions, NOx currently being the pollutant of greatest concern in Liverpool city centre. – the biggest trial of this technology in the UK



Task Number and Title	Location	Activities
2: Emissions reduction - new vehicles	Liverpool	The initiation of a city centre shuttle route to encourage interchange and support sustainable travel in parallel with the regeneration of Liverpool city centre operated by 6 diesel-electric hybrid buses – the first fleet of such vehicles in the UK.
3: Air Quality Management	Liverpool	Declaration of a formal Air Quality Management Area in Liverpool city centre and an associated Air Quality Action Plan, supported by the design of walking and cycling infrastructure support measures for installation as part of Liverpool City Council's city centre movement strategy. Implementation of a community cycle training programme to support the actions aimed at encouraging uptake of sustainable transport modes in Liverpool.
4: Working with the market and citizens	Liverpool	The establishment and operation of a one stop shop for sustainable travel information in Liverpool aimed at the local community and business groups, known as ECOtravel. Production of community mobility plans for 6 city centre developments, leading to the development of a developers protocol and a parallel supplementary document to help town planners integrate sustainable transport infrastructure and information within future residential developments. Running a healthy travel promotion initiative for an area on the edge of the city centre to encourage the community to change their travel behaviour to more sustainable and healthy options.
5: Pollution monitoring	Liverpool	The development, implementation and testing of advanced pollution monitoring techniques in Liverpool City Centre with a view to establishing a real time particulate mapping system for the city using existing CCTV systems.
7: Transferability to Candidate Countries	Suceava	Implementation of a package of measures to improve air quality in Suceava following the experiences in Liverpool, including: <ul style="list-style-type: none"> ○ The closure of a section of one of the main streets in Suceava and its transformation into a pedestrian-only low emission zone. ○ Purchase of two LPG cars by Suceava municipality that have been used in day-to-day public activities and in the promotion of clean fuels in the city ○ Extensive public promotion of sustainable travel options in Suceava ○ The refurbishment of 10 trolleybuses in Suceava leading to the removal from service of old polluting buses
8: Transferability to Southern Europe	Potenza	Investigation of measures to improve air quality in Potenza following the experiences in Liverpool, focusing on a feasibility study and recommendations for the introduction of a limited traffic zone in the town of Potenza.



Barriers Identified

This section lists some of the main barriers that have been identified during the course of CATCH. We have categorised them under the following six headings :

- political support
- institutional factors
- financial issues
- information, awareness and acceptance
- technical issues
- legal / regulatory issues

and where possible have tried to provide solutions as to how they might be overcome.

1 Political Support

The type of scheme introduced in CATCH is aimed at changing the balance in the use of various transport modes in the urban environment, providing more environmentally sustainable transport options and placing a greater priority on the environmental impact of transport choices within the overall policy framework. As such the project challenges some of the standard behavioural patterns that have become established in the modern urban way of life. Changing behaviour that is linked to people's aspirations and their perception of how other people will judge them is acknowledged to be difficult and if handled badly may result in a backlash against those who are judged to be trying to bring about the change. In order to bring about such change it is essential to have political support as this can make the difference between driving forward a successful scheme and having a proposal that fails to materialise.

Example:

This was demonstrated in Potenza where towards the end of the CATCH planning phase local elections were held and a new mayor and local administration was elected. It is inevitable that a new politician taking office takes time to control all aspects of their remit. In the case of Potenza there was a delay of approximately three months between June and September 2004 while the new administration concentrated on establishing what they perceived to be the most urgent local issues. Unfortunately in October there was another local election and the people in the administration changed again. After another delay in establishing the political priorities, the decision of the new administration was not to support the recommendations of the CATCH feasibility study in the immediate future because they had inherited some large infrastructure projects and unlike the previous administration they felt that they were unable to provide sufficient resources to support both activities.

Suceava provided a direct contrast to this because there was also a local election in Suceava and a new mayor was elected. After a period of contemplation the new mayor in Suceava has given his whole-hearted support to the project.

Part of the difficulty in establishing political support is the need for politicians to agree that there is a particular problem which needs to be addressed prior to the subsequent actions of their executive officers in putting the necessary plans into action. Within CATCH we benefited from the fact that there was a clear statutory requirement and process for the declaration of an air quality management area and the development of an air quality action



plan in Liverpool once it was clear that the 2005 targets for NO₂ would not be met. However, even though this formal process has been triggered, open statements regarding the presence of an air quality problem and the need to take associated actions in Liverpool have not been publicised. This is in contrast to the considerable political support shown for the actions of CATCH during direct discussion with the appropriate city council politicians. This may be due to an apparent conflict of issues between the over-riding desire to regenerate the area and the need to ensure that environmental considerations are taken into account in planning decisions. There may also be a worry about publicising the presence of the city centre AQMA for fear of putting potential investors off the area, whereas incorporation of environmental standards into the plans at this stage could ensure that the situation is managed to the future benefit of the area so encouraging investment.

Solution: Politicians may lag behind public opinion because they perceive people to be more reluctant to change than is actually the case. Therefore, it can help give weight to a measure which requires political support if a representative picture of public opinion can be gained. The result of this can be political confidence to take a stronger stance than would otherwise be the case. Once politicians have been convinced they can be very effective in pushing an issue forward and while this situation continues it should be formalised in terms of a written commitment of support for a given programme.

2 Institutional Factors

The integration of environmental considerations into the mainstream options implemented in all aspects of society is dependent upon institutions recognising the benefits of systemic environmental improvement and prioritising this investment in all aspects of their work. A good example of this is in the provision of public transport where environmental considerations are well known not to be high on the end user's list of influencing factors. However, by ensuring environmental investment at the point of supply, environmental improvement can be ensured for all users of a city. The current deregulated public transport market in the UK is not helpful to this, as the passenger transport authorities (Merseytravel in the case of Liverpool) are currently only empowered to set environmental standards on a limited number of non-commercial services which they subsidise on the basis of meeting a social need. Hence, within the current framework the integration of environmental considerations into the bus market is dependent upon individual operators recognising its importance and making the necessary investment of time and expertise; i.e. it costs bus operators money to reduce pollution but in the commercial environment it does not increase their revenues.

Solution: Alternative frameworks such as re-regulation or the provision of quality bus contracts would enable passenger transport authorities to specify a minimum environmental standard for particular areas / routes and so ensure that environmental considerations are integrated into the standard service provision. This would have additional impacts of risk management in terms of implementing new technology and providing long term security for those operating new technology if the contract was written to allow for, say a five year period (subject to satisfactory performance).

A wide range of complementary issues are covered by all the CATCH measures, which resulted in the involvement of a large number of stakeholder groups in order to complete the project. Separation of responsibilities, even within an individual organisation, can lead to lack of knowledge and understanding of linked issues which can reduce the chances of



meeting an overall objective. At its worst a lack of understanding and co-operative working can lead to direct conflict between participating organisations as they single mindedly pursue their own objectives. This can be overcome through common working, developing an understanding of the issues of importance to others and the framework within which they are expected to work and the production and use of cross disciplinary guidance notes where appropriate.

Example:

One of the main objectives of CATCH in the UK was to develop a partnership-based approach to transport-related environmental policy. This has been achieved by ensuring that all relevant actors were included within the project's decision making structure and allowing enough people to participate in discussions about topics to which they would otherwise not have been able to contribute, safe in the knowledge that there was political support for this approach. In this way CATCH has enabled cross-sectoral dialogue between:

- public transport authority transport planning team
- public transport authority environmental strategy team
- the Liverpool City Council Air Quality team
- Liverpool City Council highways management
- Liverpool City Council land use planning
- Liverpool City Council fleet management
- Liverpool City Council street safety (CCTV) team
- Liverpool University
- The area's main (commercial) bus operator

Solution: In some cases the links between the work of these organisations have been formalised in a forum that did not exist previously or through specific working procedures such as:

- The development of supplementary planning documents designed to set minimum standards for the provision of cycle parking and sustainable travel information provision in new developments at the planning stage
- The incorporation of the Air Quality Action Plan within the 5-year Local Transport Plan (a UK government requirement)

Solution: The fact that the UK government has formalised the link between Air Quality Action Plans and Local Transport Plans is seen as a very positive step. It is hoped that similar guidance at the national level will be forthcoming to upgrade the planning policy guidance (PPG13) linking transport and land-use planning to be more explicit and empowering for local authorities on issues such as minimum standards for sustainable transport provision in new developments, which would lead to consistency of approach between local authorities and enable a regional approach to be taken on such issues.

The imposition of fixed timescales for the delivery of certain programmes or for the spending of certain funding can present problems to projects because, even for the best managed projects, it can be difficult to predict how a situation based around technology innovation, the development of new institutional frameworks or requiring political support will develop. In CATCH we have managed to deliver most of the things we set out to. However, some issues out of our control have meant that we were not able to deliver some project elements within the project timescale and so had to change our plans. Examples include:



- delays in the planning process for residential developments in Liverpool meant that we were unable to wait for them to be built and so used the resources for community mobility plans on the healthy travel promotion instead;
- the statutory consultation and review process for Liverpool's Air Quality Action Plan has taken longer than expected, and although the draft plan has been produced and many of the measures have been trialled, we had hoped that it would have been formally adopted by the end of the project.

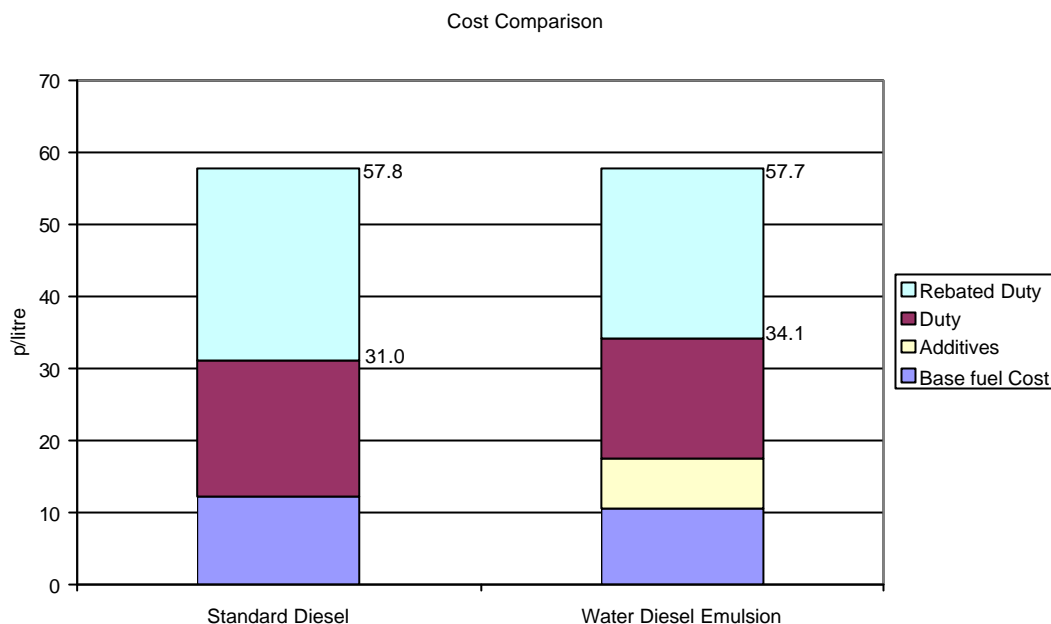
Solution: Some degree of flexibility should be incorporated into contracts for demonstration programmes which can be combined with existing project reviews to allow projects to adapt to circumstances beyond their control, such as delays in technological development / delivery.

3 Financial Issues

A significant barrier to the uptake of alternative fuel technologies in the UK is the current tax rebate system, called Bus Service Operators Grant. The scheme works by providing the operators of local registered bus services a grant, paid by the Department for Transport, to reimburse the major part of the excise duty paid on the fuel used in operating local registered bus services. The grant is extremely important in terms of ensuring that the public transport industry maintains a market position which is competitive with private transport modes. However, fuels with a similar total price, but which include a lower rate of duty, receive a smaller rebate, so making them uneconomic, especially as many contain less energy per litre than diesel. Within CATCH we found that this issue presented a financial barrier to the uptake of water diesel emulsion fuel, but this rebate also presents a similar problem to the competitiveness of biofuels, LPG and CNG in the public transport market.

Figure 1 shows the detail of this problem. The total price of the standard diesel and the water diesel emulsion after duty is charged were almost identical. However, although the total price per litre to the user is almost exactly the same, the amount of fuel duty rebate available for water diesel emulsion is lower. (This is because neither the original duty nor the rebate are payable on the water element of the fuel.) The result is that the net cost per litre of the water diesel emulsion after duty rebate is 3.1p (10%) higher than for the standard diesel fuel. Given that there is then a 5-7% volumetric fuel consumption penalty, use of water-diesel emulsion fuel would be uneconomic under current UK fiscal conditions.





The problem for biofuels such as biodiesel is more extreme because the base cost of biodiesel is significantly greater than that of standard diesel. Even though biodiesel attracts a relatively low rate of duty and the Department for Transport reimburse all the excise duty paid on the biodiesel, the base cost of biodiesel per litre is greater than the net cost of standard diesel to a bus operator after the duty rebate is applied.

Solution: Develop a similar programme of support for clean fuel technology to that for clean vehicle technology.

Retrofit technologies such as particulate filters and exhaust gas recirculation have been shown to be relatively cost effective in terms of their ability to reduce emissions of particulates and NOx (the pollutants which are currently the greatest cause of concern in urban areas) from the bus fleet. However, the cost to buy, maintain and renew these technologies is not insignificant for a commercial bus operator and apart from an operator's goodwill towards the environment there is currently little to offset this cost to the business (any vehicle excise duty rebate is relatively small). For the CATCH implementation we were fortunate to benefit from grant not only from the LIFE programme but also from a UK Government grant under the Clean Up programme administered by the Energy Saving Trust. However, as discussed in the legal barriers section, this programme is currently not available and it appears that any future grant available from the Energy Saving Trust is likely to be severely restricted by the need to adhere to European state aid rules which limit the amount of state funding that a commercial organisation can receive.

The cost of purchasing, maintaining and running hybrid vehicles remains a barrier to their implementation. In Suceava, like many places in central and eastern Europe, the cost of equipment is a critical factor. The transport company in Suceava, TPS, is extremely short of money. As a result they have been unable to purchase new vehicles and have been forced to search for alternative solutions to reduce emissions from their fleet. It is for these reasons that they have focused upon modifying their existing vehicles and refurbishing their trolleybuses.

The problem of purchase cost is not restricted to less prosperous areas. Hybrid buses are currently extremely expensive to purchase compared with conventional buses, due to the need



for manufacturers to incorporate development costs into the purchase price of relatively small production runs. The LIFE funding available through CATCH was only able to partially compensate for the extra cost of the vehicles. It is believed that as total production increases the whole life cost of hybrid vehicles will converge on that of conventional vehicles.

Possible Solution (Drawbacks Highlighted): The idea of forming procurement consortia has been explored previously as a way to counteract this. However, when groups of authorities sharing a common interest have been able to come together and consider buying vehicles in bulk it has been found that often they perceive their needs to be different. This results in either a compromise vehicle specification which does not match the ideal specification of any one participant, or a range of specifications that does not help much in terms of increasing the size of an order for a particular vehicle to the point where cost savings become worthwhile. Even if successful, procurement consortia would only help with the purchase cost and would not help with the additional operational costs until the number of production units had increased substantially and operational reliability and confidence had been established.

The market for hybrid vehicles in the UK has been severely restricted in the past 2 years because of the UK Government's temporary withdrawal of its co-financing programmes for this type of technology, whilst it gains approval under the European state-aid regulations. The lack of other production orders for the Eneco technology, due to the hiatus in the market, has meant that the batch of six CATCH hybrid buses was the sum total of their production in this period and has meant that CATCH has borne the brunt of the product development work needed to take the vehicles from prototype to something that could be classified as a pre-production model. When CATCH was conceived this type of problem was foreseen and six vehicles were purchased even though only five vehicles were needed at any one time to operate the service. (This is a much higher ratio of spare to operating vehicles than is normal in the bus operating industry.) However, even the purchase of a spare vehicle has not proved sufficient to provide cover for the service on which the vehicles have operated and at times up to four conventional vehicles have been required to provide cover for the hybrid buses while the technical faults (which are often minor) have been rectified. There is obviously a direct cost associated with this substitution of vehicles to ensure the service operates, but the commercial contract that was let by competitive tender to operate the vehicles on the CATCH city centre shuttle service was in itself around twice the cost predicted for such a service with conventional vehicles.

Solution: Ensure that grant programmes cover all financial aspects including maintenance and renewal, not just purchase costs.

Much of the technology involved in the drivetrain of a hybrid bus is based around electrical drive components which are not currently commonplace within the bus industry. This gives the operator the choice of spending money to train a sufficient number of their in-house maintenance staff to be able to look after what initially will probably be a relatively small part of their fleet, or to pay for what might be an expensive external contractor to provide specialist maintenance back-up of the vehicles. Either choice is another additional cost penalty for operating the vehicles.

Solution: Ensure that grant programmes cover all financial aspects including maintenance and renewal, not just purchase costs.



Moving away from technology costs, local authorities in the UK are subject to restrictions on how they can use large parts of their income, which comes from central government. In particular, a large proportion of this income is restricted for use on 'capital' projects, which involve the purchase of items. In recent years this has led authorities to feel restricted in terms of their ability to finance activities such as ECOtravel, the healthy travel promotion and other activities aimed at behavioural change. Although the UK government has made some steps to address this issue in relation to the rules for the use of funds within the Local Transport Plans for 2006-2011, it is clear that local authorities would appreciate both further flexibility so that they can adequately resource this type of initiative and also greater clarity from government in terms of what funding sources they are allowed to use for this work.

Solution: Review government funding rules to allow the necessary flexibility to provide the optimum package of measures for a particular situation.

4 Information, Awareness and Acceptance

In general people are resistant to change. Lack of knowledge and experience of proposed measures amongst those who live and work in the affected area can often lead to resistance to the measures unless a well structured and informative consultation process is followed. Demonstration projects such as CATCH have role in showing and explaining the benefits of proposed measures.

Because of the general resistance to change, acceptance of many of the solutions that have been demonstrated in CATCH will require changes in people's attitudes and ultimately behaviour if they are to be successful. This goes beyond the attempts to influence travel behaviour of individuals to more sustainable modes or the use of less environmentally damaging vehicles / fuels that have formed a major part of CATCH. (Although not an easy thing to bring about this is a direct challenge which can be addressed.) A more subtle effect is that it is difficult for the general public to understand that their use of motorised transport leads directly to the production of pollutant emissions which in turn have impacts upon their own health and upon the global climate. The reason for this is that, for the majority of modern, well maintained vehicles, the pollution produced by any one vehicle is not visible and the amount of pollution produced at any instant is not in itself to cause an instant impact. This appears to have extended to a difficulty for those in authority to publicly acknowledge an air quality problem, even when there is an air quality management area declared covering the city centre, in order not to discourage future economic development.

Solution: In order to raise public awareness of air quality and the measures needed to improve it a public information campaign to accompany the implementation of the Air Quality Action Plan will be extremely helpful in engaging the public and explaining the need for the measures.

This lack of awareness and resistance to change extends to health awareness and people's willingness to change their behaviour to the benefit of their health. Making a change from use of the private car to sustainable modes such as walking and cycling for suitable journeys has the potential to be a win-win situation in that not only do they give people more exercise but it also reduces the amount of pollution within the city. Although less effective making a mode switch from private car to public transport will contribute to a reduction in emissions and is likely to involve a certain degree of additional exercise to access the chosen public transport option.



Solution: Public awareness campaigns on this issue have been commonplace and have not always proved successful. Providing a more tailored, personal message as in the CATCH healthy travel promotion will help, as will ensuring that the message is that sustainable travel has benefits to an individual's daily life and does not involve the radical change to a person's core structure of beliefs that they might imagine.

There appears to be a general lack of understanding about cycling, in particular, as a mode of transport in all three of the CATCH cities. The topography in Potenza and the harsh winters in Suceava present real difficulties to cycling as a realistic option for all journeys throughout the year in these cities. In the UK cycle ownership and cycle use in the UK are at vastly different levels (typically 33% of adults own a bicycle but only 1% use them regularly and that is often for leisure purposes rather than as a transport mode integrated into their daily lives). We feel that this cannot be underestimated, because provision of cycle infrastructure alone has been shown to be ineffective in effectively addressing this issue and other persuasive measures are needed in order to ensure that any infrastructure which is implemented is actually used. Furthermore the benefits of cycling upon an individual's health also need to be considered in comparison to sedentary modes such as car, bus etc.

Solution: The cycle training initiative that was proposed and initiated in Liverpool as part of CATCH task 3 is aimed to do a lot more than the traditional task of giving people the skills needed to cycle safely. The scheme aims to make cycling an integral part of the lives of the participant, ensuring that they are also informed of dedicated cycle routes that they could use for journeys which are of practical use for their daily lives and that they understand the full range of benefits to their health.

Example:

The authorities in Suceava have found an innovative way of shifting attitudes towards the low emission zone in the heart of their city by using it as the location to host many of their town's municipal events, which are enjoyed by all citizens.

5 Technical Issues (including Vehicle Availability)

There is often a conflict between energy (and hence CO₂ emissions) and air quality impacts of the technical measures involved in projects such as CATCH.

Example:

In CATCH the technical measures have largely been focused on local pollutants, particularly particulates and NO_x. The conflict between energy and emissions impacts has been highlighted in CATCH by the introduction of particulate traps, which although giving large reductions in emissions of particulates (and CO and hydrocarbons), has led to a slight (approx 2%) increase in fuel consumption (and hence CO₂ emissions) for those vehicles to which they are fitted. Fortunately this is not the case for all the measures considered within the project. For example, there has been no noticeable change in fuel consumption as a result of fitting exhaust gas recirculation equipment to the buses in Liverpool. The CATCH hybrid buses have shown that they have the potential to reduce both energy / CO₂ and local pollutant emissions, although further technical work is needed to show the full benefit of the results observed under laboratory conditions in actual operation.



Behavioural measures have proved more successful in terms of having a broader impact, being able to bring about emissions and energy (plus CO₂) reductions in parallel with each other. However, the reductions that can be induced by behavioural measures, particularly for local pollutants, are relatively limited without a much wider intervention.

Solution: Implement balanced packages of measures for the optimum combined effect.

In case studies such as CATCH which wish to test new technologies as part of a package of measures limited availability of suitable vehicles or equipment always appears as an issue that has restricted the choice of vehicle or supplier and which can have knock-on implications once the project is committed to that supplier. Within CATCH we were relatively fortunate to be able to choose between four suppliers of particulate traps, receive tenders from three hybrid bus manufacturers and investigate two NO_x reduction technologies from three suppliers. However, this masks the fact that some of these technologies, particularly the hybrid buses were largely untested technologies and this presents a danger to the development of the market because if the available products do not quite fit the purchaser's requirements they are likely to revert to buying conventional vehicles unless they are either very determined or willing to make compromises.

The fact that hybrid buses are still prototypes, has led to problems at two levels - problems related to new technologies and systems and problems related to low production volumes which require bespoke solutions / procedures which are not tested. Even though major components may be proven they can still malfunction (for example the Volkswagen 1.9 litre diesel engine) and the smallest of components can cause serious problems if they are not easily replaced due to lack of readily available replacements (e.g. converters and gear boxes).

Solution: Provision of adequate levels of funding and support for research, development and testing.

The product development work which has been undertaken on the hybrid buses in CATCH was not expected according to the information presented by the manufacturers at the tender stage. The fact that it was needed has required much more management time and maintenance support and caused more operational inconvenience than would have been expected with the purchase of a conventional vehicle. In this respect we have been fortunate that LIFE programme funding has been available to help with some of these unexpected costs.

Our demonstration has identified nothing which fundamentally stands against the concept of hybrid vehicles. (Hybrid cars are now entering the mass car market and there is no fundamental issue that would prevent development of a hybrid bus.) However, CATCH has identified several issues which Eneco and other hybrid vehicle manufacturers must overcome if hybrids are to develop into a part of the mainstream bus fleet. More details relating to the demonstration of hybrid vehicles are contained in the main section of the report for Task 2. However, in order to make a significant breakthrough into the market hybrid buses must prove:

- that battery equalisation, requiring overnight vehicle connection to a special mains electrical supply is not necessary,
- that fuel consumption benefits demonstrated under laboratory conditions can be replicated under real-world operations,
- total life costs must be no more than those for a conventional vehicle,



- and that no special start up procedures are necessary in order for the vehicle to function.

Hybrid buses are likely to remain best suited to urban routes where stop start operation allows the benefits of regenerative braking and of zero emission operation to be best exploited.

Because they are a new product that functions using an electrical rather than a mechanical drivetrain, specialist know-how which is currently not readily available within the bus operating industry, is required in order to ensure vehicle maintenance is carried out effectively. While hybrid buses remain in the realms of what are effectively small batches of pre-production prototypes this back up will have to be provided by the manufacturers who know the vehicles in question. However, as the market hopefully develops it will be necessary that trading packages are developed in order to provide the necessary in-house skilled back up to the same level as for conventional vehicles.

Solution: Support and funding for initial training packages necessary to support the market.

The fitting of exhaust gas recirculation as a retrofit technology to existing buses may be limited by the fact that on rear engined buses the available space for additional pipework linked to the exhaust system is limited and causes a design issue in terms of what can be safely engineered as a workable solution.

Solution: If EGR cannot be engineered as a retrofit on a vehicle this does not rule out selective catalytic reduction as an alternative NOx reducing technology. Both these technical solutions will be better suited to use on new vehicles where they can be incorporated into the original design by the vehicle manufacturer.

The way in which data is presented can often be misinterpreted or hide interesting results. There appear to be two issues related to the exploitation of CATCH which need to be noted here:

- Firstly, statutory air quality monitoring regimes have been laid down for local authorities to compare their results to. Generally these require hourly, daily or even annual reporting of pollutant concentrations, based on previous epidemiological evidence. However, producing such averaged data masks sharp peaks in pollution related to specific events. The CATCH pollution monitoring has shown this by conducting real time pollution monitoring outside a school in Liverpool. As the end of the school day approached and cars arrived at the school gates the level of particulates in the air increased, reaching a very high, short-lived peak at 3pm, consistent with the observed growth in the number of cars present. When converted to an hourly average the data shows a peak, but the extent of the short-lived very sharp peak in particulates at the peak time in a highly sensitive location is masked by the presentation as an hourly average.

Solution: Review the way that national air quality targets are formulated and encourage local authorities to widen the way in which they approach air quality monitoring.

- Secondly, in spite of efforts to develop a formal industry standard for the presentation of comparative emissions results for different types of vehicle demonstrating different clean fuel or drivetrain technologies no formal standard has been accepted across



Europe. Instead certain national *de facto* standards are used (for example the London Transport buses test cycle in the UK), but even this is not universally recognised as nationally representative.

Solution: In order for a clear picture of the benefits of different technologies to develop, which can overcome the inevitable vested interests of those involved in developing new technologies, an agreed series of benchmark tests need to be developed as a priority. This should be followed by an open ended programme to fund independent tests on all new vehicles against this standard and make the results publicly available.

Even if effective technical solutions are made available enforcement and compliance remain barriers to achieving the desired result. Enforcement involves ensuring that people do not dodge the system that is put in place (and is one of the potential drawbacks of any system that relies upon an operator to top up any pollution system that relies on additives). Compliance involves ensuring that the installed system is meeting its set objectives, which includes identification of vehicles with pollution reduction systems installed but which are not functioning as they should, possibly through technical malfunction.

Solution: Investment is needed in (portable) systems which can identify in real time whether a given vehicle is meeting the emissions performance expected of it.

6 Legal Issues

Legal issues present another potential barrier to this type of project. CATCH has identified several areas in the participating countries where laws and regulations prevent or restrict what can be achieved. (The issue of how air quality regulations determine how pollution levels are reported has already been highlighted in the technical barriers section.)

The enforcement of low emission zones will require the development of detailed protocols that will need to be legally enforceable if they are to work.

Example:

Although outside the remit of CATCH, it is interesting to note that trials of such systems in Italy have had to be conducted using manual enforcement because Italian law states that automatic numberplate recognition systems can only be implemented following ministerial permission due to issues relating to privacy and data protection and the investment involved has often precluded entering such a process merely for a trial.

At various points within the CATCH task descriptions and evaluation reference has been made to the extra costs of new technologies being a significant barrier to implementation. Often these costs result from the relation between new technologies and the existing fiscal regime within a country or the need for manufacturers to recoup development costs from the first orders they receive, with the promise that prices will fall in the future once more units have been produced and the development costs have been re-paid. This additional cost to the user represents a significant barrier to the purchase of new technology, whether it be to a private sector operator of vehicles, as is the case in the UK, or an operator financed through the public sector, which is more common in continental Europe. Within the UK grants have been available in recent years in order to overcome this cost penalty, but for the past year these grants have been suspended because there has been a need to review them in relation to



European State Aid rules. It appears likely that the grant programmes will receive such approval in the near future, but it is expected that the level of grants will be too low in order to provide a significant stimulus to the market. In this case the European State Aid rules will have blocked the very essence of the work being done in demonstration projects such as CATCH and many others.

Solution: The European State Aid rules themselves need to be reviewed urgently and modified so that they do not prevent the implementation of future technologies which will significantly improve the quality of life in European cities or have a positive impact on reducing climate change.

General Recommendations

1 Long Term Transport & Investment Plans

In order to remove problems associated with short term changes in the level of funding and technical focus of transport provision it is becoming much more common to produce long term plans for transport. Examples of this include the local transport plan process implemented nationwide in the UK, which has now been extended to give formal weight to the Air Quality Action Plan process.

It is interesting to note that there are currently proposals to change the structure of the public transport industry in Suceava with the formation of a public-private partnership which it is hoped will be able to introduce an increased level of funding for vehicle purchase and operation.

2 Trans-national Co-operation

One of the main benefits of the CATCH project has been the sharing of information between the three partner cities, as this allows each to benefit not only directly from their own experiences but also to hear about and see the impact of the varying solutions implemented in the other partners' demonstrations. This co-operation has manifested itself in different ways during the course of the project.

- There have been regular, detailed reports on technical implementations, consultations and results at the six-monthly consortium meetings.
- The fact that the meetings have been held on a round-robin basis in all the cities has allowed partners to view the implementations at first hand and hence investigate possible transfer of ideas more thoroughly.
- The partners have built on the meeting schedule as a basis to incorporate some extended visits in the work programme. These visits, termed expert exchanges, have particularly benefited the representatives of Suceava who have been able to spend time in the other cities studying the methods used within the project as well as wider transport management and technology issues. We were also able to ensure that an award-winning UK bus operator visited the Suceava public transport company, assess the activities and potential improvements of TPS the local public transport operator.



3 Behavioural Interventions

It is important to understand how such proposed behavioural changes will impact on people's way of life and show them the benefits to that way of life that will accrue from making a change. However, this must be done in a way that appeals to their psychological make up. The DG TREN sponsored TAPESTRY project (www.eu-tapestry.org) has made some detailed best practice recommendations about how to influence people's behaviour through such campaigns, which have been updated for a UK context:
http://www.dft.gov.uk/stellent/groups/dft_sustravel/documents/page/dft_sustravel_039102.pdf

This has produced an agreement to pursue the objectives further in the MIDAS project, supported by the STEER programme of DG TREN. Within their proposed activities in MIDAS, Merseytravel are likely to implement a wider programme of campaign initiatives aimed at sustainable travel and urban air quality.

4 Environmental Integration

Much of the work of CATCH, and many of the proposed solutions, are focused at making changes to things that are already in place. However, good policy making can help to ensure that things work first time: for example, the directives on pollutant emissions from vehicles have for some time been driving significant improvements in emissions performance and by doing this the costs are incorporated within the base vehicle cost and so spread out over the mass market together with all the other costs aimed at vehicle development in the commercial market, so removing the need for retrofit grant programmes and the like.

5 Institutional Risk Management

It is important that all parties to an agreement understand what is and is not within their control and that all necessary partners are formally engaged by contractual agreement in order to deliver the project's stated objectives.

