To what extent can culture limit the effective sharing of transport best practice in the field of air quality?

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DECLARATION:

This study was completed for the MSc in Transport Planning at the University of the West of England. This work is my own. Where the work of others is used or drawn on it is attributed.

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ABSTRACT

Local air pollution is becoming increasingly recognised for its detrimental effect on public health, its contribution to the erosion of historic monuments, as well as damage to ecosystems. Given that the transport sector is widely acknowledged as one of the most significant contributors to local air pollution, there has been a concerted effort, orchestrated by the European Union, to more effectively manage transport related air pollution, often involving cross country sharing of best practice. This research examines the extent to which differing cultural perceptions of air quality and health can create a barrier to the effective sharing of transport best practice in the field of air quality.

Through use of a street survey of 200 respondents in each country and informant interviews with 5 key air quality professionals or academics in each country, it was found that perceptions of air quality differed significantly in each country. Yet, despite this, consideration of culture when engaging in cross country sharing of best practice was limited. The research makes the case that air quality management is not conducted within a vacuum, and that transport measures used in one country will not necessarily work in another, requiring far greater consideration of culture when looking abroad for transport measures. Considering culture means adopting a multi-discipline holistic approach to managing air quality, which could lead to the more effective transferring of transport best practice in the field of air quality, allowing practitioners to harness the benefits of sharing information, whilst reducing potential barriers which could limit its effectiveness.

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The importance of effectively managing local air quality cannot be overestimated. As early as 1958, the World Health Organisation recognised the full range of adverse effects of poor air quality on public health (Wettestadt & Farmer, 2003); ranging in severity and permanence, from irritation and annoyance, reduction of organ function and in some severe cases, even death (EAA, 1999). Indeed, it is estimated that some 370,000 Europeans die prematurely each year as a consequence of poor local air quality, which in 2006 led to an eight month reduction in the average European's life expectancy (EEA, 2006). In other areas, there is concern over the contribution of air pollution to the erosion of historic monuments (Loupa et al, 2007), and damage to ecosystems (eg. Emmet, 2003; Fowler, 2003). Dimas (2008) comments that "*whilst in Europe considerable progress has been made over recent decades in cleaning the air that we breathe, air pollution remains a serious problem and continues to damage our health and the environment." [paragraph 1]*

The European Environment Agency (2008) observes that the transport sector is widely acknowledged as the most significant contributor to the degradation of local air quality, reporting a 23% rise in vehicular emissions between 1990 and 2003. As a consequence of this vehicle growth, it is now estimated that up to 25% of the EU population live less than 500 metres from a road that carries more than 3 million vehicles per year (EEA, 2007) and that some 40 million people in 115 larger European cities live in areas where levels of air pollutants exceed safe thresholds recommended by the World Health Organisation (EAA, 1999). DEFRA (2007) suggests that whilst traditionally, air pollution has been associated with the combustion of sulphur containing fossil fuels such as coal for domestic and industrial purpose, now the major threat to clean air is road traffic.

"Petrol and diesel-engined motor vehicles emit a wide variety of pollutants, principally carbon monoxide (CO), oxides of nitrogen (NOx), volatile organic compounds (VOCs) and particulates (PM_{10}). In addition, photochemical reactions resulting from the action of sunlight on nitrogen dioxide (NO_2) and VOCs from vehicles, leads to the formation of ozone, a secondary long-range pollutant, which impacts in rural areas often far from the original emission site" (Paragraph 1)

Such is the extent of the contribution of transport to the degradation of local air quality, that Krzyzanowski et al (2005) claim the health effects of air pollution cannot be effectively prevented without significantly reducing transport related air pollution. This was reflected in

the Eddington Report (2006), which concluded that "*transport policy has no choice but to respond to the challenge of climate change and air quality, for both environmental and economic reasons and transport prices must fully reflect environmental externalities" [P.21].* This fundamental link between health, transport and air quality is inherent in the European Parliament's (2004) policy attempts to forge links between traffic, transport and air pollution on the one hand, and asthma and respiratory diseases on the other.

1.2 The Policy Context to Transport Related Air Pollution

European environmental pollution policy finds its origins in the 1979 UNECE First Convention on Long Range Trans-boundary Pollution. Since that time, European legislation has been manifested through three main political mechanisms. The first of these is the European Directive, which imposes obligations on member states to come within a specified maximum level of air pollution, but offers some flexibility as to the exact choice and method of implementation to align standards to take account of their different political and economic backgrounds (Air-EIA, 2000). Secondly, there are Framework Directives, which provide guidance on the general processes and procedures for managing air quality. The third form of European policy is management through regulations. European Regulations are directly binding within each member state and supersede an individual country's national law, however, they are usually used only in specific circumstances, accounting for around 10% of EU air quality policy (Air-EIA, 2000). Between 1985 and 1991, there were a plethora of such European protocols, one significant example being EU Directive 80/799/EU, which set limit values for Sulphur Dioxide and suspended particles. Whilst it recognised the importance of emission reductions in improving local air quality, it made little attempt to quantify the impacts of the pollutants on health. Hence, up until the 1990's EU air quality policy could be described as fragmented, with directives setting limits only for a few pollutants and a few sources (Swedish NGO Secretariat on Acid Rain, 2002).

Since the early 1990's, however, there has been a move towards an effects-based policy approach, whereby acceptable pollutant levels are based on the calculation of a critical load value used to represent a "*quantitative estimate of exposure to one or more pollutants, below which significant harmful effects on specified elements of the environment do not occur, according to present knowledge"* (APIS, 2006). These target values are set based on the World Health Organisation's guidelines, which are non compulsory in nature. A key legal milestone in the EU's policy to reduce air pollution was the Ambient Air Quality and Assessment Directive (96/62/EU). Although not setting precise air quality standards, it did set out the framework for managing air quality, which would be specified through four

subsequent daughter directives[1]. This directive has recently been superseded by Directive 2008/50/EC, which seeks to combine the existing legislation into one single directive, without changing existing air quality objectives. The directive sets an additional exposure reduction target for PM 2.5 (particulate matter below 2.5 microns in width), allows the postponement of meeting PM 10 objectives by up to two years, and offers the possibility of discounting natural sources of pollution when assessing compliance against limit values. Member states have two years to turn this new directive into national law (European Council, 2008).

In the UK transport policy context, the white paper A New Deal for Transport Better for Everyone (1998) promotes a holistic and integrated approach to managing the negative externalities of transport. Integration can take place at many different levels: between different types of transport, integration with environmental policy, with land use planning policies and with other policies such as education, health and wealth creation. One of the specific aims of the white paper is to "*create better places to live, by providing cleaner air to breathe by tackling traffic fumes." [P8].* This extract from the report encapsulates the governmnent's vision to reduce the negative externalities of travel.

> "We want to see greener, cleaner vehicles that have less impact on our environment. We want to see better public transport and we will make it easier to walk and cycle. But these alone will not be sufficient to tackle the congestion and air pollution that is caused by road traffic: we need to reduce the rate of road traffic growth. We also want to see an absolute reduction in traffic in those places and streets where its environmental damage is worst" (DETR, 1998 P11)

Figure 1.1 overleaf depicts the toolkit of measures that can be employed by the government to reduce the negative externalities of car travel. A key area of interest for this research is the selection of transport measures and the sharing of best practice. Questions arise, such as the extent to which a transport measure used successfully in one country can be just as successful in another country. As has previously been discussed, the purpose of EU directives is to set air pollution targets, but allow some flexibility to take account of each country's different political and economic background (Air-EIA, 2000). However, simply considering differing political and economic backgrounds when faced with the diversity of different countries by no means provides a exhaustive list of reasons for allowing policy

[1] 1st Daughter Directive (1999) set targets for Sulphurnitrogen dioxide, particulate matter and lead, Dioxide. Second Daughter Directive (2000) set targets for benzene and carbon monoxide and the third daughter directive (2001)set targets for ground-level ozone

flexibility. Indeed, it makes no mention of culture as an explanatory factor in the need for this flexibility, despite the inevitability of cross country sharing of best practice and the trans-boundary nature of air pollution.

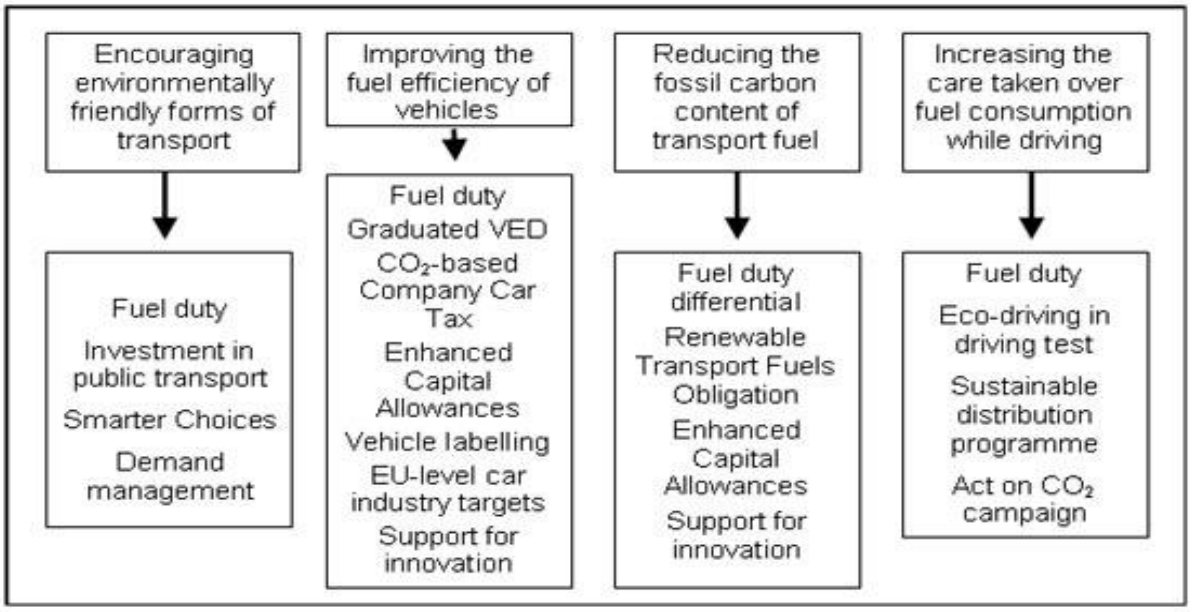


Figure 1.1 The UK Government's toolkit of transport measures. Extracted from A New Deal For Transport: Better for Everyone (1998)

Whilst some research exists to support a claim that cultural context can play a pivotal role in explaining behaviour, from consumer's purchasing behaviour (Soloman, 2007), gambling behaviour (Raylu, 2004) and indeed travel behaviour itself, *(eg. Sussman et al, 1998);* the concept of culture has not really been explored in any depth within the context of air quality management. This research makes the proposition that cultural perceptions of health and air quality are likely to impact on the effectiveness of sharing of transport best practice in the air quality field, and ultimately alter the way air quality is managed. This is a claim supported by Lovei (1995) who suggests that more than any other discipline, the discipline of the environment calls upon social sciences to develop internationally comparative and interdisciplinary approaches.

1.3 Overview of the Structure of the Dissertation

Chapter one has provided the background to the problem of local air pollution and in particular transport's contribution. Air quality and environmental policy at the European, national and local levels have been discussed, providing a comprehensive background to the research.

Chapter two will give the contextual background of the two cities to be used for comparison, their particular problems with air quality and outlines the research aims and objectives. Chapter three, the literature review will critically discuss relevant literature underpinning the research, with a view to identifying gaps and ambiguities in existing knowledge that point to the need for further research. Chapter four will begin with an overview of the research design, which will be followed by discussion of the data collection tools, their limitations and the sampling strategy used, and how these fit into the broader methodology of the research.

Chapter five will present and summarises the key findings of the research, which are subsequently discussed and analysed in chapter six, which relates the findings to existing literature and the research objectives. Finally, the conclusion in chapter seven seeks to draws out the key findings of the research and its relevance to practice, as well as considering the limitations of the study and possible areas for future research.

DEFINITIONS AND RESEARCH AIMS.

2.1 Key Definitions

Defining Air Quality Management

For the purposes of this study, air quality management is described as the common interface that coordinates two distinct tasks: first the process of identifying the extent of local pollution, often undertaken by air quality scientists; and second, the process of proposing and implementing solutions, a task often completed by the transport planner as part of the local transport plan (Beattie et al , 1998). The term *'management'* implies that there is some level of complexity involved, in particular given the number of actors involved in the process. It is worth noting at this early stage that management of air quality cannot not necessarily be viewed as synonymous with having reduction in air pollution, although this is a desired outcome.

Defining Transport related air pollution

The term *transport related air pollution* is used within this research to describe pollution that results from the process of people moving from a place of origin to a place of destination. There was some deliberation over the differing nuances of the two phrases *moving people* and *people moving.* Given that travel is a derived demand, it was decided to use *people moving*, since passengers, unlike goods are not entirely passive in their journey- and are arguably more complex to manage due to their irrational and counter optimising behaviours. Indeed, the challenges and the measures used to improve transportation efficiency are substantially different between people and goods, and the main subject of this research, cultural perception of health and air quality is less relevant to the movement of inanimate, goods. The definition used for the purposes of this study, relates specifically to the actual use of vehicles, and as such, excludes pollution originating from other sources, such as industry, as well as pollution occurring as a result of the production, disposal or maintenance of vehicles. Furthermore, the definition is less concerned with the more technical aspects of vehicular exhaust emission reductions, based on the EEA's (2008) observation that it is the inefficient use of transport, rather than the transport emissions per

se that are at the root of the problem of urban air quality problems. The EEA (2008 p78) found that

> *"increased car usage and a reduced number of passengers per car negate the improvements gained from improvements in vehicle efficiency"*.

Indeed, this research's vehicle usage based approach acknowledges that transport related air pollution is only one of a number of the negative externalities of travel- others include congestion, time lost waiting in traffic and road deaths. In brief, air pollution abatement policy needs to be discussed in light of other relevant policy objectives that seek to reduce the negative externalities caused by the transport sector.

Defining Cultural Perception

There is no one accepted definition of what culture is; indeed nor is the existence of a single national culture universally accepted (Mcsweeny, 2002). Such is the ambiguity of the term culture that Hudson (1997) suggests it is easier to start by defining what culture is not. For this research, therefore, a working definition is given below and the implied assumptions of using of that definition are outlined. Png (2001) views culture as more than simply a focus on the traditions, customs and food of a given country. Looking solely at such elements, he argues, raises the potential danger of reducing culture to simply memorizing details of any particular country in a static view, thus taking no account of the dynamic aspects of culture, such as its influence on people's judgment and cognitive processing, which in turn can affect perception.

> Culture is not theorized here as the only culture or totality within a nation, but it does culturally distinguish its members. Culture is dynamic, more than simply a study of traditions ; and can affect the beliefs, attitudes, and perceptions of a society and subsequently their response to local issues. One such example being air pollution.. *[Based on Bennet, 1990}*

Mcsweeny (2002) explains that culture cannot be portrayed as the totality of a nation, but rather, that which distinguishes one nation from another. Hence, whilst a nation may be sub culturally heterogeneous, its people can still share a common national culture. Yet, despite the potential influence of culture on decision making, Bennet (1990, p.8) is critical of lack of synergy between anthropologists and local authorities, observing that "*whilst anthropologists perform archaistic studies of the odds and ends of humanity, municipal authorities struggle with the chemical, geological, economic and political problems of toxic*

waste, without help from social scientists". This is a key starting point for this research, which seeks to join the increasing amount of research attempting to bridge the gap between environmental science and anthropology.

2.2 Research Aims

This section outlines the overall purpose of the research. This is achieved by identifying the research aims; that is the specific questions which the research hopes to answer. These aims will be referred back to on a number of occasions throughout the research and in particular in the conclusion, which will assess the extent to which this research has been successful in answering the questions it set out to explore. Subsequently, the research objectives set out more detailed or operational targets that will help to reach the desired aims. The objectives are as far as possible SMART; that is specific, measurable, achievable, realistic and time constrained.

Aim one: *To investigate the role of culture in influencing perceptions of health and perceptions of air quality in Turin and Bristol.*

The definition of transport related local air pollution detailed above gives consideration to the movement of people as opposed to the movement of goods. It is worth noting again the differing characteristics of commodities and people. Unlike with goods, which are uniform commodities, the facilitation of more efficient movement of people to reduce transport related air pollution requires changing individual behaviour, in effect promoting alternatives to the car. This research seeks to broaden the current understanding of cultural perception in changing behaviour, with specific application to the management of local air quality. If found to be of significance, this could bring into question the appropriateness of systematically sharing transport best practice in the field of air quality, which is the subject of the second aim of the research.

Aim two: To establish the extent to which sharing of transport best practice is taking place when seeking to manage air quality.

In order to establish the extent of cross country sharing of transport best practice in the field of air quality, it will be imperative to discover how the terms 'best practice' and 'sharing' are understood by practitioners. Then it could be of interest to discover at what levels such sharing is taking place and whether is formal or informal in nature.

Aim three: To examine the extent to which cultural perceptions of health and air quality could be a barrier to the effective sharing of such transport best practice.

This aim explores why it is that a measure used in one country will not necessarily work equally well in another country. Can this be attributed purely to geograohical and physical differences? Ultimately, this aim's purpose is to establish whether cultural perception of health and air quality could, in part, result in a reduction in the effectiveness of sharing best practice.

2.3 Research Objectives.

Objective one: To conduct an extensive literature review to more concretely define the key concepts in the research and further identify the specific gaps in existing knowledge.

Objective two: To identify and contact ten or more professionals in each city who are working in the field of air quality and transport to partake in informant interviews.

Objective three: To conduct the informant interviews to critically compare the measures used to reduce transport related air pollution in Turin and Bristol, and the extent to which the role of culture is considered when sharing best practice.

It is of interest to establish the extent of best practice sharing amongst practitioners and policy makers and whether they give sufficient consideration to the differing cultural perceptions when sharing and implementing measures. This will also cover issues such as the use of technology in reducing transport related air pollution, measures that offer incentives for sustainable travel, as well as their views on the future role of social marketing.

Objective four: To design and pilot a street survey and have it translated into the Italian language ready for data collection.

Objective five: To measure public perception of health and air quality in Bristol and Turin using a street survey of 200 respondents in each city.

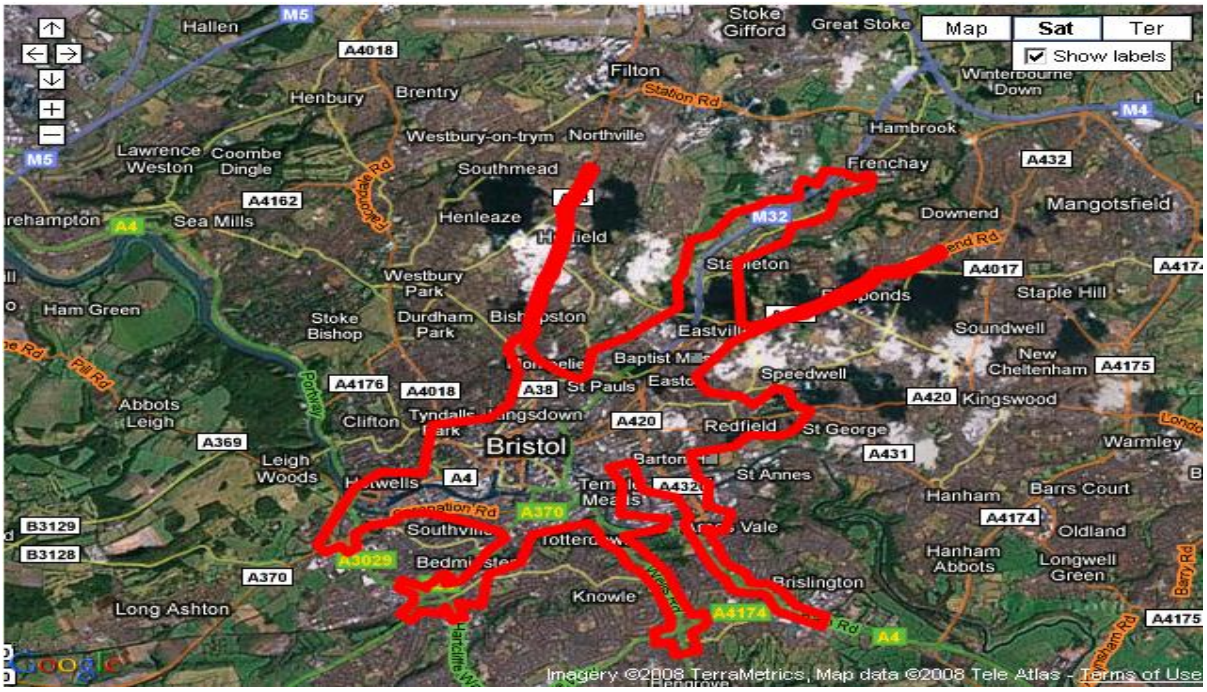
The rationale behind this aim is to establish the existence of culturally distinct perceptions of the importance attached to both health and air quality in Turin and Bristol. It will discover whether a link can be established between level of importance attached to health and level of importance attached to air quality. If this is the case, not only will it give greater prominence to the idea that culture should be given greater consideration in the air quality management process, but in addition, there could be potential implications for the marketing of air quality reduction measures to those who are more likely to change behaviour.

Objective six: Using the two tools mention above, to assess the extent to which cultural perception of health could limit the effective sharing of best practice in the field of air quality.

As previously outlined, the role of European Air Quality Directives is to provide regulation, but simultaneously allowing flexibility to account for differing political and economic traditions (Air-EIA, 2000). Yet can these 'practical considerations' to be assumed the only relevant considerations? Or, as proposed by this research, could there a larger cultural force at play that could potentially limit the effectiveness sharing of best practice in the field of air quality? Clearly this will have some potential implications on the way local air quality is managed through transport sector.

2.4 Context of the two cities chosen for comparison.

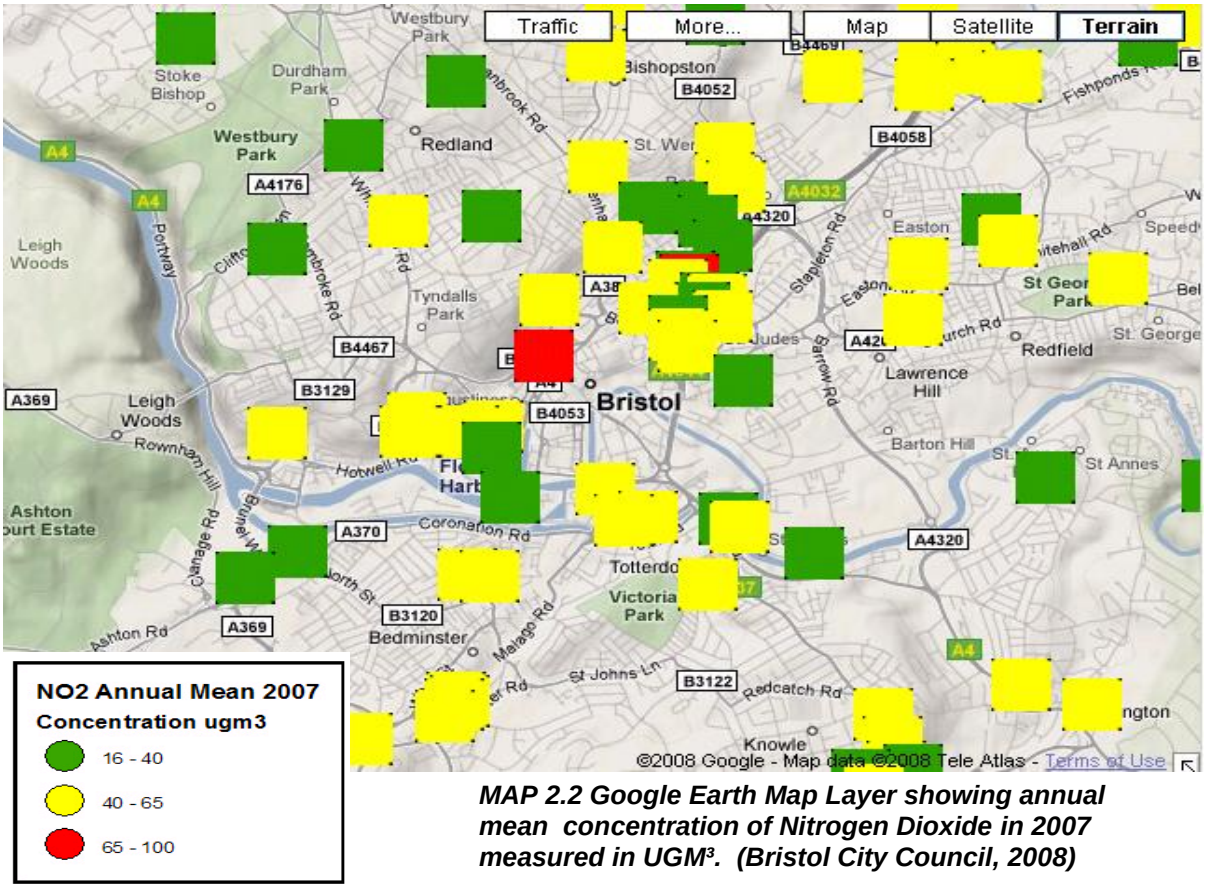
Bristol has a population of 410,950 making it the sixth most populous English city and is the main economic centre for the South-West region (Bristol City council, 2001). The Dft (2006) observed that In 2006 Bristol's average peak period traffic speed was just 16.1 mph, making it the second slowest of the 18 biggest English urban areas outside London. In addition, Bristol's average peak speed has fallen by 3.8 mph since 1999. Other comparable large urban areas have experienced much less of a decline in speeds over the same period, averaging at around 0.9mph. Whilst such headline grabbing statistics are highly subjective and the actual definition of "congested" open to interpretation, what is clear is that any improvements in the way air quality is administered and managed will be of significant interest to Bristol City Council.



MAP 2.1 Air Quality Management Area in Bristol (Bristol City Council, 2008)
http://www.bristol.gov.uk/ccm/content/Environment-Planning/Pollution/bristols-aqma.en

Local air quality management in Bristol comes under the framework of The Environment Act (1995), in which part IV requires the UK Government and the devolved administrations of Scotland and Wales to produce a National Air Quality Strategy containing standards, objectives and measures to improve ambient air quality (Defra, 2007). Its key objective is to '*ensure that the public have access to outdoor air without significant risk to health, where technologically and economically feasible" (P.13)*. It is underpinned by European policy, which not only provides the statutory duty to comply, but also opportunities for achieving the objectives such as EU standards on vehicle emissions (Beattie et al, 2000). The first National Air Quality Strategy was duly published in 2000, and was particularly noted for its emphasis on a holistic approach to addressing air pollution issues. EU Directive 96/62/EU states that each state must be divided into agglomerations, which is interpreted in the UK as the local authority (Elsom, 1999). Beattie et al (2000) suggest that, since this act, air quality practice locally has flourished. Bristol City council, as one of these local authorities, is responsible for reviewing air quality and assessing whether objectives are being met. If an area is likely to exceed the prescribed levels, an air quality management area (AQMA) must be declared, as was the case in Avonmouth and the City Centre in 2001. Some 200 authorities have declared AQMAs (Defra, 2007). Map 2.2 highlights the boundaries of the 2008 AQMA designations for Bristol.

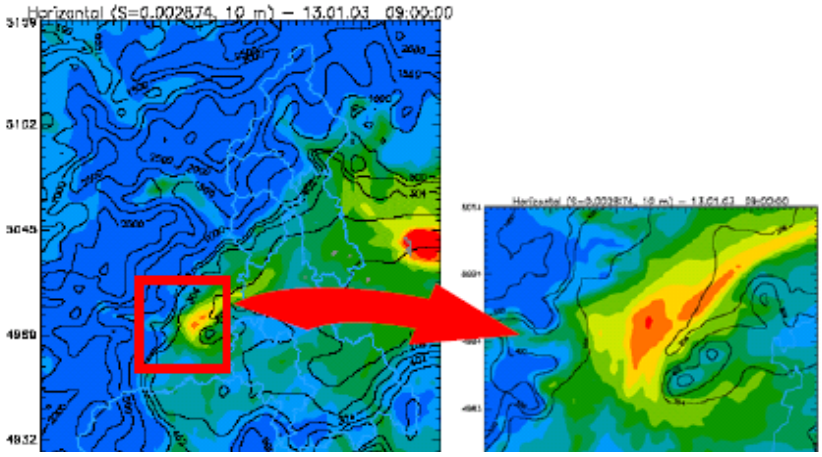
Bristol's Air Quality Action plan (2004) integrated with the local transport plan points out that over a quarter of Bristol failed to meet the health related air quality targets in 2005. These areas, declared as AQMAs are home to over 100,000 people, of which 13,000 are children. Of particular concern is levels of nitrogen dioxide (No2) and particulate matter. (pm10). The EEA (2006) estimates that transport account for 30% of PM 2.5 emissions, and that other emissions such as dust resurfacing and breaking contribute to the majority of PM10 levels. Figure 2.3 shows the annual mean for No2 levels in different areas of Bristol.



MAP 2.2 Google Earth Map Layer showing annual mean concentration of Nitrogen Dioxide in 2007 measured in UGM³. (Bristol City Council, 2008)

Turin, in the North of Italy in the region of piedmont has a larger population than Bristol at 908,000. (Maps of the World website). It was seen as comparable to Bristol, as it is also one of the Italy's top five economic centres and also experiences considerable air quality problems, due in the most part to transport. In Italy, the Ministry for the Environment at central level sets general rules for the environment, whilst the regions, in this case, Piedmont, interpret the EU directives and legislation, and subsequently provinces apply regional policy by coordinating the communes. Communes are also encouraged to use their own initiative where possible. The Regional Environmental Protection Agency (HARP) communicates the air quality data to the public and is responsible for the scientific elements of air quality management.

Nikolaulu (2003) places Turin in the second highest category for annual mean No2, ranging between 50 and 60 UG m3. Figure 2.2 illustrates a snapshot of No2 Levels on 13th January 2003. The darker colours represent more concentration of Nitrogen dioxide. The map clearly shows that Turin is the main area in the Piedmont region where levels of No2 are being exceeded.



MAP 2.3 No2 ground level concentrations over Regione Piemonte (left and Turin metropolitan area (right) 13/01/2003. 09:00. Extract from Finardi et al (2005)

Similarly, Environmental Defence (2006) comment that in 2006 PM10 levels were above the 50 milligrams per unit metre limit set by the EU for 38 days, above the allowed 30 days. Levels often reached three times the limit, creating extended periods of smog over the city. This was a particular concern over the period of the winter Olympics when cars were banned from a large area of the city area beforehand to reduce the effect of the smog. Having explored the background information relevant to the study, the next chapter explores existing research which will help to answer the research objectives.

LITERATURE REVIEW

3.1 Overview

Having outlined the research aims and objectives and the relevant contextual information, this chapter will discuss the body of existing literature and research that underpins the work. First, the literature exploring the relationship between transport and air quality will be discussed. Secondly, the health-air quality relationship will be explored. Thirdly, a discussion will take place around the factors influencing perception of air quality. Finally, the broader debate surrounding the role of culture in environmental sciences will be discussed in light of relevant studies. The literature review will help to place this piece of research within the framework of existing knowledge, in order to clearly show where the research is contributing to the advancement of knowledge in the area. It will highlight a number gaps or uncertainties in the existing knowledge that provide justification for the need for further research.

3.2 Transport and air quality

Transport related air pollution is now widely acknowledged as one of the principal causes for non compliance with the current EU pollutant limit values (IEA, 2000). The transport sector is the last to significantly cut its emissions (Mcglade, 2006). Gwilliam et al (2005) suggest that the menu of transport options to tackle air pollution is varied and can be daunting.

Many transport measures are available to reduce congestion and air pollution, categorised by Hein (2004) as either technical or demand reduction measures. Technical measures, Hein suggests, seek to improve vehicular efficiency by improving fuel efficiency and removing the highest polluting vehicles and through innovation with technology. However, whilst the DfT's (2000) 10 year plan promoted use of technology and innovation to create a modern less polluting network; factors such as vehicle growth, an increase in diesel vehicles, a large number of short trips and increasing traffic congestion are likely to considerably offset the benefits derived from these improvements (EEA, 2006). Hein's second category, *demand* management measures aim to reduce the number of cars on the road whilst providing a wide variety of alternative travel options for those who wish to travel (Institute of transport engineers, 2004). These could be implemented through push

measures, such as fuel price differentials and congestion charging, or pull measures, such as improved bus services and park and ride systems (DfT, 2004).

Gwilliam et al (2005) provide further detail, commenting that

> "*local authorities are typically able to exert the most influence on transport-related air pollution through system-oriented measures including traffic management, regulation and control of public road transport, provisions for non-motorized transport and for mass rapid transit, physical restraints, parking policies, and road pricing and land use policies*" (P.xi).

However, McGlade (2006) is sceptical about the utility of solely focusing on demand based measures, suggesting that in order to meet the current No2 objectives, at the current levels of demand, a 40% reduction of car trips would be required, which is not likely to be feasible given the traffic growth forecasts and fails to satisfy the Environment Act (1995) requirement for measures that are proportionate and cost effective. Inherent in this comment is the traditional view of the inseparability of economic growth and traffic growth, as it seems to assume that a reduction in car trips means the trip not being made, whereas in reality, substitution alternatives do exist, such as car sharing and other sustainable modes, which can generate the same economic benefit but with less cost to the environment. Although the DfT (2000) suggest that the link between economic growth and travel demand is weakening, Schipper & Fulton (2003) suggest there are "few signs of a full breakdown in the unsustainable relationship between increasing incomes and transport emissions" (P.210).

3.3 Health and air quality

Stieb et al (2002) believe that there is "little doubt that acute air pollution exposure is a significant contributor to mortality" (P.470); a claim supported by the EEA's (2006) estimation that annually, some 370 000 Europeans die prematurely as a result of poor local air quality. Exact mortality statistics are widely disputed amongst researchers, since statistics are commonly lacking in qualitative detail, such as the stage of life of the afflicted, previous health conditions, and other compounding variables that could have equally contributed to the death (Krzyzanowski 2005). Moreover, Schwarz at al (2006) point out that in reality, often doctors cannot discern whether a death was specifically caused by air pollution specifically, so instead, statistical analysis is used to tease out the effects of air pollution from *"a thicket of other health related variables such as physical fitness*" (P1),

resulting in a high level of uncertainty and unreliability (Corcoran, 2006). This links well with Pope and Dockery's (2006) previously discussed findings that there are also significant gaps in the scientific knowledge underpinning the cause-effect relationship between air pollution and health. Beattie and Longhurst (2001) suggest that since the White Paper *This Common Inheritance* (1990), there has been a policy transition from technology based controls to an effect based approach to managing air pollution, which effectively gives greater recognition to the health impacts through the introduction of limit values that seek to "avoid prevent or reduce the harmful effects on human health and the environment as a whole" **(Article 6)** (Directive 96/62/EC.)

Health statistics for Turin and Bristol provide a good starting point for any researcher seeking to assess the level of importance attached to health by residents of each country, giving an indication of what is happening at the ground level, in terms of how many doctors consultations are taking place, the level of provision of healthcare and the total amount being spent on prescriptions. It should be recognised at this early stage that statistics can easily give a false interpretation of healthcare levels. To this end, this review is critical of the data, asking what information could be missing and what other possible explanatory factors could be at play.

The OECD's (2008) comparative survey of 30 countries reveals that in 2005, there was on average, 7 doctor consultations per capita in Italy, compared to a lower figure of 5 consultations per capita in the UK. Whilst at first sight this figure could indicate a higher level of concern for health in Italy, information is lacking about the reason for attending the doctor, the proportion of first time and multiple visit patients and also the existing health problems of the patients. Indeed, Caldwell et al (2006) suggest that higher attendance rates can be largely explained by the mental state of a person. Similarly, Kersnik et al (2001) found that lower levels of education, severity of existing health problems and higher satisfaction with one's GP were potential predictors of higher doctor attendance. If the latter is the case, it may be plausible that there is generally a higher level of satisfaction with healthcare facilities in Italy, as the WHO (2004) report ranked Italy "among the best for performance before France and Spain", although again there is clearly some subjectivity around the definition of performance. This is supported in terms of Italy having a higher level of health provision, the OECD (2008) showing there were twice the number of doctors per 1000 people in Italy (4.2) compared to UK (2.2) in 2004. Although the ratio of patients to doctors is not directly correlated with the level of importance being attached to health, it suggests that in Italy, health is important as a national priority, supported by OECD's (2005) observation that Italy has been highly successful in reducing its number of daily

smokers, which went from 35.5% in 1980 to 24.2% in 2003. (OECD, 2005). Given that Jagger et al (2007) rate Italy and France as having amongst the highest life expectancies in Europe, this does begin to support the case that the Italians are on average more concerned about health related matters. This is supported by the World Bank's (2007) database that shows that private expenditure on health expressed as % of GDP, is two times higher at 2.17% in Italy compared to 1.1% in the UK. Private expenditure on health is defined by the World Bank (2007) as 'direct household (out-of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations. It should be borne in mind that this could be reflective of the level of state healthcare differing in each country, an area which requires further research. The OECD (2008) makes the point that such a measure may be misleading and that higher expenditure could be simply attributed to the increased cost of pharmaceuticals as opposed to increased demand. This is a counter to this argument, however. Italy has significantly less people per pharmacy ratio than the UK. (UK 4898, IT 3493 per pharmacy)[2]. Data from Sigvard et al (2002) records that in 1997 Italy had a Macrolide[3] prescription rate of 240 per 1000 people compared to the UK's rate of 90 prescriptions per 1000 people. It is worth noting that there is some variation in the type of drugs obtainable by prescription only in the two countries, and therefore studying prescription rates in isolation many not give the full picture of the demand for pharmaceuticals. An example of this point is given by Weirich (2008) who comments more generally, that government debt reduction strategies are likely to "trigger further austerities in the health and drug sectors, even though the country has been rocked by three strikes from medical workers in the past two years." In other words, expenditure of prescription drugs is not directly related to concern for health, but could be attributed to other factors such as economic conditions. To conclude this section of the literature review, it is necessary to ask whether frequency of doctor attendance and national prescription levels can really offer a valid insight into the importance attached to health. Although there is no simple black and white answer to this question, answer appears to be not really. Holtzman et al (1987) are explicit about other potential influences suggesting "that psychosocial factors have been increasingly recognised in the success of health and social actions. If actions are to be effective in promoting health and wellbeing they should be based on an understanding of culture, tradition, beliefs and patterns of family interaction".

3.4 Concern for Air Quality

Williams et al's (2003) London based study sought to uncover a whether there is a relationship between publicly available air quality data and the public perception of air quality. The study concluded that public perception of air quality was not a reliable indicator of the actual level of pollution in the area. Bell et al (2005) observes that "unfortunately we rely on our primate senses of smell and visibility to perceive levels of air pollution. We say unfortunately because many of the most harmful types of pollution are not detected by this way". Perception of air pollution was also found to be influenced by stress or annoyance **(Crawford and Bolas,),** setting (urban vs. rural), access to information, and socioeconomic characteristics such as age and race (Williams et al, 2003). In addition, attitudes towards the source and its attractiveness were found by Winneke and Kastka (1987) to influence attitudes, who found lower levels of annoyance towards air pollution produced by a chocolate factory than a brewery. This shows that there are a wide variety of factors that can influence how health is perceived by the public.

3.5 The role of culture in the environmental sciences

Kempton (1996) suggests that understanding culture is a fundamental part of understanding environmental problems; since "*human culture guides their members both when they accelerate environmental destruction and when they slow it down*". (P.1) Gwilliams et al (2005) are in agreement, but adopt a more cautious approach to international comparison, commenting that "*global experience is a useful guide, not least in educating behaviour, but careful adaptation to local situations is critical because the nature and sources of air pollution differ from city to city" (*p.xiii). Whilst these comments are full of good intention, Wallerstein (1976) is sceptical that one can operationalize the concept of culture. Wilkening (1999) does, however, attempt to use the concept of culture to explain the reported effectiveness of Japan's strategy to tackle the problem of acid rain. It was found that weekly individual acid rain monitoring not only increased awareness of the problem of acid rain, but also, it increased data collection and created a business case for monitoring equipment. Discourse analysis revealed that the success of environmental policy could be linked to the Japanese affinity to rain, as a necessary provision for rice, in poetry and in the spiritual realm. This led him to conclude that culture can a present and persistent factor in environmental policy making and should be considered alongside other more practical factors (Wilkening, 1999). Similarly, for this research, it is argued that if a link can be established between an individual's perception of health and their perception of air quality,

this could have a significant impact on the effectiveness of measures used to reduce transport related air pollution.

Given these findings, Bikerstaff et al (2001) are surprised at the lack of academic attention given to the public perception of air quality when compared to climate change and biotechnology. Jenkins (2000) conducted a survey on behalf of Brighton and Hove Council who were seeking to explore the best way to disseminate air quality data. She concluded that *"the results showed public confusion over what air quality is, how it is gauged and how it effects people.* P.12*"* This could arguably be more widely symbolic of what Bennet (1990) describes as a chronic lack of integration between anthropologists who "perform archaistic studies of off and ends of humanity, and municipal authorities who struggle with chemical geological and political problems of toxic waste without the help of social scientists." Hence, whilst considerable research has looked at the role of perceptions in the decision to travel (Jha, 2008), mode choice (Srinivasan et al 2008) and departure time (Ettema et al, 2003), there is currently scarce research linking perceptions of health and air quality.

This is somewhat surprising, given the considerable number of studies that link attitudes to the decision to travel, from attitudes to congestion (eg. Abdel-Aty, 1994), to attitudes towards the car (Lanken et al, 1994). Perception could be equally important when deciding how to frame air pollution abatement measures, with Owens (2006) emphasising the need for a deeper understanding of attitude and behaviours when changing behaviour. He argues that by targeting attitudes, longer lasting behavioural change can be more easily achieved. Waarts et al (2006) explore the influence of national culture on the adoption of IT systems in Japan and England, finding that the Japanese have a higher uncertainty avoidance and are less likely to adopt new technologies and perceive e-mail as less useful. The implication was that different promotion strategies should be used for different countries, due to their cultural distinctiveness. This concept could equally explored within the context of air quality management.

METHODOLOGY

4.1 Research design

This research was approached from a post positivist and critical realist perspective, through an overarching belief that underpinning world views can be equally true in the scientific

world. This ontological perspective maintains that as social scientists, it is important to recognise that all observation is fallible and it is difficult to know reality with any degree of certainty. (Research Methods knowledge database, 2006). This is particularly pertinent when working with the constantly evolving and intangible nature of the concepts of culture and perceptions. Faced with this uncertainty, a mixed methods approach was used, the main instruments being informant interviews and street surveys. Mixed methods approaches are endorsed by Lipscombe (2008), who suggests that critical realists are able to be epistemologically pluralist, as they recognize the existence of logical connections between the ontological, epistemological, and methodological premises that underpin their work. In addition, the methodology encouraged triangulation of data in order to validate the results and aid cohesion between the quantitative and qualitative data that was be obtained.

Figure 3 overleaf offers an overview of the research strategy for the research in a six stage process. The first stage was the start of the research, at which point the research question and key concepts were defined. Following this, during the second stage an extensive literature review was conducted, with a view to narrowing down the focus of the research and identifying gaps in existing knowledge that could warrant further research. The third stage involved designing a methodology and physically collecting the data using the street survey and informant interviews. Secondary data was used to facilitate triangulation of the findings, in other words how they support to negate existing knowledge. The results were then analysed and implications for the research were drawn out. Finally conclusions were made as to how the data collected and its analysis help to advance our understanding of the extent to which culture represents a barrier to the effective sharing of best practice in the air quality field. In reality, the process was far less segmented than described, for example at later stages of the research previously unseen literature came to light that helped advance the research significantly.

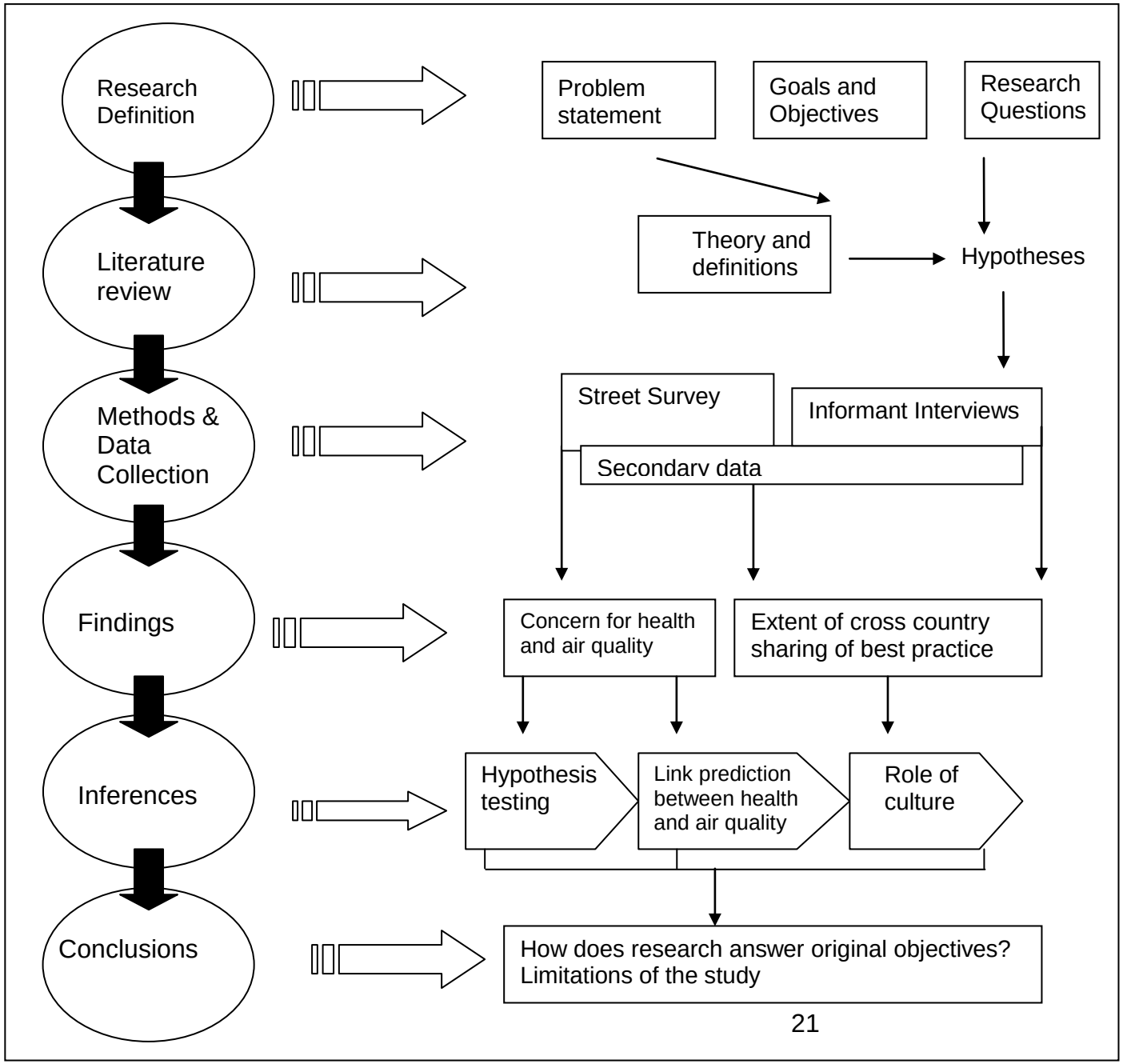


Diagram 4.1. Research Framework

4.2 THE STREET SURVEY

Objective 2, “to measure public perception of health and air quality in Bristol and Turin” was fulfilled via the street survey. Given the lack of previous studies specifically addressing the relationship between concern for health and concern for air quality, the decision was taken to follow Popper’s (1963) hypothetical deductive approach, in other words formulating a hypothesis that could be conceivably falsified with an observable set of data. For this study there are two hypothesises that were explored. Although these hypothesises are not specifically transport related in themselves, they do provide useful information on the perceived importance of air quality in each city and later, this will inform the analysis, which will assess the potential role of culture in the management of transport related air quality.

1. *Is there a statistically significant difference between perceptions of health and perceptions of air quality in the two cities? The implication being that if they are different then culture could be an explanatory factor in this difference.*

2. *Are these two factors related? Does a higher perceived importance of health result in a higher perceived importance of air quality?*

In contrast to the research’s critical realist standpoint, support is given to Popper’s (1963) observation that no hypothesis can ever really be absolutely confirmed, as there is always a possibility that future research could prove it wrong. However, Popper does add that a hypothesis which has been rigorously falsified is a reasonable basis for action, until such time as it can be falsified. Although this is more reflective of the views of a classical positivist, it is felt that this does not in any way jeopardise the validity of the research design. Due to the ambiguities and uncertainties in measuring perceptions and culture, the emphasis was not so much on the numerical value itself, but whether it was comparatively higher in one country than another. In other words, quantifying this link is beyond the scope of this research project, whose focus is mainly on identifying the existence of a link.

The street survey was one of three alternative research instruments considered. Alternatives were a newspaper opinion poll, an internet survey and street clipboard survey. A newspaper was approached about the possibility of hosting a question; however, whilst it was recognised that a newspaper opinion poll could reach a wider ranging audience in a short space of time, it was felt that there would be some inherent biases. First, it was found young readers between 18 and 24 are 38% less likely average to read a paper in a week

(Comscore 2008) and so younger groups may have been excluded. Second, responses would be biased by the newspaper reader's political following, which could make the results representative of the newspapers readers and not of the town or country. Finally, it was felt that a number of questions would need to be asked to assess level of concern, and the newspaper could only accommodate a maximum of two. Finally, the practical need of having the same instrument in both cities meant that the clipboard survey was by far the most appropriate option to answer the question. The clipboard street survey was chosen for its ability to obtain a high response rate, whilst being relatively cost effective and most time efficient.

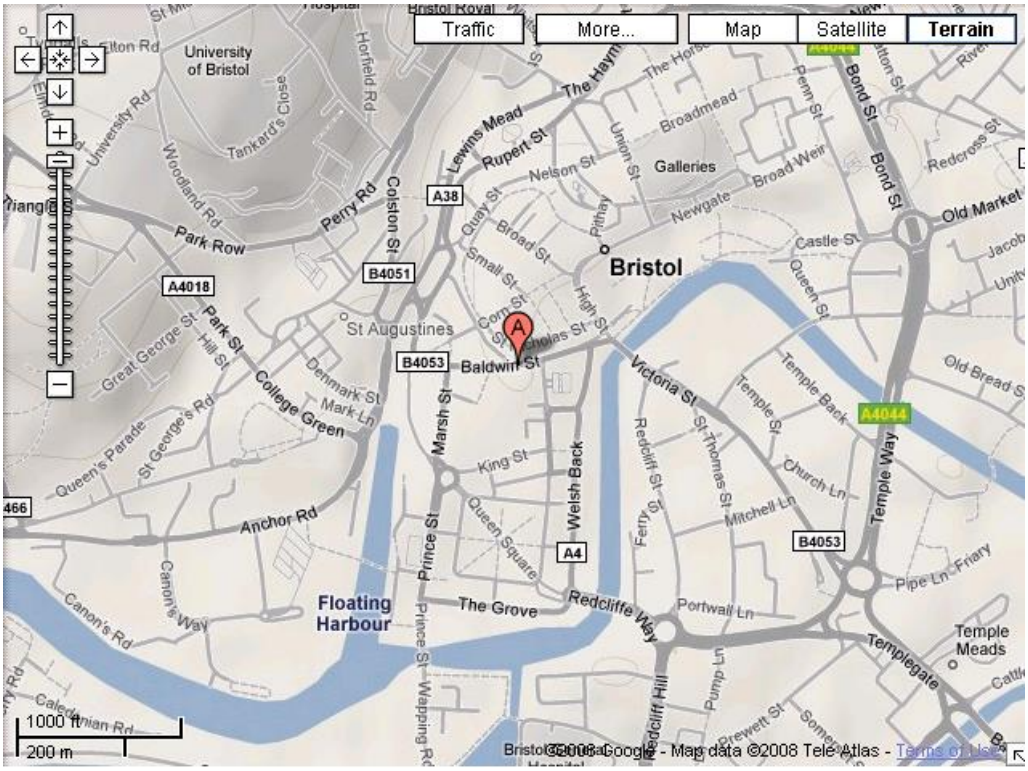
4.3 RESEARCH SAMPLING STRATEGY

An important element of the research design is arriving at a sample, in other words a group of people to whom the research is targeted. To achieve this it can be helpful to have a sampling frame, described by the International Statistics Institute (2003) as a way of identifying every single element and including it in the sample. Although, ideally this would entail a sampling frame of all the residents of both cities, clearly this was not feasible given the data and time restraints. Hence, the precise sampling frame for the research was "people using the shopping streets chosen during the times of the survey". The streets chosen were Baldwin Street in Bristol and Via Victoria Emmanuelle II in Turin. Site visits prior to the surveys revealed they were closest matches in terms the number of people passing by, the mix of houses and shops and type of street. Due to the fact that the surveys were conducted over a period of three days, at different times, it was hoped not to exclude any members of population such as office workers and younger folk leaving for and returning from school or college. Street users were asked at random to complete the street survey, meaning there was random sampling and that all participants in theory had an equal chance of being selected and the research frame was not partitioned in any way. A drawback of random sampling is the inherent personal biases that exist when selecting who to approach to survey, and there is little way of knowing if the group of people are reflective of the whole of the city. For example, one scheduled interview was cancelled due to an air quality protest taking place that day. Clearly, an event like this would influence who may potentially be out on the streets on that particular day and their concern for air quality matters.

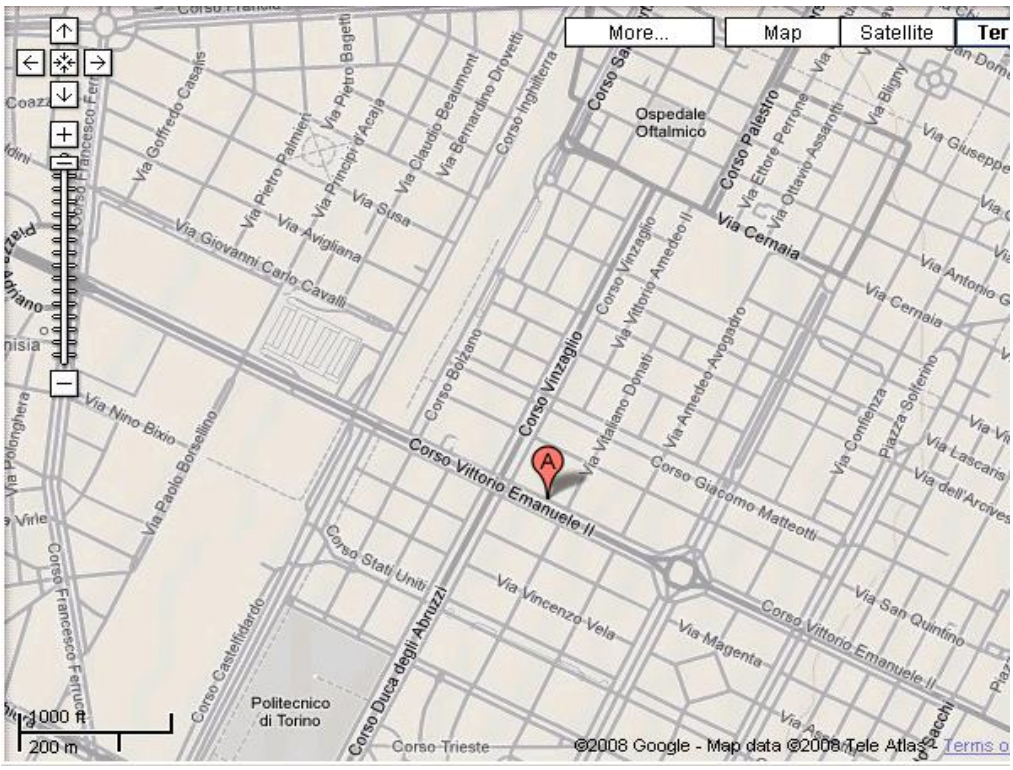
The sample of 200 respondents in each city was deemed as sufficiently large data to perform statistical analysis. It was in line with Israel's (1992) recommendation that for a population of up to 100,000, in order to achieve a 7% precision level, a sample of around

204 is seen as appropriate. In addition, given that the research is more concerned about identifying cultural difference rather than accurately measuring the difference, a 7% precision level was seen as quite acceptable. Although there could be scope to increase the sample size in future research, at a certain point the laws of diminishing returns mean that the additional cost of the extra surveys would not be reflected by a proportionate increase in the quality and validity of the data.

SITES FOR STREET INTERVIEW



Map 4.2 BRISTOL: JUNCTION WITH BALWIN STREET AND HIGH STREET [Google Maps, 2008]



Map 4.3 Turin: JUNCTION WITH VITTORIO EMANUELE II [Google Maps, 2008]

Surveys, as research tools do have some limitations. Surveys only provide a verbal description of what people think, not an accurate description of what they are thinking (Burchinal, 2007). Moreover, although this survey can establish a relationship between two variables, it cannot accurately determine the direction of causality, in that the survey cannot tell us if higher concern for health leads to higher concern for air quality or vice versa. Second, they rely on self reported data, which is potentially biased by respondents changing their answers to what they think they should be saying. In addition, administering the surveys and inputting the data makes surveys relatively time consuming.

4.4 Survey design

The survey contained a series of eight fixed response or closed questions that respondents were asked to rate. The questions were broadly split into three sections; the first about local priorities, the second about attitude towards health and the third about attitude towards air quality. Parasuraman (2006) stresses the need to ensure all possible choice options are included, that answer options are consistent and that leading questions are avoided. In addition, clear instructions were given to both the respondents and the surveyors, in order to ensure answers were valid.

Following the post pilot group, whereby 16 sample questionnaires were given to a selected group for trial, a number of limitations were highlighted - the most important being the subtle difference between asking a respondent to rate or rank, which led to ambiguous results. Rating was seen as preferable to ranking as rating gives someone's opinion, whereas ranking is only deriving someone's opinion in relation to other variables, making it difficult to discern whether the respondent likes or dislikes any of the answers on the list. For this reason, only one question remained as a ranking based question, and the remainder required rating.

Another key consideration was the translation of the survey into Italian. Given the researchers' basic linguistic ability, it was decided to employ a translator to ensure that the translation was as accurate as possible. This was subsequently checked by an external source in the language department. There is still the possibility that nuances and linguistics could alter the turn of phrase and potentially bias the results, but following discussion with bilingual colleagues, there was a consensus that a suitable survey had been created. It was decided in both cities to let the respondent read the survey and complete it, since oral

administration of the survey could lead to biases with regards to the intonation used when reading out the survey.

Data validity is defined by McNeil (2001) as to the extent to which the data we collect gives a true measurement or description of "social reality". One key area of attention was the data input stage. When inputting data into SPSS, fields were formatted in such a way that only the correct number of digits or characters could be input for a particular response. Following the data input stage, a sample of forty of the respondent's answers were double checked for accuracy and only one error was identified.

Administering the survey

A team of four researchers including the author administered the street surveys over a period of three days in each city. Interviews took place on a Tuesday and a Saturday between 08:00-12:00 and 15:00-19:00, with an average of around 100 respondents each day. The team was different in each city, so a briefing session was given to ensure consistency amongst the surveyors. The most important advice to the surveyors was to be careful not to prompt, lead or be suggestive in any way which could influence results. Once results had been obtained, data was input into an SPSS database for analysis. Data validation rules were in place to ensure that only appropriate values could be input into each cell. For each question, answers were categorised from 1 to 5: the score 1 representing the least concern, and 5 representing the greatest degree of concern.

4.5 THE SEMI-STRUCTURED INTERVIEWS

Kvale (1996) defines qualitative research interviews as an attempt to understand the world from the subjects' point of view. Hence, Patten (2002) suggests that the main task for the qualitative evaluator is to provide a framework within which people can respond, in a way that represents accurately and thoroughly their point of view about the subject. He cites the following advantages of qualitative interviews. First, the ability for the interviewee to use his or her own words in a way that is meaningful to him or her and so not being restricted by predetermined categories. Second, the ability to probe the interviewee, to ensure that answers are interpreted in the way intended. Finally, the interview allows for unexpected discussion. Limitations of semi structured interviews include them being considered quite intrusive, more susceptible to the dynamics between interview and interviewee and

unintentional cues, and the fact that they can be more subjective, because the interviewer is deciding what to place in the final report. Patton (2002) identifies three types of interview; the conversational interview, which is spontaneous; a standardised open ended interview, where a strict predetermined script is used and finally, the interview guide approach, whereby the interviewer has an outline of topic to be discussed but remains flexible. For this research, the third type is used, allowing flexibility but having some similar questions for comparison purposes. It is worth highlighting Guba & Lincoln's (1981) comment that the interviewer can be seen as a research instrument and can be affected by factors such as fatigue. Indeed Patton (2002) suggests that face to face interviews are like observation and so the interviewer should be sensitive to nuances and non verbal communication.

The aim of the interview was to explore the opinions of professionals and researchers in the fields of air quality management and especially transport. Due to the small size of the target population, the strategy was purposive sampling, whereby respondents were hand picked for the research due to the interest of the researcher (Polit & Hunglar, 1999) Dane (1990) believes that purposive sampling can offer the interviewer to delve into the extreme attitudes and concerns, rather than taking a balanced cross section, which is highly appropriate given the specialist nature of air quality management. According to Nachimus (1996), the aim is to explore the quality of the data not the quantity. The potential drawbacks could include not really knowing the size of the sample before the research begins and going against the tradition and having only a small number of respondents .

The time commitment involved meant that a low response rate was anticipated and as such, a total of 15 people were approached in each city, with it in mind that a response rate of 5 or above would be appropriate. In order to ensure that all fifteen respondents didn't agree to do the research, making the research infeasible, only seven were contacted initially and then after two weeks a further eight if the first stage had been unsuccessful The emphasis was not so much on getting exactly the same number of people in each city, or the same proportion of academics and practitioners, as the interview is not claiming to be representative, but rather informative.

An interview preparation sheet was prepared that provided guideline questions to follow, although it was anticipated that additional questions and points of interests would undoubtedly arise and create further discussion. Indeed, the semi structured interview allowed some degree of comparability between cities, but did not restrict the possibility of wide ranging answers. A mixture of open ended and closed ended questions were included. The nature of the interview meant that if a face to face interview was not possible,

it would be equally be valid on the telephone or by email. These options were likely to increase the response rate significantly. One criteria for the Italian side was that they speak English, as the author's basic level of Italian was not deemed sufficient to enter into complex debate. It was envisaged that most academics of interest to the study would have some command of English. One limitation of this was that the research could have missed some influential non English speaking air quality experts. Given the linguistic abilities of the researcher, this limitation was almost unavoidable.

4.6 Procedure and analysis

A general email was sent to the researcher's course contacts on the MsC Transport Planning Course at the University of the West of England. It attempted to identify potential interviewees working in the field of air quality management. This was an efficient way of doing it, as well as being somewhat more personal and so the respondents are more likely to be more obliging. In addition, extensive desk research identified potential candidates in both countries. Following this, e mail contact was made with each respondent outlining the research project and inviting them to be interviewed. For those who responded positively, a time was arranged, and if nothing was heard within 10 days a telephone call was made. Before commencing interview, interviewees were asked permission to tape-record the interview and asked whether they would like to be attributed in the formal report in person, in the name of the company, or anonymously. A tape recorded interview of approximately 60 minutes involved asking various questions. Following this, transcripts were sent to the interviewees, with a note of thanks and a follow up call was made in some instance when points of clarification arose.

Following the interviews, the transcripts were analysed to try and identify common themes amongst the interviewees. This was done by listening twice through the cassette. The first time involved only listening, and the second time taking notes, whilst looking for things that echo what the interviewees had previously said, and suggesting emphasis. Direct quotes were also selected and notes were taken about body language to see if that could confirm or contradict what the interviewees were saying.

4.7 Research Ethics

The ESRC (2007) makes the following recommendations in its research ethics guidance.

- Research should be designed, reviewed and undertaken to ensure integrity and quality
- Research staff and subjects must be informed fully about the purpose, methods and intended possible uses of the research, what their participation in the research entails and what risks, if any, are involved.
- The confidentiality of information supplied by research subjects and the anonymity of respondents must be respected
- Research participants must participate in a voluntary way, free from any coercion
- Harm to research participants must be avoided

The two main areas applicable to this research were informing participants about the purpose of the study and ensuring appropriate levels of confidentiality. For the informant interviews, a cover sheet was provided, which contained a checklist to ensure that the interviewer had informed the respondent the purpose of the interview, in which the level of attribution in the final report was agreed. In addition, transcripts were sent to each respondent after the interview to ensure it was a fair representation of the interview and the chance was given to opt out of being quoted in the final write up. This was particularly necessary for the informant interviews due to the sometimes emotive and controversial responded obtained. To ensure security, all results were kept in secure conditions in a locked office and electronic versions password protected.

Furthermore, at various stages throughout the data collection, the validity of the data was checked. Cells in the SPSS database were formatted in such a way that only the correct data format could be entered, whether that be date, number or text. A selection of the data inputted for the street survey was double checked to reduce the likelihood at the data entry stage. Finally, the street surveys were only conducted during daylight hours to ensure safety of research staff.

RESULTS

5.1 Results from the street survey

The total number of responses to the street survey was 204 in Turin and 207 in Bristol. Post survey validation checks resulted in seven surveys being discounted: three in Turin, due to incomplete data, and four in Bristol, due to illegibility of the questionnaires, which was brought about as a result of poor weather conditions. This meant that out of the total surveys, 96.5% were useable in Bristol and 97.1% in Turin. In the survey, a series of four questions were asked about attitudes to health in each city and a further five about attitudes towards air quality. A further two questions were asked about healthy behaviour such as consumption of fruit and vegetables and the amount of exercise. The table below summarizes the measures.

	Air Quality	Health
1	Local air quality is a key consideration in my choice of where to live.	Living life in the best possible health is important to me
2	Rate the following aspects of your local neighbourhood: [availability of local facilities, clean air, regular rubbish collections, low crime rates.	Eating right, exercising and taking preventative measures will keep me healthy for life.
3	In my opinion, the council should be doing more to tackle local air quality.	I do all I can to stay healthy
4	Local air quality is a key consideration in my choice of holiday destination.	I have no time to be healthy

TABLE 5.1 Measures of perception of health and air quality in street survey

Each possible response was then given a numerical value, in such a way that the higher the number, the more important air quality or health was perceived to be by the respondent. The score for each question was then added up to arrive at a total score for health and air quality for each respondent.

CITY	N	Mean	Std. Deviation	Std. Error Mean
Bristol	201	9.28	3.447	.243
Turin	200	10.72	3.244	.229

Figure 5.2. ***Statistical summary of the datasets.***

The mean score for the perceived importance of air quality was calculated as 9.28 in Bristol and 10.72 in Turin. There should be some caveats when using this measure. In many ways, it is a somewhat arbitrary measure, since there is no practical way of accurately measuring perceptions and attitudes to the nearest tenth of a unit, yet alone to whole units. In addition, the mean result provides little information as to the actual scale of the difference in perceptions. However, this research is more concerned with identifying the effect of culture on perceptions and its impact in the field of air quality management, rather than seeking to calculate a quantitative measurement of this effect. In brief, this result shows that on average, the Turin respondents attached a higher level of importance to local air quality than the Bristol respondents.

An independent *t-test* was conducted, which revealed a t statistically significant difference between the two means ($t(399) = 4.312$, $p = <0.01$). Hence the null hypothesis that there is no difference between perceptions of air quality in Turin and Bristol was rejected, and the research hypothesis that there is a difference between the city's perceptions accepted. This finding was a fundamental prerequisite to making a claim that culture has an influence on perception.

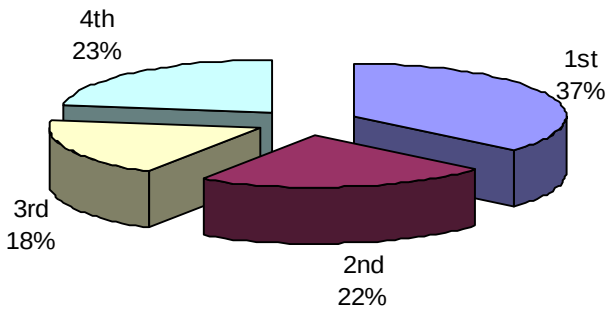
Key findings

Graph 5.2 depicts where having clean air fitted in as a local priority, compared to having regular rubbish collections, local amenities and low crime rates. The results reveal that approximately three times more respondents in the Turin sample rated having clean air as their number one priority compared to Bristol. The distribution of that priority shows that 73% of Bristol respondents felt that having clean air was amongst their bottom two priorities, compared to only 43% of Turin respondents.

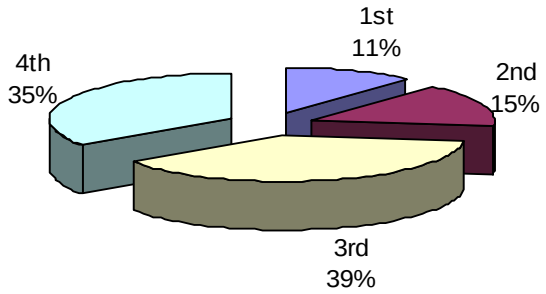
There was a clear divide between the two countries as to the extent to which local air quality plays a role in the decision of choosing an area to live. Indeed, whilst a majority (73%) of the Turin respondents either agreed or strongly agreed it was a consideration, a significant

number of Bristol respondents were neutral or disagreed with this statement. Nearly twice the number of Turin respondents compared to Bristol respondents agreed or strongly agreed with the statement “living in best possible health is very important to me.” (Turin 66.2%, Bristol 33.5%). A fifth of Bristol respondents disagreed. When asked to what extent they agreed with the statement “I do everything I can to stay healthy”, 81% of Turin respondents agreed or strongly agreed, compared with only half that amount (42%) in Bristol. Only 6% of Turin respondents either disagreed or strongly disagreed with the statement “I have no time to be healthy”, compared to 35% in Bristol. This suggests that unlike in the Bristol sample, the Turin respondents did not see time limitation as a barrier to being healthy.

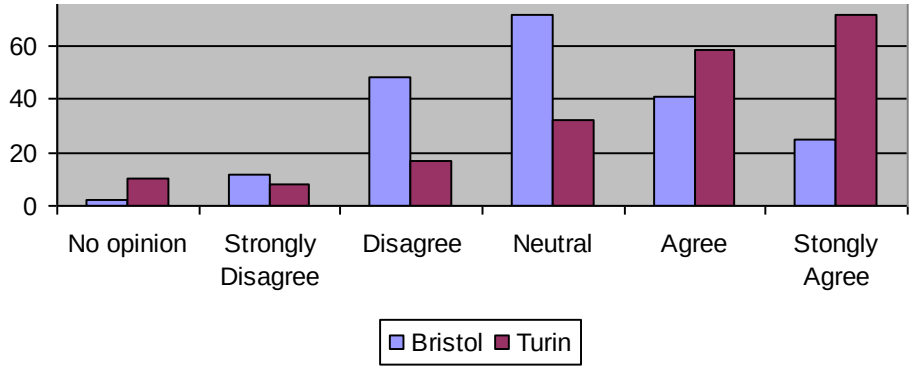
Graph 5.3 Ranking given to having clean air amongst Turin respondents



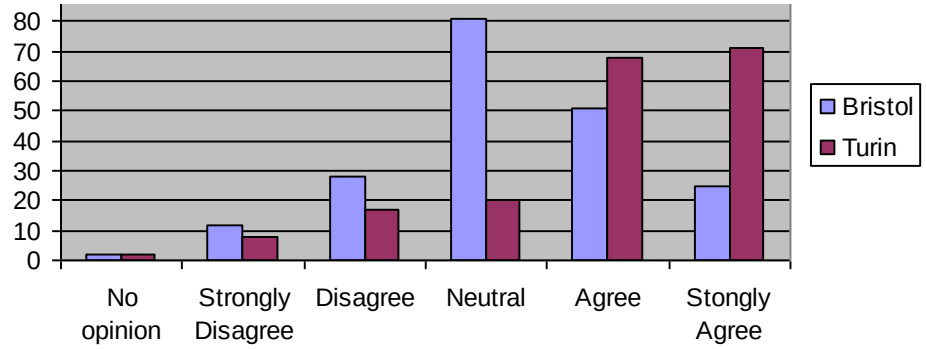
Graph 5. 4. Ranking given to having clean air amongst Bristol respondents

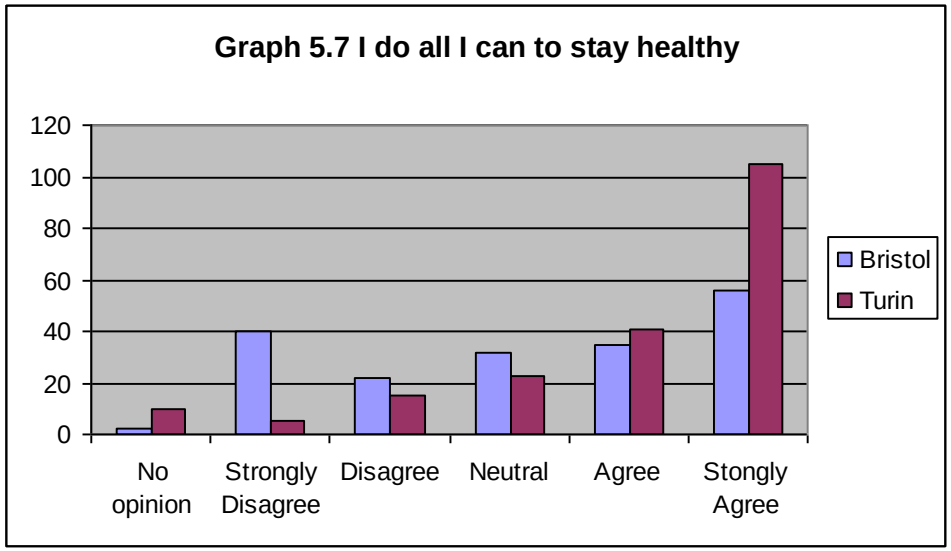


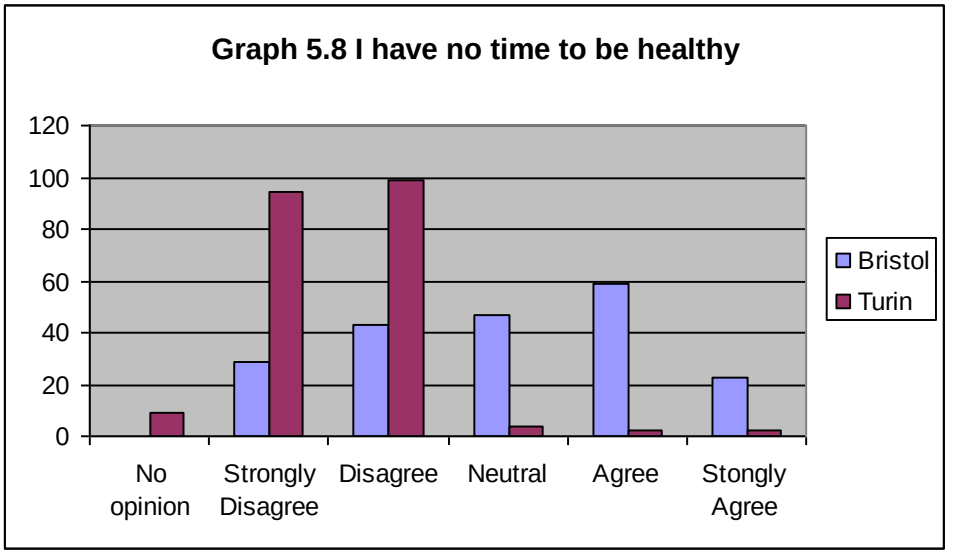
Graph 5.5 Local air quality is a key factor in my decision of where to live



Graph 5.6. Living life in the best possible health is very important to me




Graph 5.7 I do all I can to stay healthy
120
100
80
60
40
20
0
No opinion
Strongly Disagree
Disagree
Neutral
Agree
Stongly Agree
Bristol
Turin


Graph 5.8 I have no time to be healthy
120
100
80
60
40
20
0
No opinion
Strongly Disagree
Disagree
Neutral
Agree
Stongly Agree
Bristol
Turin

Results of the chi squared test.

Objective two hypothesized that there is a relationship between the importance attached to health and the importance attached to air quality. To uncover this relationship, a Chi squared test was used to test for a relationship between the priority given to clean air and the agreement to the statement "living in the best possible health is very important to me." The chi squared test was chosen as is generally considered useful for the categorical values used in this research, whereas the T test is more suited to continuous variables. The Chi squared test, in order to be a valid test, requires that each subject only contributes data to only one cell and that there are at least 20 values. (Mathsbean Project, 2006)

A statistically significant relationship was found between these two variables. x^2 (15) = 38.230, p = <0.01), and thus the research objective that there is a relationship between perceived importance of health and perceived importance of air quality was accepted. Further details of the calculations can be located in the appendix.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.230	15	.001
Likelihood Ratio	38.461	15	.001
Linear-by-Linear Association	22.206	1	.000
N of Valid Cases	402		

Table 5.9 SPSS output for chi squared values

5.2 Results of the informant interviews

Overleaf three key themes have been drawn out of the informant interviews. Summary table 3.2 below shows the name of each of the 10 interviewees and brief details about their roles and responsibilities within the organisation they work in. A number has been assigned to each interviewee, which will correspond to future references to their interview. Further interview summaries and details about the companies can be located in the appendix. Note 3 of those interviewed requested anonymity and are not attributed by name.

TURIN		**Bristol**	
Name	**Responsibility**	**Name**	**Responsibility**
1 Mr S. Crawshaw	Air Quality, Bristol Council	6 Dr P Casselini	Traffic telematics
2 Anon	Bristol City Council, transport	7 A. Marsero	Research student
3 Pr. J Longhurst	Air Quality Centre, UWE	8 ing A. Cocucinno	Chief executive GTT
4 Anon.	Air quality expert at Halcrow.	9 C Vitale	Fiat Research Centre
5 Anon	Air Quality expert Peter Brett.	10 Arch G. Foti	Lecturer in Air Quality

Table 5.10. List of Interviewees for informant interviews

BRISTOL

1 With 97% of the transport related air pollution originating from the car, even if the air quality action plan were fully implemented Bristol Council would still struggle to meet its objectives. […]The main focus of the council has tended to be reducing car use through the car club, 2+ lanes, promoting cycling.

2 Bristol is reliant on a “high profile” scheme such as congestion charging to have any effect on the alarming rates of traffic growth and consequent air pollution.

3. Scientifically, research suggests that a large proportion of air pollution is carried in by the wind, so our transport measures alone are likely to have only a limited effect.”

4. Whilst technology is invaluable to measure and monitor air quality levels, I am sceptical about the over application of technology […] Simple measures are often more effective, for example reducing the speed limit on M32 to 50mph.
5. I feel that the best way to improve the way we manage air quality here in Bristol is to increase coordination between air quality professionals and transport planners- as this is fragmented at best in my opinion

TURIN

6. Much of the problem is caused by the inefficient use of transport, rather than simply blaming car drivers. At 5T we our central aim is to better manage poorly coordinated junctions which cause unnecessary queuing and delays. This especially a problem in certain junctions that have not been linked and are in effect stand alone

7. Three core aims are to reduce waiting times, to help citizens move around the city more quickly and reduce pollution. Provide real time information on car parking , traffic conditions, route planning in a holistic approach. Recent project linked bus timetable information to Google Earth

8. The car is banned on weekdays in the ZTL’s, showing the seriousness taken towards the externalities of car travel, But one cannot just ban the car, there needs to be realistic alternatives- this is where my job comes in to promote the alternatives.

9. Technology, if used in a sensible and logical way can help reduce transport related air pollution.

10. During the Olympics he traffic management centre and traffic information centre were brought together in a coordinated approach.

BRISTOL

1. Bristol Council is involved in international forum such as Eurocities and Polis . I am pleased that all European cities and countries seem to be working towards the same goalpost.

2. It seems sensible to see what works and what does not work. Politics plays a big role in this, for example work to introduce air quality management processes in Beijing was hindered as it conflicted with the rampant economic growth that they were experiencing out there.

3. Strategically I would ask myself why does the UK need an emissions inventory and Italy not. Comparing with other cities could lead to huge efficiency gains.. From another angle one could argue that tolerance of air pollution is culturally influenced.

4. Cultural difference is given little consideration when comparing countries as it seems common sense to check any proposed measure is in line with what would normally work in the country. It is more about gathering ideas than simply copying another country's idea

5. If it is the EU setting the standards, it seems logical that the European level can be used as a platform for gathering information

TURIN

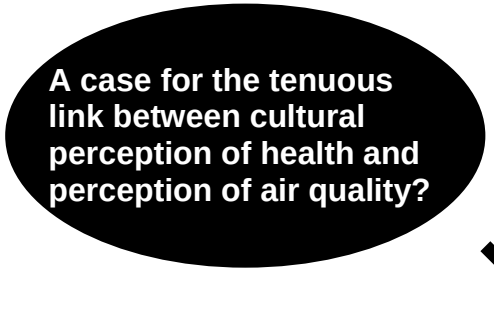
6. "Our authorities regularly work collaboratively with cities in other countries and share best practice. […] Naturally it would be naïve to simply implement a measure or policy based solely on it working in another country – there are geographical, topographical and political differences between each country.

7. It is no different to comparing another city in the same country, caution should be adopted. […] In the same way Turin should not exclude options that do not work elsewhere such as the decision to build car parks underground to free up street space would not be considered good practice in other countries

8. There are cultural factors which could influence how effective the policy is, I think Italians generally don't like being told what to do and so enforcement of the ZTL's was of paramount importance

9.. Also Turin residents have typically smaller cars, but is then result of a concern for the environment or simply meeting a practical need ? to find parking spaces?

10. I think the primary explanation for measures being more effective in different countries is practical reasons such as political structure, resources available, and that socio- cultural factors could explain some of the deeper underlying trends.



BRISTOL

1. I believe that if people were more aware about what they are breathing they may be more concerned about air pollution levels, but being concerned is not a precursor to taking actions. […]

2. There are two aspects of health, that which is tangible and direct actions can be taken, such as reducing cholesterol by eating less fatty foods, and the intangible, that which seems beyond an individuals control. […] The smoking ban could be used as an example of where health and air quality have been interlinked by government policy, perhaps making car use so socially negative as smoking could be the way forward.

3. Our research has shown that many people experience the health effects of air pollution when they are asleep so perceptions of health impact can be an unreliable measure

4. No comments

5. […] The assumption that more health consciousness are more healthy is negated by the way in which asthma suffers may be more aware of the problem of air pollution and more concerned about the air which they breathe..

TURIN

6. It is clear that if an individual travels further in the car, that journey will have the doubled effect of the opportunity cost of the exercise in the form of walking that could have taken place, and the extra pollution. [..]

7. [..] I know this sounds stereotypical bit the typical Mediterranean diet in Italy is tied up in the association with alfresco dining, fresh ingredients and the countryside. It can almost be the case that just as it seems impossible to imagine an advert promoting alfresco dining with air pollution in the background, that health and air quality are intertwined concepts.

8. “It is ironic that some people who are more concerned about their health may drive to the gym and more frequently, thus contributing to urban traffic pollution. This negates the relationship between perception of health and perception of air quality. […]

9. It could be argued that healthy people are more likely to walk and cycle and so are not the main contributors to the urban pollution problem because they are not driving. It follows through, then, that even if the health conscious are more concerned about air pollution, targeting this sub group would be unlikely to translate into a tangible reduction in pollution.”
10. No comments

ANALYSIS & DISCUSSION

6.1 Overview.

This section will draw out commonly occurring themes in the street survey and the informant interviews with the view to capturing not only what was said, but looking deeper into the implications of what was being said. This will subsequently be discussed in light of the research context and the literature review. Figure 6.1 summarises the three research objectives, which form the basis of the research and shows how they shall be achieved.

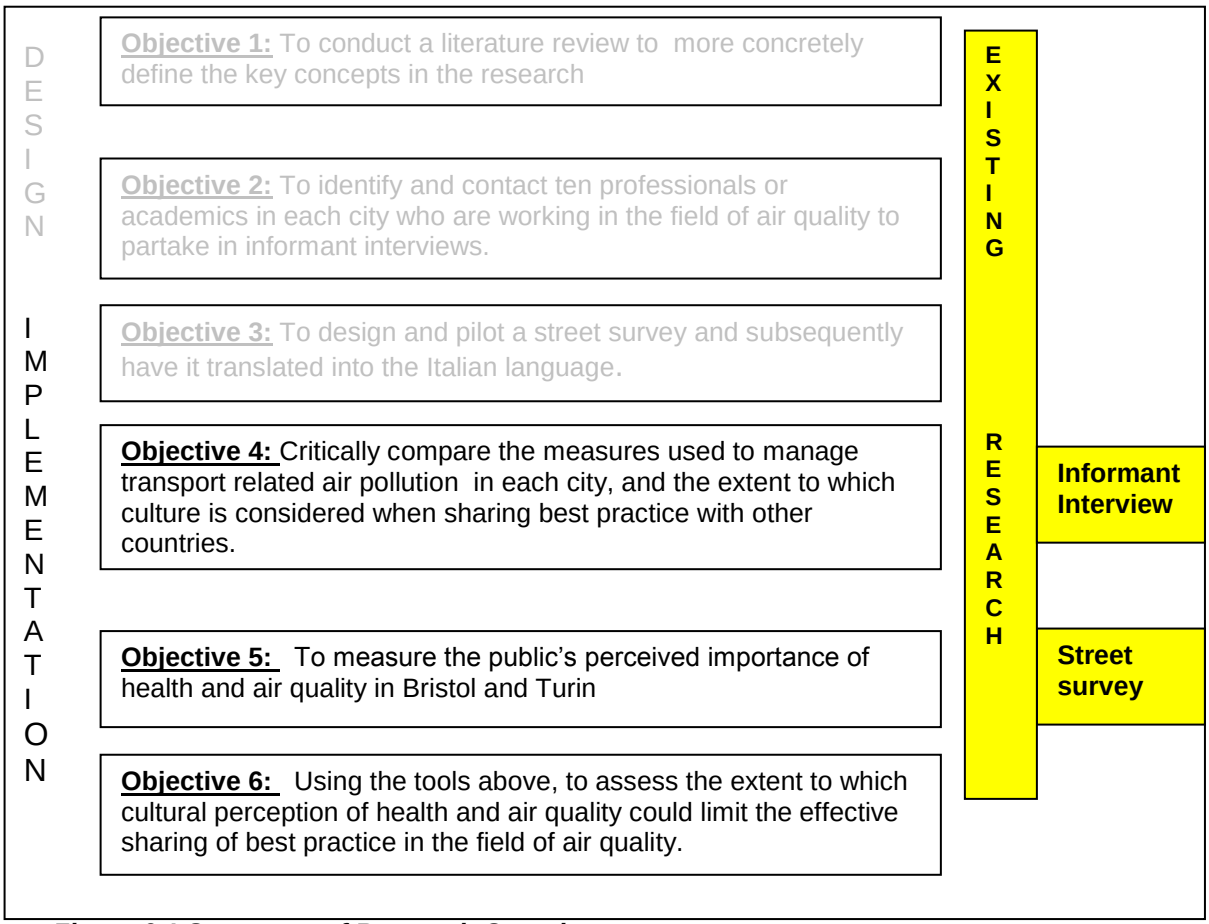


Figure 6.1 Summary of Research Question

6.2 Discussion of results

OBJECTIVE 4a : To critically compare the measures used to reduce transport related air pollution in Turin and Bristol and the extent to which the role of culture is considered when sharing best practice.

The underlying approach to improving local air quality

Scrutiny of the interview transcripts revealed that the words '*car'* and '*drivers'* were used 28 times during the Bristol interviews, compared to 34 in the Turin interviews, making them the most commonly referred to words in the interviews. Whilst this is perhaps of little surprise, and fits with Krzyzanowski et al's (2005) observation that the effects of air quality cannot significantly be reduced without significant progress in the transport sector, that which is of most interest to this research, is the context within which the term '*car'* was used. It is also valuable to see what this can reveal about the underlying approaches of each country when seeking to reduce transport related air pollution. A key theme emerging from the informant interviews was the differing perspectives concerning the relationship between car use and the subsequent level of pollution. There was a general consensus amongst all those interviewed that transport related air pollution was the product of inefficiency at various levels within the transport sector, and that effectively reducing air pollution meant addressing these inefficiencies. Those interviewed in Bristol more commonly alluded to air pollution reduction measures that focused on the car user and his decision of how and when to travel. As a representative of Bristol City Council succinctly put it [respondent 2]:

> "*over 97% of transport related air pollution originates from the car, so we need to reduce car travel. It's the only logical way forward".*

This was followed by much discussion about the benefits of reducing car travel through the use of 2+ lanes, car sharing and the merits of encouraging drivers to switch off their engine whilst stationary in traffic.

On the other hand, if the discussion about the measures in Bristol can be said to be predominantly focused around improving efficiency through the user itself, then discussion in Turin could be said to revolve around improving efficiency in the network in a holistic multimodal approach. Whilst those interviewed on the whole, recognised that reducing car travel was a necessity, indeed as discussed earlier, cars have been banned in the city centre on weekdays in Turin; there was an impression of an attempt to go beyond simply restricting cars, to explore areas where pollution emissions could be reduced without banning cars. This is not to say this concept was not alluded to in Bristol, as they too have

measures to improve network efficiency, but rather the observation during the respondent interviews was that this was more central to discussions within the context of air quality. Respondent 3 in Turin put it like this.

> "*We cannot simply ban all cars, that idea is preposterous. By simply transferring travel from road to bus and other modes, it is assuming that all the time spent travelling is desired, whereas in reality, road inefficiencies like wasted time finding a car parking space and miscalculated roundabouts can cause inefficiency on the system"*.

The Managing Director of 5T [Respondent 1] described his company's core aims as reducing waiting time for all those travelling around Turin and through this, to reduce air pollution.

> "*Our approach is modally agnostic. We strive for more efficient travel around the city for all. We believe in the longer term- that is to say, we recognise that achieving modal shift by discouraging car use, in other words forcing car users to take a bus that will take them longer will mean they are more likely to revert to car use."*

This difference in approach could begin to explain the frustration that began to come through amongst the Bristol respondents. Adopting a user based means dealing with the complex interactions of people and the society around us. This effectively means one of two options; either that improvements in air quality must come about by a high profile project which is politically controversial, or moving people out of their cars, which is equally no easy task. The frustration was emphasised by one member of Bristol council who commented [Respondent 1]

> "*although transport is one of the remaining objectives to be met in the action plan, I feel ill informed and have a lack of voice about future developments*."

In Turin, on the other hand, seeking to address network inefficiencies means that policy makers are less quick to apportion blame for transport related air pollution entirely to the driver. In other words, whilst duration of use of the car, and its subsequent pollution level is ultimately a function of a driver's decision to travel by car, it can also be seen as a function of how efficient the network is. Perhaps was given more recognition in Turin than in Bristol. Turin respondent 4 used a rather helpful concrete example to clarify this point.

"*If a twenty minute car journey takes forty minutes to complete, and this is due to inability to find a parking space; is it fair to blame the driver for this network inefficiency? Of course, your argument could go along the lines of 'they shouldn't have been driving in the first place', but the fact remains that they were driving and there was a doubling in pollution levels, which can be attributed to factors beyond their control. That is where we are coming from"*

This is perhaps one reason why technology was viewed with more favour in Turin, as the type of task they are undertaking – improving network efficiency is perhaps better suited to use of technology, whereas managing people through use of technology has proven more problematic.

Implications:

Questions about how to more effectively managing transport related air quality are intertwined with another key question; how do you go about approaching the concept of transport inefficiency. The selected approach h will not only have implications for the measures used, but also for the problems that are likely to be encountered when implementing these measures. Discussion about improving air quality could be seen to have been highly focused on the car, and missing other opportunities to see a considerable reduction in air pollution. This being the case, transport planners, when looking at other countries for measures need to understand that the visible concrete measures are an output of a series of complex relationships which need to be understood.

OBJECTIVE 5 : To measure the public's perceived importance of health and air quality in Bristol and Turin.

The findings of the street survey show that the Turin sample on average, perceived health and air quality as more important than the Bristol sample. The difference was most recognisable in the extent of agreement with the statement that they do everything they can to stay healthy, and the extent to which living life in the best health possible is important to them. These findings seem in line with the health statistics previously alluded to, revealing a higher doctor per patient ratio in Italy, as well as a more frequent doctor visit rate and better perception of healthcare. Air quality was also perceived as more important on average. However, there are many difficulties in interpretation of this statement, both at the methodological level and at the theoretical level, which need to be rigorously explored in order to properly answer the second research question concerned with measuring the

public perception of health and air quality in Bristol and Turin and the extent to which it is culturally influenced. Referring back to Wilkening's (2000) scepticism of the ability to operationalise culture in research, it is clear that measuring perceptions and attaching a quantitative value to them is problematic. Indeed Bell (2005) argues that even if this were possible, perceptions are not an accurate representation of the health effect of air pollution.

Perceptions of air quality and health are too based on the basic smell and visibility which means that many types of harmful pollution are not detected, and some of the health effects occur at night. If this is the case then this research could be seen by its more harsh critics to attempt inaccurately measure that which cannot be measured.

Naturally, this research counters this argument, by arguing that a direct approach, such as simply asking respondents to answer the question "are you concerned about air quality" would in most cases lead to an affirmative answer and not really answer the question in a methodologically valid way.

Given the incongruous nature of the topic area, no one single question from the survey can, and indeed should be taken in isolation to answer the research question but the research should draw out what can be learnt from the totality of the questions. This could be analogous with culture itself, that just looking a food and drink is a far too narrow focus, leading to the creation of unfounded stereotypes. For example, whilst is true that considerably more respondents ranked air quality as a number one priority in Turin than in Bristol, this is only representative of a limited choice set given to respondents in the survey. Any critical observer would wonder if the results would be different if the sub set were different, or indeed whether it is possible or indeed appropriate to meaningfully compare elements that are so different to each other as regular rubbish collections, low crime rates and availability of local amenities against each other.

The ranking process itself could be potentially influenced by a wide array of factors, from class, gender, socio-demographics, and also existing provision, and the literature review revealed a whole array of other factors ranging from proneness to anxiety, urban verses rural setting and access to information. Taking these variables into account, the very fact of conducting the street surveys in a key shopping area could create a bias towards more affluent respondents who may well live in areas where crime rates are already low and rubbish collections regular, whereas respondents from lower income areas could be more concerned about lack of local facilities. Indeed one respondent anecdotally mentioned that he had become more concerned about air quality recently, following significant

improvements to the rubbish collection service. It could be argued that local facilities are taken for granted when they are good and only become important when they are lacking or inadequate in some way. In brief, ranking regular rubbish collections as more important than having clean air could have nothing to do with importance attached to clean air, but rather the lack of rubbish collection facilities. This questions its validity as measure of concern for air quality. The data seems to suggest that potentially concern about clean air could be seen as part of a broader subconscious hierarchy of needs, in that regular rubbish collection and personal safety are perceived as basic needs that need to be fulfilled before concern for higher needs such as clean air. I say perceived, as it is ironic that according to Maslow's hierarchy of needs air to breathe is the most basic of requirements, yet poor air quality is contributing to premature death. This lack of perceived concern could be attributed to the longer term nature of the effects of air pollution, the intangible nature and also going back to the use of limited sense of primate senses such as smell do not make people sufficiently concerned. Whilst further research would be required to discover this need, it could be the case.

The finding that air quality has greater prominence in the decision of where to live in Turin than Bristol does seem to indicate that the Turin respondents value the cleanliness of clean air. This was supported by one of the questioned who suggested that "Italians enjoying hanging about on the street socializing" and

> *"Italians generally live in flats and so open space and clean air is really important to us" "I mean, we have the Mediterranean stereotype, but it is true that we do like to do a lot more things outside*.

There could also be a link with Turin having better weather making people spend more time outdoors and so are more likely to notice air pollution. One respondent quite rightly pointed out that the process of choosing a house is fraught with difficulties and air quality is the least of their concerns. It may be tied in with other factors such as desiring a garden and not being near a road and so air quality may be better, but I see clean air as a bonus not a necessity. Perhaps it is more of an indirect effect. " Also it must be borne in mind that decision to live in a clean area does not always guarantee clean air. Recent developments such as the M32, which opened in 1970's, meant areas that were once abound with green fields are now so close to the motorway that they cannot even open their windows.

Implications

Concern or lack of concern for air quality is generally going to be measured in relation to other aspects, as it seems illogical that someone would actually want dirty air. The finding that there is a tenuous link between cultural perception of health and air quality has several implications. First, as discussed earlier perceptions are not an accurate measure of actual damage to health, so there is clear need for government action and involvement. Second, if perceptions are different in each country this means they can be changed. Thus a potential outcome of this research could be that new campaigns to reduce car use could be guised as health campaigns. A good example of this was mentioned in Turin where the night bus was promoted with two core aims, to reduce drink driving and also reduce pollution. This requires better integration and taking a more holistic approach to managing transport related air quality. It is moving from seeing health as an inevitable outcome of the extent of air pollution to an input that can guide the appropriate selection of measures. For example walking instead of taking the car will have ostensible health benefits and will improve air quality. The Japanese study shows how really knowing the audience can have real effects. The implication being that pollution reduction measures should be more firmly based on social studies.

Objective 4b: To critically compare the measures used to reduce transport related air pollution in Turin and Bristol and the extent to which the role of culture is considered when sharing best practice.

Four out of five of the Bristol respondents and three out of five of the Turin respondents claimed to have taken part in cross country sharing of best practice within the last year. However when probed further it became apparent that there was a lack of consistency in defining sharing of best practice. Each respondents definition varied according to the degree of information sharing, how information was used, the type of information being shared and the formality of the process. Indeed it was interesting that two of the interviewees were not even aware they were involved in the process of cross country comparisons, showing the potential informality of sharing of the process.

The implication here is that if sharing of best practice is taking place automatically or unknowingly in some instances then, even if culture can be proved to be an influence in the process, how can we add this consideration to a process that doesn't exist? This was

proven by the way in which out of these only two in Bristol and two in Turin had actually acted on the best practice in a specific scheme, that is consciously.

If defining sharing of best practice was somewhat ambiguous, then defining culture was even more problematic. One respondent suggested “of course I think culture is important when looking at practice overseas. Its “how we do things over here”. Going back briefly to the debate over a definition it would be perhaps more appropriate to ask “why we do things over here” and why what we do over here is different to what we do “over there”. Strictly speaking even this doesn’t capture the essence of culture as the motivations behind a measure are not always the same. This vagueness concerning the role of culture and indeed what it is could be symbolic of the broader divide between anthropologists and scientists introduced earlier. Air quality measurement, by nature is hard evidence based, and quite scientific in approach. For scientists to even contemplate culture having an influence would require a marriage between two disciplines, or else culture becomes the odds and ends of society or the last resort. Another responded “I think the primary explanation for measures being more effective in different countries is practical reasons such as political structure, resources available, and that socio- cultural factors could explain some of the deeper underlying trends.” There was a general impression amongst both cities that cultural diversity can explain why one measure may work in one country and not another, but that it could be represented as a triangular relationship with physical factors such as the topography and composition of streets and structural factors such as political structure, financial structures on the bottom.

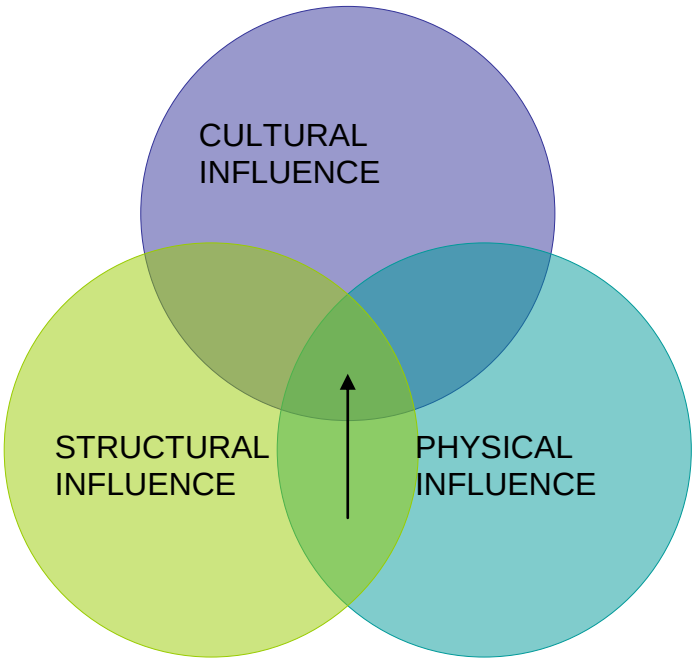


Figure 6.2 The barriers to effective implementation of best practice – introducing culture into the equation.

These influence and are influenced by culture, for example one respondent suggested that the restricted traffic zone in Turin was "successful not only because of the centralised political structure and the topography but also because banning cars in Turin centre meant that streets were once again free for people to roam in, and the Italians' enjoy open space" . The effect of culture is described by one respondent as indirect and subtle and so is not given so much consideration.

	Physical	**Structural**	**Cultural**
Turin	Topography & climate accentuating pollution problem.	Political power to make changes	Attachment to open space (ZTL's)
	The extent to which pollution is carried in the wind	coordination with existing infrastructure	Tolerance level of air pollution
Bristol	Problem of Canyon Streets & other space limitations	Consistency with UK transport policy.	Previous policy and impact on attitude to new measure
	Financial constraints	Political acceptability	

Figure 6.3 Explanatory factors why a measure may work in one city and not another.

Implications

Sharing of best practice was found to be quite common amongst those seeking to address transport related air pollution, yet culture was given surprisingly little consideration in the process. This is surprising as culture is given paramount importance in a company marketing abroad. In some sense a transport measure could be similar to a product, in that it meets a need and has a certain cost attached to it. A deeper understanding of the importance of culture when involved in cross country sharing of best practice could lead to countries being sub divided into groups according to their cultural similarities. For this to happen there needs to be greater cooperation between air quality scientists, transport planners and social scientists, and a certain degree of patience and understanding of their different methods approaches and expectations.

OBJECTIVE 6 : To assess the extent to which cultural perception of health could limit the effective sharing of best practice in the field of air quality.

There was some controversy regarding the concept of cultural perceptions of health affecting the way air quality is perceived. A simple question here must be whether the two both being perceived as higher could be coincidental or whether it has signifcance. Whilst it was recognised that if people were more aware of the health implications of what they are breathing they may become more concerned about air pollution, there was a debate over the practical application of this. If this argument is inverted it suggests that those not concerned at all are less likely to act to reduce air pollution. To some extent this seems a logical deduction, however it makes the unfounded assumption that concern for air quality is directly correlated with actions to reduce it. There are instances when this is clearly not the case, in that people can choose to take the bus instead of the car for a plethora of reasons, one of which may or may not be related to air quality. Even if an individual is concerned about air quality there was a strong suggestion that those who consider themselves more healthy may be more likely to cycle and walk and not be the people, who on the whole, contribute to local air pollution.

Thus there was a suggestion that a key limitation of this finding would be finding the group in the first instance and that targeting this sub group is unlikely to translate in a tangible reduction in pollution. Having been used to dealing with hard facts and figures, the fuzzy nature of perceptions and culture seemed to be frowned upon, such as respondent who said “how’s all this going to help reduce Bristol’s pollution levels then?” Perhaps this goes back to the broader lack of synergy between social scientists and air quality scientists who

are more quantitative based. It was suggested that although the field is practical, the people in the field are personal and there needs to be more a marriage between these two aspects.

CONCLUSION

The research sought to discover the extent to which cultural perceptions of health and air quality could be a barrier to the effective sharing of cross country transport best practice. The cross-country sharing of best practice was found to be relatively common in both amongst both professionals and academics working within the field of air quality, both as part of a formal collaborative process, and indeed more informal; to the extent that in one case it was taking place subconsciously. Yet, whilst many of the respondents were conscious of the need to take account of differing physical and political contexts when sharing information, far fewer felt that cultural difference was another factor to consider. This low level consideration of culture in the process of air quality management is reflected in the way that European Directives to reduce air pollution actively encourage cross country sharing of best practice explicitly allow flexibility for such differences to take account of each country's different political and economic backgrounds (Air-EIA, 2000); yet seem to make no reference of cultural diversity.

The research found the public's perceived level of importance of air quality and health to be statistically different between in Bristol and Turin, suggesting that perceptions of air quality can be seen as culturally influenced. The scarcity of consideration of culture when managing local air quality is all the more concerning in the light of this research's findings that not only are those in the field of air quality working in a field where behaviour change is influenced by culture, but in addition, the practionners themselves are influenced by their cultural setting which changes the way they see the world. Indeed, amongst the professionals there was an interesting divergence in the underlying approach to managing air quality. Those in Turin seemed to favour improving network efficiency through optimisation of traffic lights, provision of real time information pertaining to parking traffic conditions, whereas in Bristol there was evidence that the approach was more focused on user inefficiency, with much emphasis being place on 2+ lanes and car sharing initiatives.

Furthermore, there was a tendency amongst those involved in cross country sharing of best practice, to look at the tangible measures to reduce air pollution that have worked in a particular city without considering them as an output of a series of complex relationships that can help understand why they have been successful. More broadly speaking, an

underlying theme in this research was the conflict between an individual's simultaneous desire for mobility and independence and the desire for clean air and environmental protection, which has proven a major barrier, politically speaking; to the implementation of major transport measures that have the potential to significantly reduce transport related air pollution such as congestion charging.

Whereas traditional studies into people's attitude environmental matters have tended to segment people according to their attitude itself, suggesting that a certain type of person is more likely to be concerned about environmental issues and conduct pro social behaviour, this study makes the case for the existence of geographical variation in perceptions of air quality and particularly that within a specified geographical area there is cultural variation, in other words, that which distinguishes one group of people from another. This being the case, there is an argument for greater attention being given to the features of that local area and its cultural differences when sharing best practice.

The second key finding of the research was the existence of a tenuous link between the perceived importance of health and the perceived importance of air quality, suggesting those who perceive health as more important will perceive air quality as more important. Although some instances were identified where this may not be the case; for example the health conscious person who drives to the gym rather than cycling to work; this link could be quite useful in developing integrated approaches to managing air quality.

In effect, if culture is seen as having a role in the construction of perceptions towards air quality and health then, this means recognising that air quality management is not conducted within a vacuum and that transport measures used in one country will not necessarily work in another.. The research is not arguing against the sharing of best practice in transport measures, indeed this can be highly beneficial in many cases. However, it should be conducted in a more cautious manner, and the list of reasons for the need for flexibility in specific transport policy should extend well beyond that suggested in the directives as simply political and social.

With this in mind, cultural perception of air quality and of health could indeed be considered a barrier to the cross country sharing of information in the field of air quality management - perhaps explaining why measures may work in one country and not another. Failure to consider culture's role and simply considering the tangible and most obvious structural and practical considerations could lead to unwise choices. This having been said, the inverse of this finding is that a deeper understanding of culture's role, far from being seen as a barrier,

limiting cross country sharing could be seen as an opportunity to be used to better tailor transport measures to the needs of the culturally distinct area in which the field of air quality management is taking place. This research recognises that culture is only one of a whole range of explanatory factors as to why different measures work in different countries. Culture's influence and the role of perceptions of health and of air quality, even though they may be small and hard to separate out individually cannot and should not be counted as insignificant. Clearly, a policy measure considered in isolation may be ineffective because of the countervailing impact of other factors.

One of these factors, as this research has unveiled is culture. By giving greater consideration to cultural difference as a factor when sharing transport best practice between countries, the practitioner will able to maximise the benefits of sharing information, whilst simultaneously reducing the impact of potential barriers that determine how effective implementation is likely to be. This more multi-disciplinary and holistic approach to managing local air quality could have the result that policy efforts begin to work in coordination with each other rather than internal competition being created the disciplines of the environment, transport and air quality management.

Opportunities for Future Research

Whist this research has identified that cultural perceptions of health and air quality can represent a barrier to the sharing of transport best practice, the exact extent of this influence remains unknown. Future research could attempt to quantify the extent of the influence of culture. This study could be questioned regarding the transferability of the findings. Having selected just two cities and just two comparison countries to establish this link, perhaps future research could confirm this link using a greater number of comparison cities. In addition, attempts could be made to identify countries with similar cultural traits with a view to segmenting countries by cultural similarity rather than by geographical boundaries. Underpinning the research is the assumption that culture can be accurately measured – if it cannot then the value of the research could be significantly reduced.

APPENDICIES

University of the West of England
BRISTOL

Street Survey

To be completed by interviewer

1. ***Rate the following aspects of your local neighbourhood according to how important they are to you. 1= most important, 4= least important. If two aspects are equally important the same number can be used twice.***

a. Availability of local facilities	1	2	3	4
b. Clean Air	1	2	3	4
c. Regular Rubbish Collection	1	2	3	4
d. Low Crime Rates	1	2	3	4

2. ***Circle the response that best describes your opinions about the following statements***

a. Local Air quality is a key consideration in my choice of area to live.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Opinion

b. In my opinion, the council should be doing more to improve local air quality

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Opinion

c. How much exercise do you undertake in a typical week? (This can include walking, cycling, as well as other recreational activities)

Up to 30 minutes	up to 1 hour	up to 1.5 hours	up to 2 hours	2 hours or more

d. How many fruit or vegetable portions do you consume in a typical day?

0	1	2	3	4	5+

e. Living life in best possible health is very important to me

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Opinion

f. I do everything I can to stay healthy

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Opinion

g. I simply haven't got time to be healthy.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Opinion

h. Eating right, exercising and taking preventative measures will keep me healthy for life.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Opinion

Interview Guide

Research for the Msc Transport Planning Dissertation

THANK YOU FOR AGREEING TO ANSWER A FEW QUESTIONS TO HELP ME WITH MY MSC DISSERTATION WHICH WILL COMPARE THE AIR QUALITY MANAGEMENT PRACTICES BETWEEN BRISTOL AND TURIN. IN ORDER TO COMPLY WITH ETHICAL RESEARCH GUIDELINES, I ADVISE YOU THAT ANY INFORMATION YOU GIVE WILL REMAIN ANONYMOUS WITHIN THE RESEARCH. THANK YOU FOR YOUR TIME.

1. Please give me a brief outline of your background within the field of air quality.

2. To what extent has local air quality has seen an improvement since you began working in the field?

3. What effect will the new Cabot Circus development have on local air quality in your opinion

4. Given that research points to transport as one of the largest contributors to local air pollution, would you agree that changing travel behaviour is the biggest challenge when seeking to improve air quality?

5. In your opinion, is there sufficient integration between transport planners and air quality professionals

6. How do you view the relationship between global warming and local air pollution?

7. How aware do you feel the public are aware of local air quality issues in Turin/Italy?

8. Do you feel that each country's different attitude to health and healthcare can affect the perceptions of air quality

9. How important do you feel the congestion charging would have been in helping to improve air quality? Is there a reliance on these centrally led schemes to improve air quality?

10. How do you see the role of technology in helping to improve urban air quality?

11. Any final remarks?

Summary of Informant Interviews

Name	**Responsibility and key ideas from informant interview.**
1 Mr S. Crawshaw	Manager of the CREATE centre for sustainability in Bristol City Council. His Role is to manage local air quality through the local air quality management process, which has been in place since 1999. He did express concern and frustration at not meeting the air quality objectives, especially PM10 and average annual mean for No2. He suggested that transport is by far the main challenge in managing air quality, quoting that a high of exposure is down to transport emissions. He went on to comment that even if all of the items in the action plan were implemented then they would still struggle to meet the objectives.
2 Anon	Bristol City Council, transport Planner. Responsible for assessing the impact of new developments on the transport network and the likely pollution increases. Much emphasis on high profile and politically controversial programmes and felt a sense of frustration at the lack of advancement.
3 Pr. J Longhurst	Air Quality Resource Centre, University of the West of England. Renowned researcher into the scientific aspects of air quality and the effectiveness of policy to address the problem. Technological fixes will not work, it remains to be seen how sustainable hydrogen sources of energy are, and fixes will not address the underlying problems of personalized car use such as accidents, noise and congestion. The only way the more environmental impacts of travel are going to be addressed is by moving to more sustainable modes.
4 Anon.	Air quality expert at Halcrow in charge of assessing transport's contribution to air pollution in transport assessment for new road schemes. Technology was a key theme- there was some scepticism about the over-application of technology and the use of technology as an acceptable alternative to politically sensitive measures.
5 Anon	Air Quality expert Peter Brett. Newly qualified, working on a project to reduce the pollution caused by the school run. (Limited information available due to sensitive nature of project)

Turin	
Name	**Responsibility**
6 Dr P Casselini	**5T (Telematics technologies transport traffic Turin) is a private**

	enterprise which seeks to work with Turin council to improve the speed and efficiency of travel around the city. The key concept that came out was the attempt to bring together traffic management centre and the traffic information centre. During the Olympic Games there was one traffic operation centre, and hence one decision making core, but post Olympics the owners of the data were reluctant to release the data and so it is a slow process. The traffic data is updated every three minutes and helps determine policy for traffic management. This shows how accurate data can help better manage traffic levels and hence reduce pollution levels
7 A. Marsero	**Research student – route optimisation for freight and passengers to reduce pollution** It was suggested that much urban pollution is caused by inefficient use of transport, such as pollution caused by people looking for car parking spaces and in traffic. It is perhaps easier and more politically acceptable to reduce the pollution caused by such instances as a first step, rather than trying to reduce car usage immediately.
8 ing A. Cocucinno	**Chief executive GTT. GTT manage the transport network in Turin from the driverless metro, the buses and some road congestion schemes in the city.** The respondent believed that culture plays some role in how traffic and air quality is managed – the availability of cheap public transport here shows that people want the basics right and do not care for the quality of the trains etc. Health is an issue often combined with traffic lately, such as the night bus running all night to stop people drink driving, but also reduces car use in the evening. This could introduce someone to the bus and the likelihood of them using public transport again in the future would be higher. Use of technology is sometimes to impress people, for example it is interesting that on Google maps 5T has a link informing the user about bus times, but do the people in America

	really need to know about such things, or is it simply a gimmick?
9 C Vitale	Fiat Research Centre (little known information due to sensitive nature of project) Technology, if used in a sensible and logical way can help reduce local air pollution problems by decreasing the delays incurred when travelling around the city. This multi modal approach goes beyond simply targeting car users, but rather reduces the wasted journey vehicle time, which recognizes that busses often run on the same route as cars, so to make public transport more attractive, you may simultaneously improve conditions for motorists.
10 Arch G. Foti	**Lecturer in Air Quality at Politenico di Torino. Research interests include reducing car travel through encouraging cycling, better managing the data collection of air quality.** There are issues around the enforcement, privacy issues that need to be addressed, such as the inability to put a permanent camera at the bus stops to improve security. Not technology that is at fault, but the organization. Concern about contradictory information being released, e.g on radio hear one thing and by SMS you hear another – perhaps people will ignore it if this occurs too often.

Interview Response Form - June/July 2008

The role of culture in the management of local air quality

INTERVIEWER COPY

Interview details: *(To be completed prior to interview)*

Date: 03/08/2008 **Time**: 14:00 **Location:** 5 T Office, Torino

Translator Present: No

Name of Respondent: Mr Paolo Cassinelli

Organization: 5T Traffic Urban Management (Torino)

Position Held: Operations manager

Additional Relevant Information: website:
http://www.5t.torino.it/5t/en/sistema5t.vm

(1) Has the purpose of the research been made clear to the respondent?

(2) **Ethical Considerations:**

i) The opinions of the interview should be taken as

a. Personal opinion
b. Representative of_____

ii) In the report, this interview may be associated with :

a. The respondent's name
b. The respondent's position
c. The organization
d. Anonymous

iii) Permission has been granted to use electronic recording equipment.

Signature of respondent_____ Signature of Interviewer:

Gpandrews

Date 14/08/08 Interview Ref:

11CASS

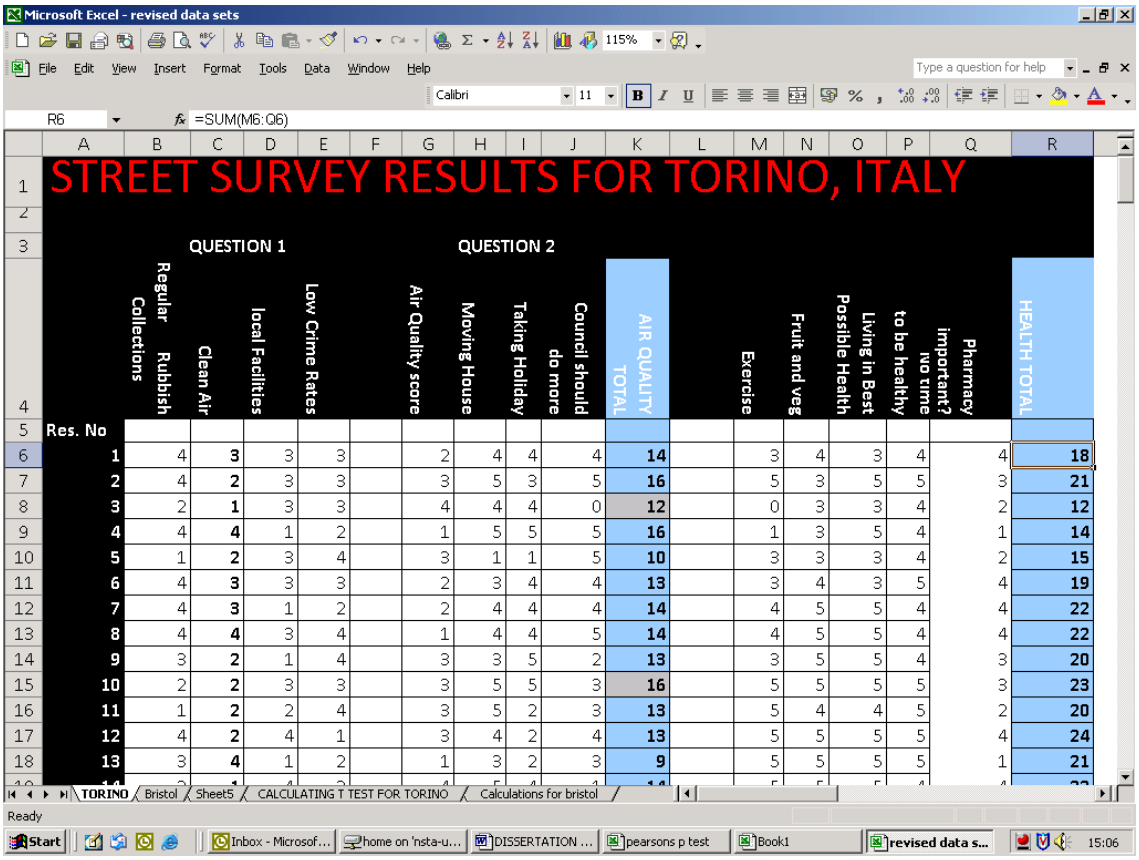
Interviewer Details : Geoffrey Andrews – MSC Student of University of the West of England, Bristol, Built Environment. Tel. 011732 83129 geoffrey2.andrews@uwe.ac.uk

SPSS Statistical output.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AIRQ.TOTAL	3.752	.053	-4.312	399	.000	-1.441	.334	-2.099	-.784
			-4.312	397.761	.000	-1.441	.334	-2.099	-.784

Group Statistics

	CITY	N	Mean	Std. Deviation	Std. Error Mean
AIRQ.TOTAL	Bristol	201	9.28	3.447	.243
	Torino	200	10.72	3.244	.229


Microsoft Excel - revised data sets
=SUM(M6:Q6)
STREET SURVEY RESULTS FOR TORINO, ITALY
QUESTION 1
QUESTION 2
Res. No
Regular Collections Rubbish
Clean Air
local Facilities
Low Crime Rates
Air Quality score
Moving House
Taking Holiday
Council should do more
AIR QUALITY TOTAL
Exercise
Fruit and veg
Possible Health
Living in Best
to be healthy
Pharmacy important? no time
HEALTH TOTAL
1 4 3 3 3 2 4 4 4 14 3 4 3 4 4 18
2 4 2 3 3 3 5 3 5 16 5 3 5 5 3 21
3 2 1 3 3 4 4 4 0 12 0 3 3 4 2 12
4 4 4 1 2 1 5 5 5 16 1 3 5 4 1 14
5 1 2 3 4 3 1 1 5 10 3 3 3 4 2 15
6 4 3 3 3 2 3 4 4 13 3 4 3 5 4 19
7 4 3 1 2 2 4 4 4 14 4 5 5 4 4 22
8 4 4 3 4 1 4 4 5 14 4 5 5 4 4 22
9 3 2 1 4 3 3 5 2 13 3 5 5 4 3 20
10 2 2 3 3 3 5 5 3 16 5 5 5 5 3 23
11 1 2 2 4 3 5 2 3 13 5 4 4 5 2 20
12 4 2 4 1 3 4 2 4 13 5 5 5 5 4 24
13 3 4 1 2 1 3 2 3 9 5 5 5 5 1 21
TORINO
Bristol
Sheet5
CALCULATING T TEST FOR TORINO
Calculations for bristol
Ready
Start
Inbox - Microsof...
home on 'nsta-u...
DISSERTATION ...
pearsons p test
Book1
revised data s...
15:06

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EU POLICY DOCUMENTS

EU Directive 80/799/EU

Ambient Air Quality and Assessment directive (96/62/EU).

Directive 2008/50/EC,

Front cover: left **www.ead.ae/en/Components/Archive.aspx**