USING DISRUPTION AS AN OPPORTUNITY TO CHANGE TRAVEL PRACTICES

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ABSTRACT. Disruption has negative connotations in society, yet it can provide the opportunity for change to reduce our reliance on high carbon travel practices. Using local authorities in England as the unit of enquiry the paper discusses how local authorities currently manage disruptive events. Using a social practice approach to behaviour the paper uses two case studies: the Workington Floods 2009 and the closure of Bridge Valley Road, Bristol between 2010 and 2011 to identify where the opportunities existed to change travel practices to low carbon alternatives through disruptive events in England. The paper identifies several opportunities that may have existed to change practices to low carbon alternatives that were not taken up due to the desire to return infrastructure to pre-event conditions rather than an improved future of low carbon travel.

Keywords: (**maximum of 5**) Disruption; Local Authority; Social Practice; Low Carbon Travel

1. INTRODUCTION

Disruption only becomes apparent to most people when the infrastructure that modern society relies on fails and what is seen as mundane (such as the highway network) comes to the forefront of societal consciousness [1]. Disruption has negative connotations for most people and society seeks to return infrastructure to pre-event conditions as quickly as possible [2]. This paper takes an alternative view to show that disruption can also provide the opportunity for innovation and change to the practices that constitute everyday life. Disruption regularly occurs to the patterns of modern life; and capturing these opportunities for change can help society to meet the significant environmental challenges of the direct and indirect impacts of a changing global climate [3] as well as administrative challenges such as the financial pressures placed on local authorities in England by the 'Age of Austerity' [4].

The paper will focus on understanding what measures can be undertaken by local authorities in England to provide a more efficient use of the existing infrastructure to provide a resilient and adaptive transport network to meet the potential challenges of the future. Local authorities have been selected as the unit of enquiry as they play a significant role in the function and operation of society, overseeing activity in several areas of everyday life in the UK including: waste management; planning; education; housing; and the transport network [5]. This places local authorities in a unique position to influence the uptake of low carbon travel practices through developing a more overarching and coordinated approach to these functions. Practice-based approaches to interpreting behaviour differ from traditional psychology-based approaches of behaviour change in that they do not focus on the individual, but rather the wider framing of activity at a societal level. From this viewpoint, individuals are seen not as the originators of practice, but carriers of practice [6]. For example, commuting to work forms a sizeable part of many peoples' daily routine for much of the week, yet it is not an activity many people would choose to do outside a complex web of societal contexts. The practice of

commuting was derived from the development of first the railway network and then the motorcar. Developments in the transport system increased accessibility and land values, whilst commuting made possible particular spatial forms so that lifestyles based on low residential density, and the physical separation of work activities and home activities became possible. Commuting is now necessary to sustain such individual lifestyles and wider social practices. Practice theory therefore suggests that if we wish to reduce the carbon impact of travel, we should focus not on individuals, but rather the elements of the social and physical world that retain and support high carbon travel [6].

Influencing, rather than simply providing for, societal practices is not new to local authorities in England, as they have played a significant role in improving household recycling rates in the past 10 years. In 2011, 41.5% of refuse was recycled by local authorities in England compared to just 11% in 2001 [7]. Rutland County Council was the best performing local authority in 2011, with 57% of waste being recycled [8]. These differences suggest that the method used by local authorities to engage with and to enable people to change their waste disposal practice can have a significant effect in changing the practices associated with waste. The practice of waste disposal has altered by introducing the materials to recycle (segregated boxes), and changing from weekly collections to fortnightly collections. The practice of waste disposal now involves: washing recyclable items; using separate containers and knowing when each type of waste will be collected, whereas before all items of waste were disposed of in one bin. If local authorities have been successful in changing the practice of recycling in one section of their operation, it is possible that these lessons could be transferred to enabling to low carbon travel options. Local authorities have been able to tap into the 'niche of persistence' [9] that existed around recycling, where glass and metal were collected at community locations. The practice of recycling has changed during this period and is now undertaken in the home. Niches of persistence exist around travel that can be considered low carbon such as walking and cycling. It is important to harness such niches to enable change.

The opportunity for local authorities to change travel practices to favour low carbon alternatives requires effective and coherent management across the authority and the removal of the 'silo mentality' and the horizontal transfer of expertise and working between departments [10-11]. This may be one of the greatest challenges in reducing high carbon travel for the local government sector. This paper is not at the stage of forming conclusions, but is aimed at identifying where the opportunities for change exist during disruptive events.

The paper will review the existing management of the transport network, outlining the procedures followed by local authorities in England that are designed to mitigate and/or minimise disruption to the transport network when an event occurs. The paper will then discuss alternative approaches to altering behaviour before evaluating two case studies, one which might be perceived of as a major disruption and the second a minor disruption, to examine where the opportunities to improve sustainable travel were available, whether they were taken and will identify what lessons can be learnt in the event of future disruptive events.

2. LOCAL AUTHORITY MANAGEMENT OF A RESILIENT TRANSPORT NETWORK

The pressure on local authorities in England to manage the transport network comes from several sources including legislation, politics and the public. By understanding these pressures it will be possible to identify the opportunities that may arise from a disruptive

event to change travel practices. A secure and robust traffic network is seen as a nation builder [12-13] and the most important element of infrastructure to be repaired in a disaster situation [14], as it provides access to the other infrastructure relied on for the function of society. In political terms a strong economy is seen to require a robust and efficient road network to operate effectively [15]. This places a large burden on local authorities to ensure the transport network is safe, reliable and passable at all times. Moreover, it might be argued that in the public's perception, the state's ability to maintain effective functioning of the transport networks despite adversity is a touchstone of an efficient, high-technology, robust civilisation. Local authorities have a statutory obligation under the Civil Contingencies Act 2004 to manage the services provided effectively when a disruptive incident occurs [16]. This obligation includes where possible, continued operation of the local transport network.

2.1 Winter Maintenance

The Traffic Management Act (TMA) 2004 places a duty on local authorities to ensure the "expeditious movement of traffic" through their highway networks and to ensure that this process does not have a detrimental impact on neighbouring local authority networks [17]. This is a requirement throughout the year, but an adequate level of the network needs to be passable during the winter season regardless of any winter weather events.

Due to the availability of weather forecasts, winter weather events are one of the most predictable disruptive events faced by local authorities. Local authorities are expected to ensure areas of the highway network that are deemed strategically important to network operation (by the authority) are passable during winter weather events such as those that occurred in the winters of 2008/09, 2009/10 and 2010/11 in England. The 2008/09 winter weather event was the most severe for 18 years, with a sustained cold period between October and February, and a major snowfall event in February 2009. Many local authorities found they had insufficient resources for meeting their statutory obligations, most publicly so in terms of the availability of salt for de-icing the highway network [18]. Local policies on stockpiling had in several cases been influenced towards economising by a number of relatively mild winters in the years prior to 2008/09. The issue of storing salt is important as if left uncovered outside the salt degrades and is not suitable for use on the highway network. The cost of storing and managing an asset that degrades places a significant financial burden on local authorities.

For the following winter seasons local authorities planned ahead by ensuring adequate stocks of salt and providing plans for revised key routes, in the event of future levels of stock reducing due to an extended winter season [19]. In 2011 the UK Government retained an additional level of salt stocks in case of emergency that could be bought by local authorities in the event of a prolonged winter weather event and the use of their existing supply [20].

2.2 Flooding and Flood Risk

In 2007, England suffered from one of the worst flood events in memory, with insurance companies estimating up to £3bn worth of damage caused to property and businesses. The highway infrastructure in areas of Oxfordshire, Wiltshire, Gloucestershire and Worcestershire was inundated with water making the road network impassable in numerous places throughout the network [21]. Following this disruptive event, the UK Government introduced the Flood and Water Management Act 2010 [22] which stated that local authorities would be responsible for minor waterways and highway drainage. As part of the local authorities' new

role as Lead Local Flood Authority they have the power to enter private land and ensure that drainage systems are operating effectively to minimise the impact of significant events on the highway network. The risk of flooding again places a burden on local authorities, as it is expected that such events will become a more regular occurrence in the future due to global climate change [21]. The management of the highway drainage network by local authorities is one of the areas covered by their Transport Asset Management Plan which provide a comprehensive review of all transport assets including the highway drainage systems.

2.3 Asset Management

Asset management is a process that allows an organisation to manage all the physical resources of the organisation and places a monetary value on each asset the organisation owns or controls [23]. Transport Assets are the components that make up the highway network, many of which are obvious, such as the carriageway and bridges. Other assets are not so obvious, such as retaining walls (which hold the carriageway when it is higher than the adjoining land) and highway drainage systems. The Asset Management process allows the local authority to manage assets in the most cost effective way, ensuring that items are properly registered, maintained and replaced when they come to the end of their operational lifecycle. For the example of highway drainage systems, Gloucestershire County Council, Wiltshire County Council and Swindon Borough Council worked collaboratively in 2009/10 to use video technology to survey and record the highway drainage system [24]. This project was designed to improve the understanding of each local authority's drainage assets: to identify areas of improvement to mitigate against future flood events and the disruption caused. By proactively managing the risk of assets failing during a disruptive event it is possible for local authorities to maintain their highway networks to allow access by the emergency services and utility companies during a disruptive flooding event.

The asset management process allows local authorities to optimise funding, to ensure that the highway network remains operational. This enables local authorities to identify and prioritise workloads to ensure that users of the network do not notice a problem. The asset management process has identified a possible risk to many authorities in that current funding levels are inadequate to meet the need for maintaining the network. This has led to a funding gap for many authorities in terms of which works they would like to undertake and what is actually feasible due to the budget constraints. This means that it is conceivable that in the future many local authorities may have to close highway assets until a suitable level of funding is available to undertake the work, causing potential disruption to existing travel practices. This happened to Bristol City Council in 2010/11 and is discussed in Case Study 2.

2.4 Planned Works and Statutory Undertakers

To ensure that the transport network and other infrastructure networks are maintained to a suitable standard in the long-term, maintenance-related road works are typically required often causing short-term, managed disruption to the operation of the network. These can take two forms: planned works such as the replacement of highway assets undertaken by the local authority or their contractors, and works undertaken by statutory undertakers (primarily utility companies). The New Roads and Street Works Act 1991 allows statutory undertakers access to the highway network to undertake works, after giving notice to the local authority (seven days) that they wish to undertake the work [25]. With many of the pipelines, cables and sewage system placed under the highway network, this can take a great deal of planning and organisation to ensure the minimum disruption to the transport network.

2.5 Pressures on Local Authorities

The nature of most local authority services is that whilst they operate without any problems they receive little or no public attention. However, once a service is problematic or disrupted it can attract significant local and possibly national attention. Local authorities in England occupy the middle ground between central government and the public. They face pressure on all sides due as shown in Figure 1. From below, the customer-facing side of the local authority deals with the public and their expectations of how a local authority should operate and what services they should provide. Local politics also applies pressure, where party politics can delay the delivery of new infrastructure [26], and where the local media sensationalise what the elements of a story that they perceive to be disruptive to peoples' right to drive to increase sales [27] or web traffic.
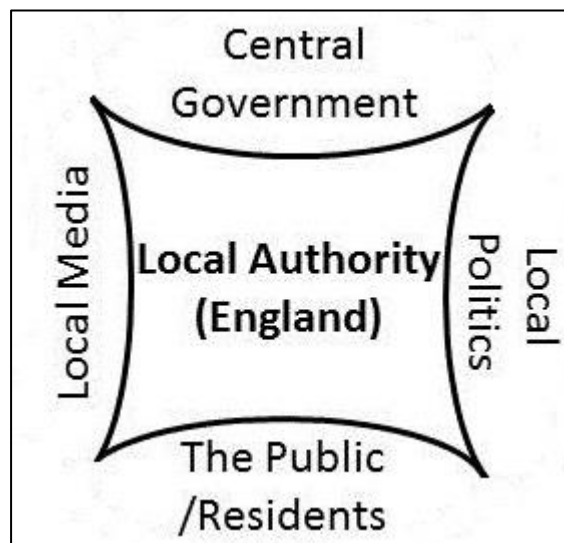

FIGURE 1. Pressures on Local Authorities

At a national level, political and media pressures can also play a significant role in how the local authorities are able to manage their highway assets. In 2011, following the winter season, the road network had been damaged by the significant freeze/thaw effect causing 'pot holes'. Due to extensive media coverage, and despite intentions for an overall reduction in funding for local authorities in the 2010 Spending Review, the Government subsequently found £100m of additional funding to be spent on fixing damaged road surfaces [28]. Whilst the additional finances were welcome, the fresh injection of cash at a late stage in the financial year also meant the redesign of maintenance programmes and the alteration of contracts and staffing levels to deliver the additional works. The 2012 'Pothole Review' was commissioned by the Government following the 2011 winter weather event and uses an asset management approach to manage networks to: prevent future problems; completely fix problems in one step; and provide better communication to the public [29]. This approach is a change to the practice of managing the network and is designed to minimise disruption and improve public understanding of how the highway network is managed.

When a disruptive event occurs and the processes used by local authorities are unable to mitigate the disruption travel practices alter or flex to adapt to the changes in circumstances. The question is how can local authorities use this disruption to provide a more effective use of the network whilst increasing the use of low carbon travel options? If travel practices alter

in the short-term during a disruptive event, how can these altered practices be locked in and retained in the longer-term?

3. INFLUENCING TRAVEL BEHAVIOUR

The highway network is designed, where possible, to meet peak demand, yet for the majority of the day the network operates well below this capacity [30]. Local authorities have the potential to change travel practices around peak times in several ways including: altering school opening times, creating school travel plans, liaising with employers to alter shift patterns, moving waste collections to non-network critical streets during periods of peak demand; and ensuring highway works do not take place during peak hours. A local authority which acts as Planning Authority can also impose planning restrictions on new developments, including managing the parking capacity, managing parking charges to influence parking demand and to ensure deliveries are not made at network critical times of the day.

Planning and the decisions on where to locate key amenities are important in influencing how people travel. A new school or hospital located on the outskirts of a town may make sense in economic terms due to land prices, but the long term impacts caused by the necessity of travel to the site by motorised vehicle as the primary option can have a detrimental impact on air quality, levels of public health and reinforce the overall reliance of the local population on high carbon travel [31]. Low carbon travel options therefore needs to be given greater weighting in the decision making process. A review is required of the way highway networks operate as travel patterns are already changing due to the cost of fuel and insurance and the potential shift in status symbol away from ownership of the car to smart phone and tablet devices [32-33]. With less people taking driving tests in England between 2007 and 2012, [34] and other indicators suggesting we may have reached 'peak car' and even 'peak travel' [35-37] it is possible that the existing highway network may already be suitable for future transport needs. The question then becomes how to use it more effectively?

3.1 Local Sustainable Transport Fund (LSTF)

The LSTF is a £560m fund for local authorities in England to provide sustainable transport options designed to make slight improvements to and better use of the existing infrastructure [38]. The fund has been created for both capital schemes, such as cycle paths, and revenue-funded schemes such as cycle training and personalised travel planning. Personalised travel planning has been proven to be successful in the short term in changing peoples' individual behaviour [39-40], but this approach can be expensive, time consuming and is therefore inefficient to deliver on a large scale. It is possible that focusing on a social rather than individual level would improve the success in reducing high carbon travel. Shove *et al*. (2012) state that "*public policy has yet to adopt social practice as a policy tool*" [41], yet it may be a highly relevant approach for local authorities to take on board, due to the overarching role they play in many areas of daily life (as discussed above). In times of financial austerity, a focus at the social level rather than on the individual may also be financially prudent.

At an individual level, household members are under time pressures to conform to societal norms [42] meaning that travel by the private car still remains the most logical and effective means of travel for many people to engage in the increasingly complex and fragmented lifestyles that have built up around ownership of the car. This means that strategies such as personalised travel planning can only have a limited impact as the time pressures faced by

individuals increase, the default option of driving is retained as a means of coping with increasingly 'harried' lifestyles [43]. Previous studies aimed at changing behaviour to sustainable modes have found that schemes such as offering incentives such as free public transport 'taster' tickets have not been successful in the long-term, as individuals returned to driving afterwards because it was the most efficient option [44]. Similarly, it is difficult to know what the long term effects of the LSTF funding will be once the local authority support is no longer available to individuals. In order to generate a long-term reduction in high-carbon travel, changes need to be made to the transport infrastructure and elsewhere in society to make driving a less advantageous option.

3.2 The Social Practice Approach

The three basic elements of a practice are: materials, competences and meanings [45]. Connections between these three elements shift and vary over time, so a practice such as driving a car which is seen by many people as relatively static, has changed over time. Shove *et al*. (2012) use the example that, where once people could be amateur mechanics, modern engines are now a 'closed box' requiring qualified technicians and specialist diagnostic equipment to fix [45]. Local authorities have the potential to influence each of the three elements with regard to travel practices. For example, they can affect *materials* through the management of the highway network; *competences*, by providing cycle training (but not driving lessons); and *meanings*, by saying how the network should be used (20mph zones, Traffic Regulation Orders, the promotion of non-motorised options and public transport). It is at the practice level where the local authorities may have the greatest impact on reducing high-carbon travel by changing the materials, competences and meanings of how we travel.

When the connection between two elements is broken, for example by a disruptive event, travel practices have to flex in the short-term to accommodate or account for the disruption. It is at this point that the opportunity arises to change the practice in the long-term, but identifying *how* to do this can be complex, emotive and politically challenging. Sections 4 and 5 outline disruptive events where the opportunity to change travel practices existed, due to a disruptive event.

4. CASE STUDY 1 – WORKINGTON FLOODS 2009

This case study is taken from the Workington Transport Study (2010) completed by Jo Guiver at the University of Central Lancashire and was funded by Cumbria County Council [46].

4.1 Background

On 19 November 2009, excessive flooding of the River Derwent in Workington, Cumbria destroyed or damaged four of the five crossing points (leaving just the railway crossing). This severed all the existing road and pedestrian crossing points across the river between the two sides of the town. The closure of these road routes meant that the nearest road crossing involved an 18 mile detour and significant congestion as vehicles tried to move from one side of the town to the other via this route. To combat the severance of the community a new temporary railway station was built on the northern side of Workington and completed 10 days after the initial flooding event, with free-of-charge train services running to the southern station at 30 minute intervals. In early December 2009 the Army installed a footbridge linking the two sides for people travelling by foot. The severance of the bridges led to significant disruption to the highway network between November 2009 and April 2010, when a

temporary road bridge was opened. This meant that the town had an unusual situation where travel by train and foot was significantly quicker and cheaper than travelling by car.

4.2 Changing Travel Practices

Travel practices in Workington flexed or changed during the disruption in order to adapt to the changes in the transport network. Travel by car reduced, with only 58 percent of trips being made by car during the disruption event, compared to 79 percent prior to the disruption. Rail travel increased from one percent of all trips to nine percent during the disruption. Other low carbon modes such as the bus, cycling and using multiple modes of travel also increased. The fact that the majority of trips were still made by car shows the persistence of high carbon travel, which is difficult to break despite the additional delays and costs in choosing this mode. It would suggest that the benefits provided travelling by car outweigh the detrimental impacts of the additional cost and time. There were however a percentage of trips by car (21%) that were flexible to being transferred to low carbon modes or were suppressed during the period of disruption. It is these trips that need to be identified by local authorities and acted upon in instigating the first steps to reducing high carbon travel practices.

During the period of disruption, the total number of trips made by residents in and around Workington reduced by a third, as the number of what could be deemed 'non-essential' journeys was reduced. This meant that fewer trips were made for leisure and social purposes during the period of disruption. Of the trips made 52 percent were now for work purposes, compared to just 37 percent prior to the disruption and this suggests that there may be a benefit in commuting by car for residents in Workington than travelling by car for other purposes.

After the new road bridge was installed in April 2010, trips by car increased to 72 percent, with train, bus and multi-modal trips reducing. Although trips by car did not initially return to pre-event levels, with the benefits of travelling by car restored, 14 percent of trips that were flexible returned to this mode. What is interesting is that seven percent of trips that were undertaken by car prior to the event were now undertaken by a different mode, suggesting the opportunity to try alternative modes can have a positive impact on reducing high carbon travel. The phenomenon of reduced traffic levels was highlighted by Cairns *et al.* 2002, as disappearing traffic and shows that removal of some elements of the highway infrastructure can be an effective means of reducing overall traffic levels in the longer term rather than just relocating traffic away from the affected location [47].

4.3 Capturing New Travel Practices

With Cumbria County Council (as the highway authority) acting primarily under the pressure to return the network to pre-event conditions to meet their various statutory obligations and public expectation (as outlined above) outlined in Section 2, it is possible that the opportunity to break the links of travel associated with car trips was lost. This was certainly the case when the train shuttle service stopped in May 2010 and the Workington North temporary station was finally closed in October 2010. The survey found that many comments spoke favourably of the station and the service provided. Once the road bridge was re-opened the number of services and carriages available for rail trips reduced, significantly reducing the attractiveness of travel by train. The management of the railway network is outside the control of local authorities, although new powers set out by the Government may allow rail schemes to be may give local authorities a greater say in the management of railway networks [48]. The

opportunity for widespread and a long lasting increase train travel in Workington was unfortunately lost in this case.

Cumbria County Council launched a campaign 'Keep Workington Moving', leafleting 14,000 properties encouraging people to continue to travel by low carbon modes, rather than travelling again by car, but the return to the pre-event bus and train services did not help retain the people who wished to continue travelling by these modes. There were a proportion of trips previously undertaken by car that were undertaken by alternative modes during and after the event. It is important for local authorities in these circumstances to identify and understand what has changed so that similar initiatives can be implemented during other periods of disruption, such as winter weather events and when road works are being undertaken to improve the long-term uptake of low carbon travel options.

4.4 Changes to Other Practices

The results show that the car acts as an enabler, allowing people to complete a variety of different activities (working, shopping, socialising and leisure activities) across a relatively wide area in a relatively short timeframe and when this option is no longer available the practices of everyday life are altered to focus on the important activities of working and education, as work is essential for financial reasons and education is a statutory obligation until the age of 16. Leisure and social trips increased again after the road bridge was restored, as people who continued to drive during the event had more time than during the event when they were making the 18 mile detour, and people who chose not to drive for leisure and social trips decided to make these journeys again.

The Workington Transport Study shows that disruptive events provide an excellent opportunity to change localised travel practices and they are effective during, and to some extent after, a disruptive event. The difficulty is maintaining and 'locking in' this change if the transport network reverts back to pre-event conditions that favour the car, and temporary facilities provided during the disruption, and that facilitated the changes, are removed. The local authority can help by providing enhanced walking and cycling facilities during the event that can be maintained after the event, but they have less influence on level the services provided by private rail and bus companies at this time.

5. CASE STUDY 2 – BRIDGE VALLEY ROAD, BRISTOL, 2009-2011

This case study is taken from several sources including personal communication with Bristol City Council officers: an interview by The Bristol Evening Post in April 2011 with Bristol City Council's project engineer Phil Lloyd [49]; Bristol City Council Committee Minutes from September 2010 [50] and Department for Transport statistics on traffic flows [53].

5.1 Background

In March 2010 engineers monitoring a Victorian retaining wall on Bridge Valley Road in Clifton, Bristol found that it had moved due to subsidence and decided that it was necessary to close the road. Bridge Valley Road forms what Bristol City Council consider to be part of an important commuter route providing access and egress to/from Clifton and the University of Bristol to the northwest of the city centre. £2.7 million was spent by the Council to secure a disused Victorian railway tunnel below the road network in a time of fiscal austerity for the Council [48]. The scheme was initially delayed as there was no funding was available from

Central Government for this scheme, but the potential risks to the A4 Portway and long term risk to property in Clifton meant that the works were deemed essential by the Council and a loan was sought from Central Government to pay for the works [50]. The work was required to secure the tunnel structure and the Council's assessment found that there was little additional cost in reintroducing the road once the works were complete [49].

Cycling charity Sustrans identified the closure as an opportunity to encourage commuters to choose sustainable alternatives to travelling in the city [49], particularly as Bristol City Council had secured central government funding as a 'Cycling City' demonstration town during the period of the road closure. However little of this funding was focussed on the Clifton area, as planning and budgeting for the project took place prior to the closure, [51] meaning it would be difficult to use the opportunity to change high carbon travel practices created by the closure of this road link. During the closure the steep route up Bridge Valley Road was still open to pedestrians and cyclists, providing better access/egress to the area by these modes compared with cars. The road eventually reopened to motorised traffic in September 2011, with Bristol City Council's executive member for Transport having to apologise to users of the A4 Portway for the reinstatement of Bridge Valley Road bringing an end to free flowing traffic [52]. As with the example in Case Study 1, the disruption caused by this event provided an excellent opportunity to change travel practices in the Clifton area.

5.2 Traffic Movements During Closure

During the closure Bristol City Council provided several diversionary routes for drivers, which included a northern route that bypassed Clifton (using the A4 Portway), and an internal city route that used Whiteladies Road, Jacobs Well Road and Queens Road to enter/exit the city centre. Bristol City Council's research found significant increases in traffic flows and levels of congestion around Queens Road with an average 56 percent increase in traffic between 0600 and 1800 for the months of March to May 2010, compared to the previous year [49] and an 18 percent increase in traffic across the Clifton Suspension Bridge. However, this increase in traffic flows in on Queens Road does not show in the Department for Transport's Annual Average Daily Flow (AADF) results, which display average daily traffic flows for a whole year [53]. These results show that total number of vehicle movements on Queens Road reduced by just 0.16 percent between 2009 and 2010 from 25,500 to 25,100 vehicle movements and there was a negligible difference between 2010 and 2011 average flows.

Both sets of results are captured using Automatic Traffic Counts in place on the highway network. The AADF results show a reduction in trips through this area during the disruption event. This could be a problem with the way that traffic flows are taken and the difficulty of comparing the results for a 12 hour period, as opposed to the average number of trips over a year. It may be possible that following the days of congestion on this route demand was suppressed; people altered the time of day they travelled; or used alternative routes and means of travel causing the volume of traffic to level out across the year, although this cannot be proven through the evidence available. This uncertainty indicates that during periods of disruption, more attention needs to be given towards assessing finer details of how actions change in order that a better assessment can be made of what measures would be most appropriate for securing longer term benefits, as opposed to simply restoring the status quo.

To the south of Clifton traffic mitigation measures were put in place to minimise traffic movements through residential streets and traffic flows did not increase dramatically during the disruption on these routes. During the period of the closure traffic levels fell across the

city, possibly due to the economic downturn, and overall congestion was reduced across the network, particularly on the A4 Portway, where anecdotal reports to the Council suggested that congestion levels dropped considerably.

5.3 Missed Opportunity to Change Travel Practices?

The closure of Bridge Valley Road altered travel practices to and from Clifton across of the city. This break in the *material* associated with travel practices (car access via Bridge Valley Road) meant that new *meanings* emerged related to the speed of travel on the A4 Portway and how and when to drive in Clifton. New *competences* emerged around travelling had to improve their navigation of the city or choose alternative modes. With the network operating more efficiently due to the closure of this link an opportunity existed to review the highway and transport network in Bristol. The anecdotal evidence suggests that Bridge Valley Road being open for car trips does not benefit the network, as traffic speeds and journey times improved on the A4 Portway and, due to this freeing up of previously congested road space on this route, elsewhere on the network. The greater network efficiency was however at the detriment to the Queens Road area of Clifton where traffic levels increased during the disruption. From this example it is possible to identify whether there are other areas of the network that could be closed that would provide benefits to the network and trialling schemes to test their impact. Through such measures it may be possible to improve network operation and improve take up of low carbon travel options. However political and media support of these trials could provide significant challenges to local authorities in instigating such schemes.

6. SUMMARY

Local authorities play a significant role in the operation and management of many areas of society and through this position have a greater opportunity to reduce high carbon travel practices than individuals have of changing their own behaviour. The results from the changes to recycling levels in England show that local authorities have the ability to change practices through exploiting niches of persistence associated with low carbon travel that exist around existing travel practices. Disruptive events offer local authorities the opportunity to evaluate and change the existing material infrastructure and meanings associated with high carbon travel practices to enable changes to be locked in for the long-term rather than reverting back to the pre-event situation. Disruptive events provide a trigger for developing new competences regarding travel, as routine patterns are rapidly altered. Much of the work conducted by local authorities is designed to minimise or mitigate disruptive events, yet it is these relatively predictable small scale events themselves that offer the opportunity for real change to high carbon travel practices. This requires a change of focus at a societal level of the meaning of travel during events such as adverse weather conditions, particularly when home working options are available for many people who usually work in an office environment. By looking at how these changes have worked it is then possible to identify how these can be locked in during non-event conditions.

The examples from both case studies show that travel practices flexed or changed (or had the potential to) during each disruptive event. It was however difficult to sustain these changes once the road network was restored. The key for local authorities is to identify and understand what opportunities may exist during disruptive events and to include them at the appropriate point in the response process. It is only when these opportunities are included in the response to an event that disruption will become a useful tool in reducing high carbon travel practices.

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