# Monetising Human Impacts

CLeMM: Customer Led Monetising Method
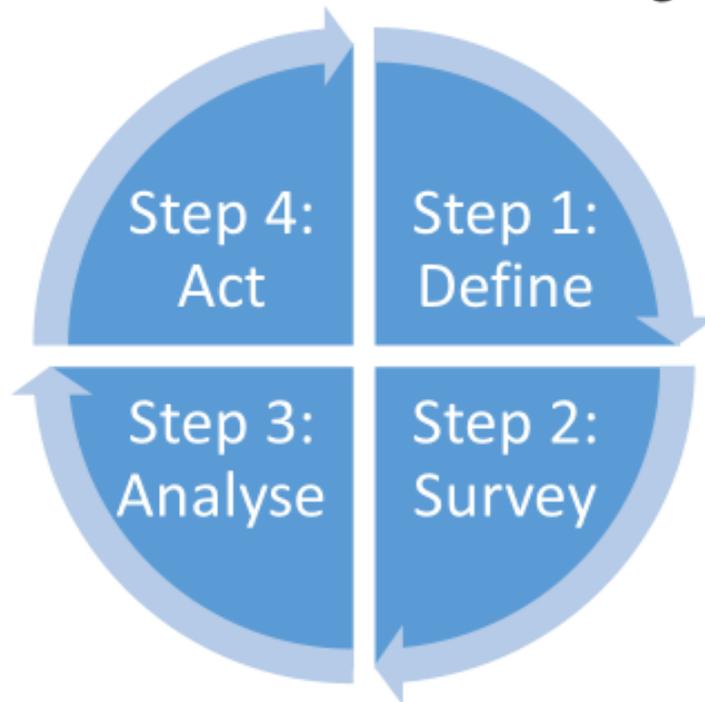
Centre for Lean Projects

Nottingham Trent University, UK

Saad Sarhan and Christine Pasquire

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If you would like to find out more about this project, please contact any of the following authors:

Saad Sarhan

Research Fellow,

Centre for Lean Projects,

Nottingham Trent University

saad.sarhan@ntu.ac.uk

Christine Pasquire

Professor of Lean project Management,

Centre for Lean Projects,

Nottingham Trent University

christine.pasquire@ntu.ac.uk

School of Architecture Design and the Built Environment

Nottingham Trent University,

Shakespeare Street, NG1 4FQ,

Nottingham United Kingdom

EXECUTIVE SUMMARY

This study has developed a Customer Led Monetising Method (CLeMM) to assess the monetary value of the human impacts of Highways England's operational services. CLeMM is simple in concept, easy to use and adaptable to a wide variety of situations enabling Highways England to use it in surveys, focus groups and other customer consultations for the widest range of stakeholders. The method for using CLeMM is described in the CLeMM Guide.

Introduction

This report presents outcomes of a study commissioned internally by Highways England and awarded to Nottingham Trent University for execution. The study addresses a perceived shortfall in understanding the human impacts of Highways England's operational services, and to develop a methodology on how to monetise them. The report captures current knowledge on identifying and quantifying human impacts and benefits. The report concludes by devising a bespoke methodology that has the potential for the systematic monetising of human impact for use within HE and their supply chain as appropriate. Overall recommendations of the study and suggestions for further research are also provided by the end of the report. The report is presented in three parts and is supported by two stand-alone documents:

- Background (Section 1)
- Current Knowledge (Section 2)
- Empirical Study (Section 3)
- A3 Knowledge Transfer Pack (stand-alone document)
- CLeMM Guide (stand-alone document)

SECTION 2: CURRENT KNOWLEDGE REPORT

This section reviews the available literature relevant to the subject in order:

1. To establish current knowledge surrounding the impact of road usage and on whom, in order to develop a wider understanding of customers in the context of Highways England's operational directorate.

2. To review the theory on identifying and quantifying human impacts/values/benefits, and the methods that can be used for measuring and monetising them.

The review of current knowledge summarises the impact of roads on five key areas that have been identified within the report as significant. Following this, an in-depth discussion around road usage in the United Kingdom, with a particular focus on the Strategic Road Network in England, is presented. The report then introduces the concept of a 'Customer-System', to introduce an enhanced understanding of customers within the context of Highways England's operational directory. Subsequently, a classification of a wide range of social impact measurement frameworks that can be used for monetisation approaches, is provided. These frameworks, however, require the assignment of financial proxies to impacts that do not typically have a market value. For this reason, the report then scrutinises three broad approaches for estimating the economic values attached to non-marketed impacts of assets, goods or services. Finally, a cutting edge review of human value / impacts valuation studies is summarised.

Whilst many studies have given and continue to give significant consideration to the economic, environmental, societal and safety impacts of road usage, very few have sought to investigate the human impacts of operational services. The concept of a 'customer-systems' offered within this report can be used as a guiding framework for investigating the values and needs of each customer classification. The review suggested that 'Stated Preference Valuation Techniques' have the potential to be used for monetising the human impacts / benefits of Highway England's operational enhancements. However, empirical testing suggested otherwise as described in sections 3 and 4 of this report. Instead a bespoke method (CLeMM) was developed, refined and then tested through a web-based questionnaire survey.

SECTION 3: EMPIRICAL REPORT

This empirical report provides an analysis of the primary research findings of the study to develop a systematic methodology for monetising the human impacts of HE's operations. The study is based on data collected through a pilot study that comprised of nine in-depth semi-structured interviews, and a web-based questionnaire survey that received 188 responses. The conclusions to be drawn from this pilot study about the value of the human impacts tested are _limited by the small sample size_.

 The empirical study explored and evaluated five main areas identified as significant:
(1) Road users' experience of the SRN, and their level of satisfaction with HE's operational services;

(2) The influence of the Strategic Road Network (SRN) on the economy, society and environment;

(3) The impact of information provision on how customers feel and driving behaviour;

(4) The human impacts/value/benefits of Highways England's operational services; and

(5) The effectiveness and reliability of a bespoke methodology developed for monetising human impacts.

The limited study sample indicated that the SRN is mainly used for social domestic pleasure, going to work, and commercial and business purposes in corresponding order. In general, most of the participants of this study were satisfied with HE's operational capability. Interestingly, most of the study's participants believed that the SRN is in need for improved maintenance and operational capability (nearly 66%) as opposed to the need for more investment in construction of new roads (only 27%). However, 7% of the respondents supposed that the SRN is not in need for any more investments of any kind. Evidence from the study indicates that participants are generally aware about the significance of the SRN and its influence on England's economy and social well-being. The study ranked the economic, social and environmental impacts of the SRN according to the participants' point of view. In addition, a number of key areas for improvement were highlighted as suggested by the respondents.

The results showed that most of the participants (nearly 70%) feel confident when travelling on the SRN while only 5% feel nervous and 25% are neutral. The study identified and prioritised different types of information available to road users, according to their importance to the respondents. Interestingly, most of the types of information provided to road users was regarded by the majority of the respondents as highly important, except for: 'information about public transport' and 'general driving advice'. The study also found that 'VMSs and electronic displays' and 'Road marks and signings' are road users' most preferred means for receiving information. Consequently, the study identified and ranked the factors influencing driving behaviour based on the respondents' perceptions. Finally, a relationship model was developed that illustrates the main human impacts and benefits of information provision that were assessed within the study.

Findings from literature suggested the potential for adapting the commonly used 'WTP' economic valuation technique. However, empirical testing through the pilot-study revealed

the inappropriateness of the use of the WTP technique for the current study. Two main methodological problems were found to be associated with its use in this particular study: (1) Difficulties of deciding on a payment mechanism; (2) Receiving biased or irrational responses. Thus, a bespoke methodology was devised for monetising human impacts (CLeMM). In contrast with the WTP approach, CLeMM is based on asking participants to distribute a fixed sum of money among pre-defined factors thus providing a customer led financial proxy model. The methodology was tested through the questionnaire survey and reviewed through feedback received and self-reflection. Evidence from findings and results obtained suggest that CLeMM has the potential to support HE with gaining a better understanding of how to identify and monetise the human impacts and benefits of their operations. Finally, a summary of key findings, conclusions and recommendations are provided.

A3 Knowledge Transfer Pack

This is a one page poster that summarises the research project.

CLeMM Guide

This is a seven page guide to aid with the implementation and use of the monetising method.

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LISTS OF ABBREVIATIONS

BACO   Best Available Charitable Option

BT   Benefits Transfer

CBA   Cost Benefit Analysis

CLeMM   Customer Led Montetizing Method

CM   Choice Modelling

CV   Contingent Valuation

CVM   Contingent Valuation Method

DfT   Department for Transport

DTLR   Department for Transport Local Government Regions

HA   Highways Agency

HE   Highways England

NRUSS   National Road Users' Satisfaction Survey

OASIS   Ongoing Assessment of Social Impacts

PDCA   Plan-Do-Check-Act

PR   Priority Ranking

RAC   The Royal Automobile Club Foundation for Motoring Ltd

RoSPA   Royal Society for the Prevention of Accidents

RP   Revealed Preference

RPT   Revealed Preference Technique

SCBA   Social Cost Benefit Analysis

SCEA   Social Cost Effectiveness Analysis

SP   Stated Preference

SPT   Stated Preference Technique

SRA   Social Return Assessment

SRN   Strategic Road Network

SROI   Social Return On Investment

SVA   Stakeholder Value Added

TfL   Transport for London

UK   United Kingdom

VMS   Variable Message Signs

WTA   Willingness to Accept

WTP   Willingness to Pay

1.0 BACKGROUND TO THE STUDY

The Strategic Road Network (SRN) is a national road network that is operated and managed by Highways England, formerly, the Highways Agency. It comprises of approximately 4,300 miles of England's motorways and major 'A' roads or "trunk roads". The SRN is arguably the most important infrastructure asset in England with an estimated value of £110 billion. It provides links within and between cities, and connects England's major ports, airports and rail terminals. There are however a number of current and future challenges facing Highways England, in particular, rapid traffic growth, increased pressure on England's major roads, increased demand for assuring the delivery of value for money. These factors have prompted the need for more efficient and effective operational capability and greater funding certainty. Alongside these, there is also a crucial need for gaining a better understanding of the human impacts of HE's operations. This requires defining who constituents a customer and investigating their individual value systems. If these human impacts could be quantified and then monetised, they could potentially make business cases, value assessments and benefits realisation more robust.

1.1 Research Aim and Objectives

This overall aim of this study is to gain a better understanding of the human impacts and benefits of Highways England's operational services and develop a method on how to monetise them. Accordingly, the following objectives were formulated:

1. Review current knowledge surrounding the impact of road usage and on whom in order to define the widest understanding of customers.

2. Review current knowledge on identifying and quantifying human impact, value/s, benefit and dis-benefit – drawing on a range of scientific & social theory and practice

3. Develop a strategy for collecting data from all identified customers and implement sampling techniques.

4. Develop a system for the evaluation of human impact that responds to the data collected in activities 1, 2 & 3

5. Test and refine system

1.2 Methodology and Sampling Approach

Summary:

- The study used a mixed-methods methodology that comprised of exploratory interviews and a questionnaire web-survey.

- The study targeted specific groups of customers across different regions in England through: Purposive sampling + Snowball sampling techniques.

- A total of 188 well-rounded responses were received and analysed.

The study adopted a mixed-methods methodology for collecting and analysing date (Figure 1.1). The sampling approach focuses on creating a representation of a range of potential variables of interest rather than ensuring a statistically representative sample. The main tool used for collecting data was a Questionnaire web-survey that was launched online on 1st October 2016 for three weeks. The survey has been piloted through exploratory semi-structured interviews. Nine participants were selected for these interviews based on their profile characterisation, e.g. gender, age band, driver or passenger, type of vehicle used (See Table 1.1).
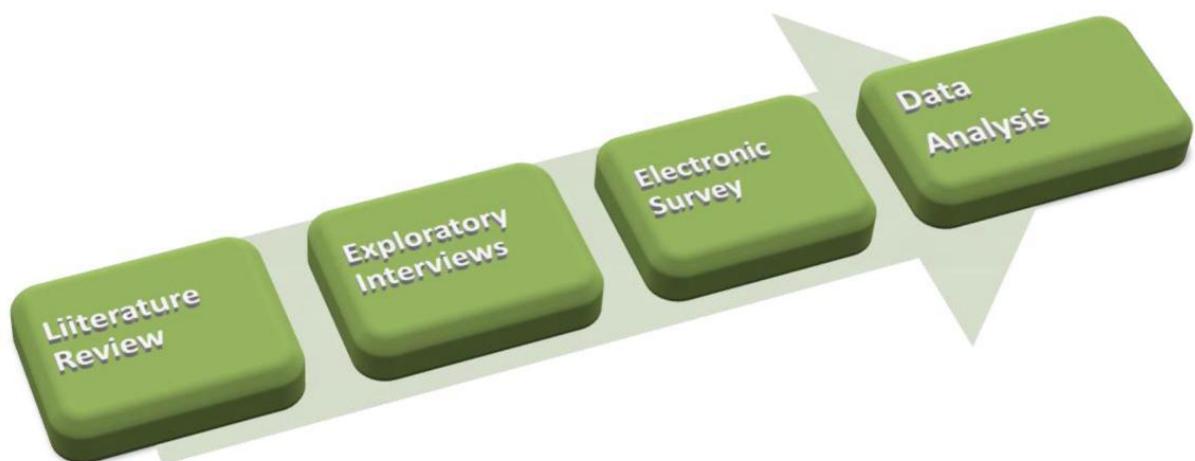
Figure 1.1: Data collection process

Exploratory interviews:

The exploratory interviews were useful for testing and refining the draft version of the main questionnaire in terms of clarity and effectiveness of questions used. In addition, they helped

the study to examine the suitability of the use of the 'Stated Preference' monetisation approach for this particular study. They have also enabled the researcher to probe into deeper meanings and understandings, and to elicit different points of view and ideas that were not mentioned in literature. Thus, the pilot study has led to refining the contents of the questionnaire, in particular the clarity and effectiveness of the wordings and questions used. The findings of the conducted interviews are reported within the 'Empirical Report' section. Also samples of the transcripts are available in Appendix 1.

Table 1.1: Characteristics of the participants of the pilot study

ID	Gender	Age band	Driver or Passenger?	Working status	Average Annual Income	Vehicle often used
P1	F	25-44	D	Self-employed	Between £25K and 50K	Car
P2	F	25-44	D & P	Employed	Between £25K and 50K	Car as a driver; Coach as a passenger
P3	F	17-24	P	Employed	Less than £20K	Car
P4	F	60+	P	Non-employed (House-wife)	Less than £20K	Car and Coach
P5	M	25-44	D	Employed	Between £25K and 50K	Car
P6	M	60+	D	Retired	Less than £20K	Car
P7	M	25-44	D	Employed	Less than £20K	Motor cycle
P8	M	17-24	D	Employed	Between £25K and 50K	Car
P9	M	45-60	D	Employed	Less than £20K	Van

Electronic Survey:

The survey study targeted specific groups of customers across all regions of England through 'Purposive and Snowballing' sampling techniques'. The study started by purposively selecting reference contacts within nine regions covering England's SRN (see end of Table 3.1). These reference contacts were used to help the study to represent different classifications and types of road users (see section 3.2.2) The approach for selecting 'reference contacts' is similar to that of 'sample points' used in NRUSS annual surveys; however based on purposive sampling rather than random selection. An invitation email was then sent to each reference contact which included:

- A cover letter outlining the background and main objectives of the study (see Appendix),

- A unique URL that is generated by the web-survey software for each email recipient

- A request to forward the link to the survey to similar potential participants living within the same regional area of residence.

- Eligibility criteria for taking part in the survey. These are that respondents must be aged 17 years or above and that they use the SRN at least once per week on average.

The sampling criteria were used to ensure that participants of the study are broadly representative of adults in England and that the data elicited from the respondents is up-to-date. The survey was launched online for nearly 3 weeks and a total of 188 responses were received.

1.2.1 Discussion coverage

The survey was structured into four main sections:

- Background information - Respondent and travel characteristics

- Introduction to the SRN and its impact on the economy, society and Environment

- The impact of Information provision on customers' feelings and driving behaviour

- Allocating a monetary value to the human impacts of HE's operational services.

A summary of the key points covered in the survey, an analysis of the characteristics of the respondents, and the overall results and findings are presented in sections 3 and 4.

SECTION 2: CURRENT KNOWLEDGE REPORT

This report explores current knowledge surrounding the impact of road usage and on whom, in order to define the widest understanding of customers. It also provides a state-of-the-art review that summarises current knowledge on identifying and quantifying human impact, drawing on a range of scientific and social theory and practice. The outcomes of this report support the research project that aims to address the current shortfall in understanding the human impact of Highways England's operations.

2.1 AN INTRODUCTION TO ROADS

Roads play an important role in supporting economic growth and enhancing the productivity and social well-being of countries. Actually roads could have a significant influence on five key areas, as discussed below:

- Economy of the country
- Environment and biodiversity
- Society and neighbouring communities
- Safety of road users
- Emotions and behaviour of road users

2.1.1 Economic Impacts

A well-functioning network of roads within a country can boost innovation and support economic growth; for example by (Cook, 2011; HA, 2014a):

- Reducing journey times
- Reducing business costs;
- Improving access to markets;
- Enabling economies of scale,
- Attracting inward investment;
- Increasing competitiveness through reduced costs and better connectivity.

2.1.2 Environmental Impacts

Environmental impacts of roads that need to be mitigated or managed and reduced include (Campaign for Better Transport, 2014; Highways England, 2015c):

- Noise pollution – resulting from traffic noise and low standard surfacing,
- Air population – resulting from increased carbon and greenhouse emissions and dust.
- Water pollution – Contaminants in runoff pollution from roads

- Fragmentation or reduction of wild life and ecologically sensitive habitats,
- Worsening of landscape and visual amenity

2.1.3 Social Impacts

Road usage could also impact on people's social well-being and quality of life. Impacts can be negative when they relate to negative outcomes and social risks, or positive when they relate to social benefit. A list of potential social impacts have been identified through a review of various studies (e.g. Stevenson, 1995; Transport Scotland, 2011; New Zealand Transport Agency, 2016) and presented in Table 2.1.

Table 2.1: Examples of Social impacts of Roads

Social Impacts of Roads	
Positive impacts	**Negative impacts**
Improved connectivity between communities and access to facilities including cultural/heritage sites	Severance of communities and facilities for cyclists and pedestrians
Protection/enhancement of Historic buildings and places	Reduction in quality of the setting of historic places or buildings and or their surrounds
Integration with surrounding land use, urban/rural areas, transport systems and creation of new public amenity e.g. open space	Stress to affected persons due to change to property values – economic hardship or gain
Improved journey comfort to commuters and commercial road users	Disturbance e.g. sleep to neighbourhoods / nearby residents due to noise and vibration resulting from movement of vehicles
Empowerment to the community from feeling listened to	Reduced connectivity to community facilities e.g. businesses, social interactions
Widening choices and providing new opportunities for travel and leisure	Negative aesthetic impacts

2.1.4 Safety Impacts

Most road accidents have several causes. The majority being human error. In 2014, 194,477 people were reported to be killed or injured in UK road accidents (RAC, 2014). However, in comparison with other countries, the UK remains one of the world leaders in terms of road safety, In fact, the UK along with Sweden, the Netherlands and Denmark, are the four safest European countries for road users (RAC foundation, 2013). Based on police reports, the most common factor which contributed to accidents since 2005 to 2014 was 'drivers failing to look properly' (DfT, 2015c). According to the Royal Society for the Prevention of Accidents (RoSPA), the main causes of fatal road accidents in the UK include:

- Over-Speeding.

- Drink-driving.

- Not wearing a seat belt.

- Careless or aggressive driving.

- Distracted driving

Car occupants remain the largest road user group suffering from road casualities (RAC foundation, 2016). Other safety aspects related to roads that are worth significant consideration include, for example, the public's fear of crime. This reduces the public's use of footpaths and cycle-tracks and has a greater negative impact on vulnerable road users as opposed to car and van drivers.

2.1.5 Emotional and Behavioural Impacts

Many studies have given and continue to give significant consideration to the economic, environmental and safety impacts of roads. Yet, much less attention has been devoted to investigating individual value systems, which is needed to enable us to gain a better understanding of the human impact of road operational services. This includes understanding the factors influencing road users' emotional state, driving behaviour and level of satisfaction with operational services offered to them. Social and emotional benefits or dis-benefits are difficult to quantify, particularly, because of the intangible nature of emotions and values (Mayor and Coleman, 2011). However, consideration of these values and benefits is vital, if we are to make fully informed decisions on the cost / benefit values of road investments or business cases for road schemes. A number of interrelated human impacts of road usage are given below (Mayor & Coleman, 2011, Toombs et al., 2013; Highways England, 2015a):

- Improved/worsened driver behaviour and its impact on safety

- Reduced/increased stress and frustration

- Improved journey time reliability

- Improved/decreased customer satisfaction

- Mood or emotional state of users (e.g. Happy, relaxed, frightened, angry)

- Attitude Towards the Council or Government Authority

- Perceptions on feeling safe

- Feelings of Empowerment

The National Road Users' Satisfaction Survey (NRUSS) in the UK, identified key factors causing dissatisfaction to road users (Highways England, 2015a), as follows:

- The length/time of the delay in proportion to the journey length

- Not seeing signs explaining road-works

- Inaccurate provision of information:
    - respondents had been warned of a delay, but were then not delayed
    - respondents were not warned of a delay, but were delayed.

- Poor positioning of signs

- Seeing Litter on the network

- Encountering poor driving behaviour on their journeys

- Not seeing works in progress at road-works

2.2 ROAD USAGE IN THE UNITED KINGDOM (UK)

In the UK, roads are vital for people's journeys and the economy. Total road length in the UK in 2014 was estimated to be around 246 thousand miles (DfT, 2015b). The latest statistical study on road usage published by the Department for Transport (DfT, 2016) shows that, in 2014:

- 90% of passenger journeys were made by road.

- Distance travelled by car or vans has increased in 2014 by over 1000% than in 1952.

- Road is the main method of transporting freight across Great Britain

- Almost three times more goods were moved by road than by water and rail combined.

- Road freight sector contributed £11.2 billion to the UK economy.

- Traffic on the Strategic Road Network in England has had the largest traffic growth.

The Strategic Road Network (SRN) is arguably the most important infrastructure asset in England with an estimated value of £110 billion (Highways Agency, 2014a). It consists of approximately 4,300 miles of motorways and major trunk (A) roads that are managed by Highways England (see Figure 2.1 below). The length of the SRN accounts for only 2.4% of total length of England's road network, but interestingly it carries about one-third of all road traffic and two thirds of freight in England.

2.2.1 Economic Significance of the Strategic Road Network

Successive governments have argued that the SRN is critical to the growth and sustainability of UK's economy (House of commons, 2015). The England-wide road network provides reliable and efficient connections that enable the movement of people and goods around the

UK. This in turn encourages inward investment by making England more attractive. Operating the SRN in an effective and efficient way helps create the conditions for sustainable economic growth. This is achieved through enabling businesses to (HA, 2014a; DfT, 2015c):

- share and access the resources and ideas they require to perform efficiently and grow

- connect with their suppliers and govern their costs;

- meet their customers' needs and reach out to new markets; and

- create and establish effective collaborations and partnership

- Reduced travel times and greater reliability means less time wasted in congestion

- adapt innovative ways of working for business, e.g. "just-in-time" methods

- mobilise their workers and resources efficiently
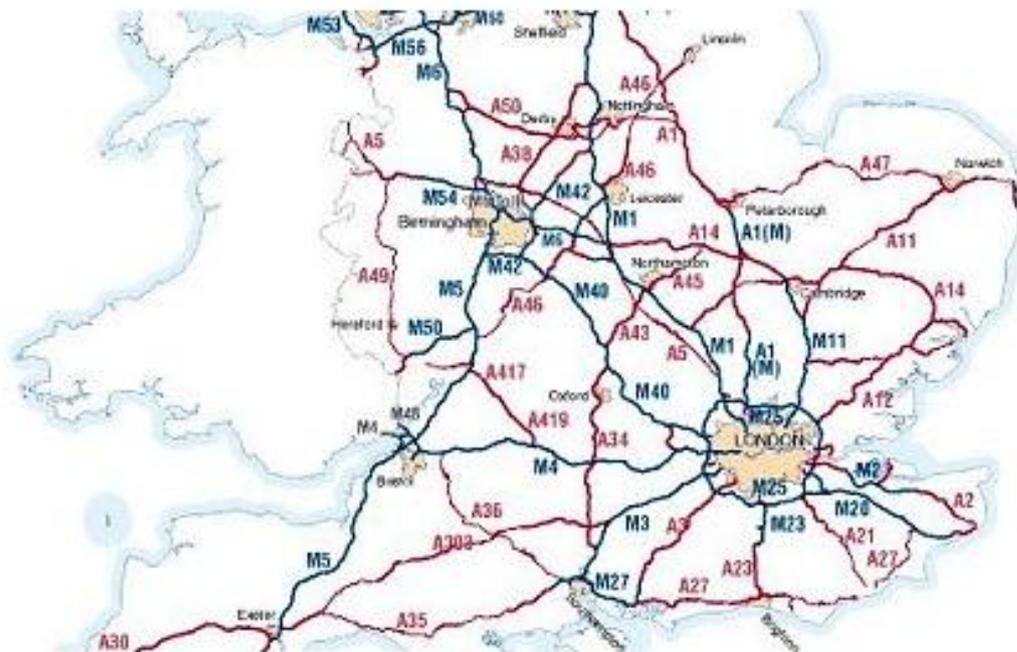
Figure 2.1: A map of the Strategic Road Network (House of Commons, 2015, p. 4)

The Department for Transport estimates the direct cost to the UK economy of time lost due to congestion, on the SRN alone, to be around £2 billion a year. This could increase to £10 billion a year by 2040 (DfT, 2013). According to Cook (2011, p. 6), "*a recent incident that closed Junction 7 of the M25 at rush hour is estimated by the Highways Agency to have cost the economy £1.74 million, or £62,000 an hour*". These factors emphasise the significance of managing and operating the network in a resilient and effective way, which meets and responds to the needs of its users (i.e. the individuals, businesses and communities that it serves).

2.2.2 Trends in SRN Policies and the Role of Highways England

Since 1979 Governments of all political stripes have expanded the SRN (Cook, 2011). Lots of investment and construction took place in a pattern that largely reflected the fortune state of the economy during those times. However, since the late-mid 1990s as road infrastructure developed and stabilised, SRN policy shifted away from capacity expansion to capacity management (Toombs et al., 2013). Governments, dictated to a large extent by fiscal constraints, started taking into account that networks were complete and thus returns on investment for further infrastructure provision was regarded to be relatively low (Eddington, 2006). Therefore, this more considerate approach focussed on making the best use of the existing network. It considered further development and construction while taking into consideration health and environmental impacts. In the Autumn 2010 Spending Review, the Coalition Government committed to a full review to ensure that the Highways Agency structure and governance secures value for money across its programme (Cook, 2011, House of Commons, 2015). Following this, the Coalition Government moved from the preceding cautious approach to construction of roads to a more assertive approach that formed part of a wider National Infrastructure Plan on new capital spending for roads and floods.

In 2011, the non-executive Chairman of the Highways Agency Board published his independent report that reviewed the SRN (Cook, 2011). He provided recommendations for operating, maintaining and improving the efficiencies of the SRN. His central recommendation was 'for a transformation in the management of the network'. This eventually led to a number of improvements which included the formation of Highways England – a regulated arms-length Government-owned company with greater accountability for costs and performance (House of Commons, 2015).

Highways England, formerly, Highways Agency, is now responsible for operating and maintaining the SRN. It is also responsible for major projects associated with the SRN, such as the introduction of traffic officers and the increase in smart motorways coverage, which form part of the Roads Investment Strategy for 2015-21 (House of Commons, 2015). There are however a number of current and future challenges facing Highways England, in particular, rapid traffic growth, increased pressure on England's major roads, increased demand for assuring the delivery of value for money, and uncertainty about road users' behaviour and individual value systems.. These factors have prompted the need for a more effective and efficient operational capability and greater funding certainty (Toombs et al., 2013). Alongside these, there is also a crucial need for gaining a better understanding of the

human impact of HE's operations. This requires defining who constituents a customer and investigating their individual value systems. If these human impacts could be quantified and then monetised, they could potentially make business cases, value assessments and benefits realisation more robust.

2.2.3 Who Is Using The SRN?

According to a report published by Department for Transport (2014a) on the use of the SRN, more than 95% of England residents use the SRN, either as a driver or passenger, at least once per year. Also, nearly half the residents use the network at least twice per week. Obviously, people living in England use the SRN more frequently than those living within other regions within Great Britain. In England, middle aged groups (25 to 44 and 45 to 64) use the SRN more frequently than the younger (16-24), and older (65+) age groups. This could possibly be associated with work-related travelling purposes. The report indicated that most people across occupation levels use the SRN. Interestingly, the report also found that the frequency of the use of the SRN increases as the respondent's gross income level increases; peaking at a middle-high income level (£31,200 - £41,599) but then decreasing for those on higher income levels.

Most personal trips including commuting, shopping and visiting friends are made by car. Commercial road users, e.g. HGVs, rely more heavily on the Strategic Road Network than other traffic and other vehicle. Two thirds of all HGV traffic on the SRN (DfT, 2016). Additionally, HGVs travel more frequently on the SRN than LGVs and Cars (see Figure 2.2).
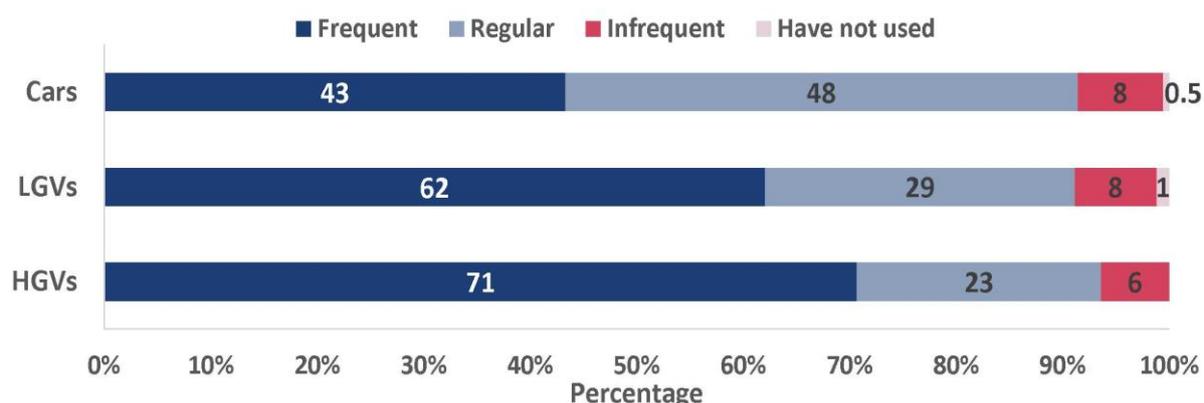
Figure 2.2: Frequency of use of the SRN according to vehicle type.
Source: DfT in-vehicle GPS data, 54,018 vehicles (Sep 2011 to Aug 2012); GB vehicle coverage.

In general, 89% of SRN users were satisfied with their latest journey in 2014/15 (DfT, 2016). Interestingly, despite the increase in traffic growth, the amount of greenhouse gas emissions and road casualties have decreased. Journey satisfaction scores varied with different aspects of the SRN, as shown in Table 2.2:

Table 2.2: SRN performance based on road user's evaluation (DfT, 2016, p. 36)

% fairly or very satisfied with the following SRN aspects in their latest journey				
Safety	Upkeep	Info Provision	Journey time	Road works Management
92%	90%	89%	87%	67%

2.3 TOWARDS DEFINING A CUSTOMER-SYSTEM

2.3.1 What Does the Term Customer Mean?

The terms "consumer", "customer" and "client" are often used interchangeably to describe the relationship between commissioners or service providers and those who receive those commissioned or provided services (McLaughlin, 2009). A "consumer" could be defined as a person who consumes or uses something. Consumers are usually thought of as the end users. A "customer" is someone who purchases and buys goods or services; while a "client" could be defined as someone who buys professional services and uses advice and solutions that are customised to their particular needs. For simplicity, a "consumer" could be described as an end user, a "customer" as a purchaser, and a "client" is more likely to be referred to as an employer/owner in private sector or the Government in public-sector.

In the marketing and business domains, producers (or service providers) do not sell their products directly to "consumers", but reach them through intermediate users. These intermediaries are the "customers" of the producers (Akman, 2008). In essence, "consumers" use products while customers buy them. A "customer may also be a "consumer" and vice versa; but situations occur where this is not the case. Thus, in general, marketing efforts should be focussed on addressing the needs of both – The "customers" and the "consumers".

Lean management theories and practices seem to provide useful insights, as the ultimate lean goal is to achieve "customer" satisfaction (Bertelsen and Emmitt, 2005; Leong and Tilley, 2008). According to lean thinking principles, it is essential to specify value from the customers' perspective (Womack and Jones, 1996). This implies that in order to understand and deliver value, we must first understand who our customers are (i.e. the Supplier /

Customer Chain). In lean project management, the customer is frequently divided into two generic types:

- *Internal customers* can simply be a next trade or anybody who depends on you to complete a task or to provide information they need to do their job (see Leong and Tilley, 2008).

- *External customers* are the people or organisations that we usually think of when we use the expression 'customers' – ultimate end user customers (i.e. road users)

2.3.2 Defining Customers in the Context of HE's Operational Directorate

With journeys on the SRN totalling up to 85 billion vehicle miles per year (Highways England, 2015c), it is obvious that Highways England has a diverse range of customers. These customers have different needs, and these needs can sometimes conflict (Highways England, 2016a). Thus, it is essential to be able to understand customers' needs and priorities, and to respond to these needs in a thoughtful and proactive way. In fact, Highway England's customer base is enormous (Highways England, 2015c) and includes:

- Four million users every day
- Millions of neighbours who live near the network
- Numerous logistic and freight companies
- Industries from all corners of the country
- Thousands of walkers, cyclists and equestrians
- Many local communities connected by the road network.

We can add to this list all tax payers (road tax, income tax, VAT etc) who expect their money to be used judiciously whether or not they use or live near the SRN.

Highways England's (2016) Customer service strategy recognises the value of the wide-range of customers that they serve. However, it does not provide an explicit customer-analysis. Even within NRUSS (2013-2014 and 2015-2015) annual reports, the user groups considered are age, race, gender and disability. However, those are not clustered into groups of customers. In order to define the widest understanding of customers, this study argues that the customer is not a single person, a defined group of people nor an entity (e.g. road drivers). Instead the study introduces the concept of the 'customer system', as illustrated in Figure 2.3:
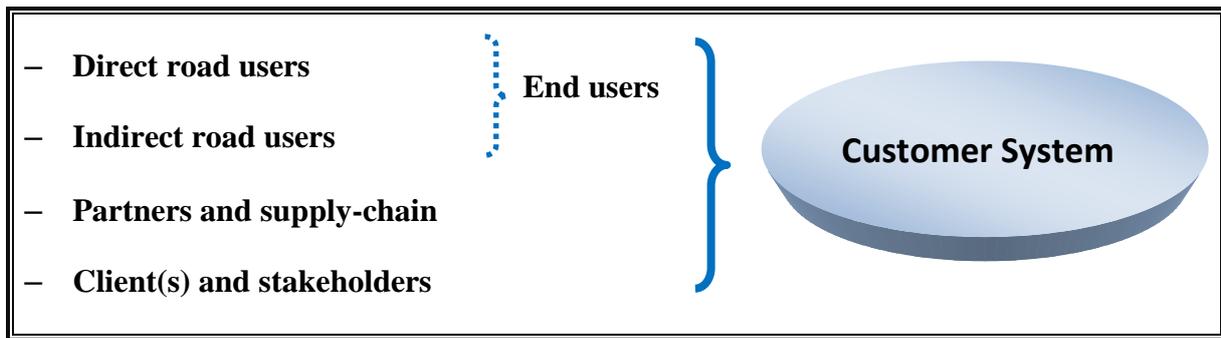
Figure 2.3: A basic model of the concept of the 'Customer-System'

Direct road users – are those who use the road for transportation and whom are directly influenced by the various impacts of roads (e.g. drivers and passengers, pedestrians, cyclists and hauliers) irrespective of the mode of transport (e.g. car, van, motor cycle, walking). Additionally, these direct road users are divided into two classifications depending on the purpose of their journey: (i) General public drivers and non-drivers, and (ii) Commercial drivers. The former are those who use the road for commuting (e.g. going to work, shopping and visiting friends), while the latter refers to those driving on the road for commercial purposes (e.g. Freight Transport and hauliers); see Figure 2.4.
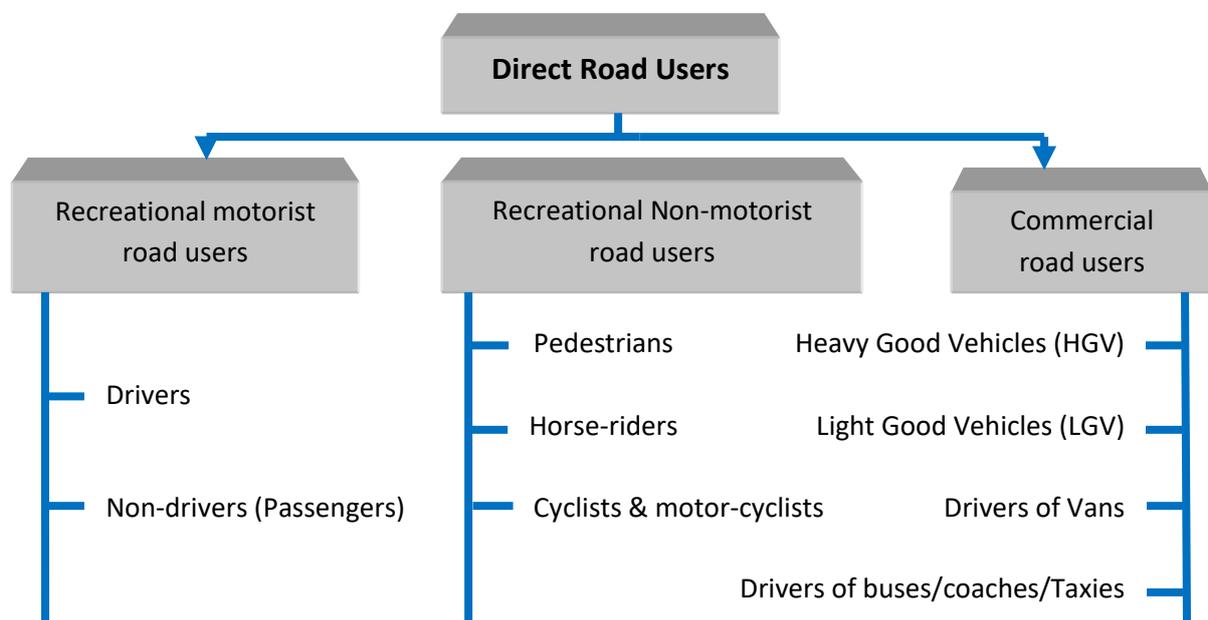
Figure 2.4: Classification of direct road users

Indirect Road users – are those who are not directly using the road but are still affected by the road existence, condition and usage (see Figure 2.5). These include: Neighbours and local communities; Physical communities (e.g. habitats and rivers); Land owners, Road workers, Businesses and those who rely on the road for the transportation of goods and people. Hence,

the SRN aims to improve and sustain economic, social and environmental impacts. It is thus, important to include these indirect road users in HE's customer analysis.
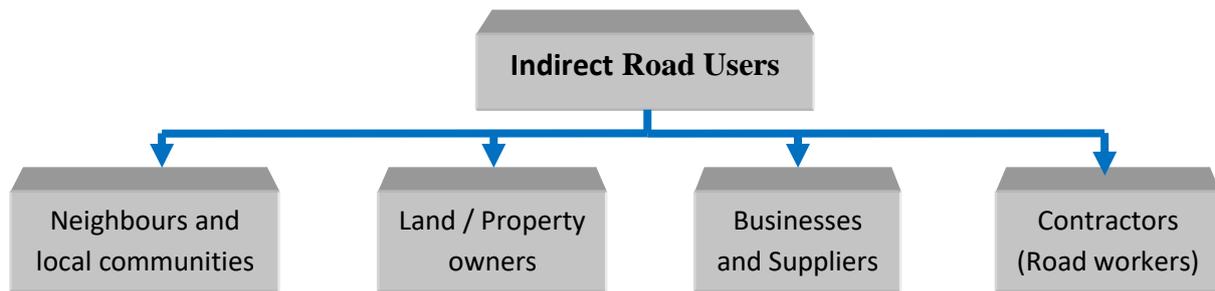
Figure 2.5: Classification of indirect road users

Partners and supply chain – include all organisations that collaborate with or support Highways England customer operations department in delivering its operational services (Figure 2.6). These include: other directories with Highways England (e.g. Major Projects directorate); local authority roads; traffic communities; Police, Fire and Ambulance and Third-Party Providers such as those responsible for removing abandoned/broken down vehicles on the SRN which pose a safety risk. These organisations require timely and accurate sharing of information, in order to be able to fulfil their duties. Furthermore, their actions have an impact on (direct and indirect) road users' satisfaction with Highway's England operational services.
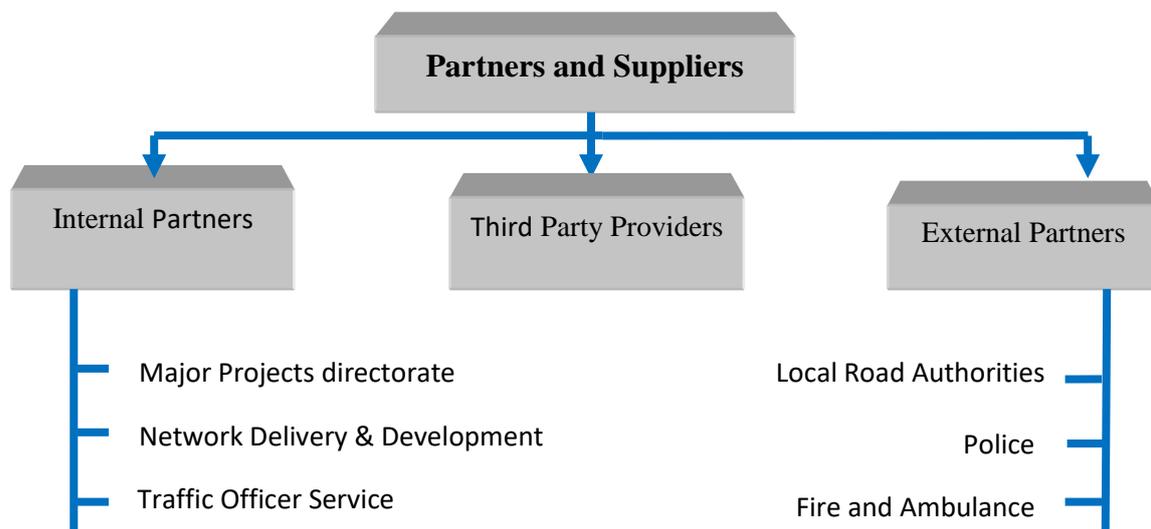
Figure 2.6: Classification of partners and supply-chain

Clients and Stakeholders – This consists of Department for Transport that is Highways England's client. Stakeholders, by acting as independent user watchdogs (i.e. (i.e. transport-focus and Office of Rail and Road) that are responsible for monitoring performance and

ensuring the provision of value to taxpayers. Thus, stakeholders have an influence on key decisions. See Figure 2.7.
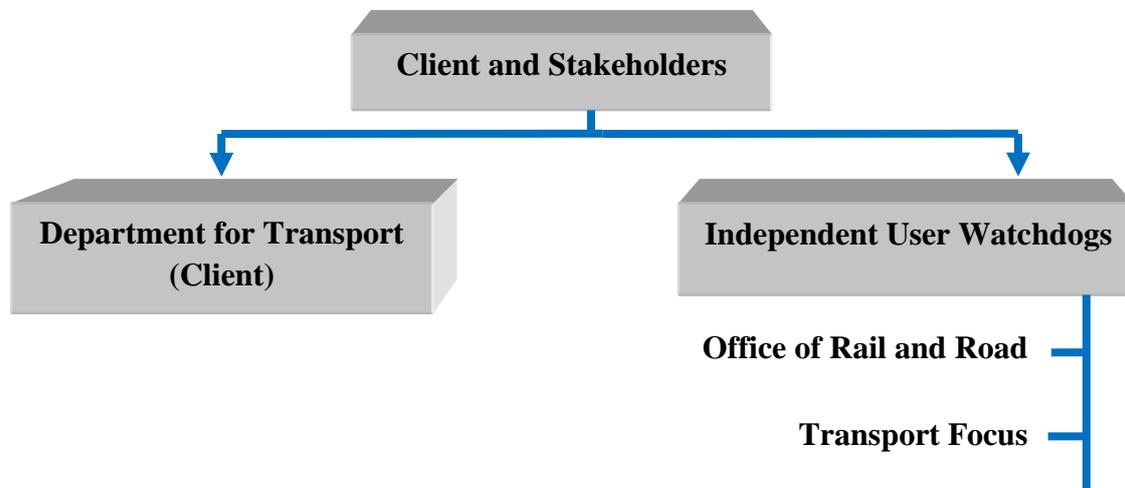
Figure 2.7: Classification of clients and stakeholders

2.4 SOCIAL VALUE /IMPACTS /BENEFITS

2.4.1 Definitions of Social Value / Impacts

Academic disciplines such as business, society and general management studies have given rise to a similarly large number of definitions to explain social impact. One of the main differences among them relates to the replacement of the term 'social impact' with other similar terms such as 'social effect or outcome', 'social value creation' and 'social return' (Maas, 2014). Three of the many definitions are:

> *"Social value is created when resources, inputs, processes, or policies are combined to generate improvements in the lives of individuals or society as a whole" (Emerson et al., 2000).*
>
> *"By social impact, we mean any of the great variety of changes in physiological states and subjective feelings, motives and emotions, cognitions and beliefs, values and behaviour that occur in an individual, human, or animal, as a result of the real, implied, or imagined presence or actions of other individuals" (Latané, 1981).*
>
> *Social impact refers to impacts (or effects or consequences) that are likely to be experienced by an equally broad range of social groups as a result of some course of action (Freudenburg, 1986)*

2.4.2 The Importance of Measuring Social Value and Benefits

There are three main reasons why it is important for organisations to identify and quantify social value and benefits. Firstly, measuring the value of social impacts and outcomes is useful for benefits realisation and value assessments. It helps organizations to communicate and demonstrate the importance of their work to their own staff, customers, clients, funders and investors, government agencies, and the community that they serve in general (Hebb and Bhatt, 2014). Secondly, being able to evaluate social value when making business cases can lead to competitive advantage, especially during peak times of spending cuts and limited financial resources. Thirdly, evaluating past performances and reflecting on target achievements encourages continuous improvement of management skills, and enables organisations to focus their efforts on key issues that make a difference. By doing so, it enables them to plan more strategically and to deploy their resources more effectively. According to Hebb and Bhatt (2014), to measure social value, it is important to start with questions like:

- Who are the people that matter to the organisation? And What are their objectives and priorities? – ***Defining the customer-system and identifying their needs***

- Are the customers' needs aligned with the social changes/impacts that the organisation seeks? – ***Goal alignment***

- What are the resources used by the organisation to perform its operations? - ***Inputs***

- What output/performance indicators would illustrate how well the organisation's objectives are achieved? – ***Outputs*** *- e.g. no. of people who find sign posts useful*

- How will Social Changes/Benefits be quantified? – ***Outcomes/Impact indicators,*** *e.g. no. of people saving money or time because of reading the signs*

2.4.3 Social Impact Measurement Frameworks

A very wide range of social impact measurement frameworks currently exist. However, each has its own characteristics; thus used for different purposes and objectives, depending on what the user wants to measure. Work by Maas (2014) analysed and classified 30 different quantitative social impact measurement frameworks, in order to aid practitioners with selecting the most appropriate framework for the needs of their organization. Out of the 30 frameworks analysed within their study, only 10 of them are developed for monetisation approaches, as described in Table 2.3).

Table 2.3: Description of social impact measurement frameworks (Maas, 2014)

Framework	Brief Description
Social Return On Investment (SROI)	A way of measuring the total impact of voluntary and community organisations in economic terms. Social and environmental benefits are included through the use of financial proxies
Social Return Assessment (SRA)	A tool that breaks down the SROI into manageable portions and is designed principally to assist smaller organisations, or those with fewer resources or knowledge, to assess the impact of their activities in a meaningful and user-friendly way.
Stakeholder Value Added (SVA)	Based on the stakeholder approach or standard setting and strategic management of corporations. It measures the contribution to corporation value due to stakeholder relations (stakeholder value)
Social Cost Benefit Analysis (SCBA)	A traditional economic tool for performance management adapted to include impacts on society. Costs and social impacts of an investment are expressed in monetary terms and then assessed according to one or more of three measures: 1. Net present value 2. Benefit-cost ratio 3. Internal rate of return
Social Cost Effectiveness Analysis (SCEA)	A traditional economic tool for performance management adapted to include impacts on society. It can determine the cost-effectiveness of an intervention
Social E-valuator	A web-based tool based on the Social Return on Investment (SROI) methodology
Measuring Impacts Toolkit	Provides a way for corporations to look at the impact of volunteering on the volunteer, the service user, the corporation, and the wider community. It allows for comparison of results over time, provides positive and negative results, and allows intended & unintended impacts to be explored
Ongoing Assessment of Social Impacts (OASIS)	A customized, comprehensive, and ongoing social management information system
Best Available Charitable Option (BACO)	Looks to quantify an investment's social impact and compare it to the universe of existing charitable options for that particular social issue
Local Economic Multiplies	Based on the idea that dollars spent in locally owned stores will affect the local economy two or three times more in comparison to dollars spend in national retailers

Interestingly all of these 10 frameworks (Table 2.4) take a process approach; but only two of them are impact measurement frameworks (i.e. SCBA and BACO). Process frameworks focus on monitoring the efficiency and cost-effectiveness of ongoing operations; while impact frameworks measure operational outputs and their impact – the incremental outcome above or below what would have otherwise occurred in the absence of the intervention or the organization itself (Maas, 2014).

Table 2.4: Classification of social impact measurement frameworks (Maas, 2014)

X = Yes, O = Partially, - = No

		1	2	3	4	5
Characteristics	**Types**	**SROI**	**SRA**	**SVA**	**SCBA**	**SCEA**
Purposes	Screening	-	X	-	X	-
	Monitor	X	X	-	-	-
	Reporting	X	X	-	X	X
	Evaluation	X	X	X	X	X
Time Perspective	Prospective	-	X	-	X	-
	Ongoing	X	X	-	X	-
	Retrospective	X	X	X	X	X
Orientation	Input	X	X	-	X	X
	Output	-	-	X	-	-
Time Frame	Short term	X	X	-	X	X
	Long term	-	-	-	X	X
Beneficiaries	Micro (individual)	X	X	-	-	-
	Meso (corporation)	-	X	X	-	-
	Macro (society)	O	X	-	X	X
Approach	Process methods	X	X	X	X	X
	Impact methods	O	-	-	X	-
	Monetisation	X	X	X	X	X

		6	7	8	9	10
Characteristics	**Types**	**Social E-valuator**	**Measuring Impacts Toolkit**	**OASIS**	**BACO**	**Local Economic Multiplies**
Purposes	Screening	-	-	-	X	X
	Monitor	X	-	X	X	-
	Reporting	X	-	X	X	-
	Evaluation	X	X	X	-	X
Time Perspective	Prospective	-	-	-	X	X
	Ongoing	X	-	X	X	-
	Retrospective	X	X	X	X	X
Orientation	Input	X	X	X	X	X
	Output	-	-	X	-	-
Time Frame	Short term	X	X	X	X	X
	Long term	-	-	-	-	-
Beneficiaries	Micro (individual)	X	X	X	-	X
	Meso (corporation)	-	X	-	X	X
	Macro (society)	O	X	X	X	-
Approach	Process methods	X	X	X	X	X
	Impact methods	O	-	X	-	-
	Monetization	X	X	X	X	X

In general, social impacts are often difficult to measure and quantify, because of their qualitative nature (DfT, 2014b). Moreover, attributing a monetary value to the impact adds another layer of complexity to an already challenging process (Hebb and Bhatt, 2014). In cases, where the impacts are significant but do not have a market value, it is recommended if feasible to construct a monetary value, or assign a financial proxy, to non-marketed impacts of assets, goods or services (i.e. Economic valuation).

2.5 APPRAISAL AND VALUATION TECHNIQUES

Sound appraisal informs policymaking, and robust valuation of impacts in monetary values helps decision makers to consider them more attentively. Some of the costs and benefits of appraisals can be readily valued because they impact directly on markets, and thus have a market price. But some cannot, and therefore require a monetary value to be estimated or obtained from complementary markets (see Figure 2.8 below). Appraisals which are undertaken to support decision making (and which include subjective criteria) generally fall into three broad categories (DTLR, 2002):

- **Cost Benefit Analysis -** where all the advantages and disadvantages of a range of alternative solutions are compared, ideally in money terms;
- **Cost Effectiveness Analysis** – where alternative ways to meet a defined result are compared generally in terms of financial costs;
- **Multi-Criteria Approaches** – where alternative options are compared on the basis of attributes which are measured but not necessarily economically valued.

The first two of these appraisal approaches rely fundamentally on monetary values. However, cost benefit analysis reaches its limits when a monetary value cannot be practically assigned to some significant impacts. In such cases other techniques may be more suitable, such as multi-criteria decision analysis (DTLR, 2002). According to the DTLR (2002):

> *"Decision making in central government in the UK is based on a general appraisal framework which involves the assessment of costs and benefits and associated risks. The full implications of relevant options are examined and compared in terms of their estimated impact on general welfare. There is a presumption that market prices will normally reflect social values and so can often be used to derive welfare effects. In cases where market prices clearly do not reflect collective values (for example, environmental and other effects for which there is no direct market), then shadow prices should be estimated".*

2.5.1 Economic Valuation Techniques

Valuation techniques are commonly used for measuring environmental impacts (University of Olso, 2014). They have also been used for estimating the monetary values of safety in the appraisals for roads and rail transport (Jones-Lee and Spackman, 2013). They have also been

used for valuing time savings, and hence congestion costs (DTLR, 2002). In general, there are three broad approaches for estimating the economic values attached to non-marketed impacts of assets, goods or services:

1. using Revealed Preference (RP) Techniques;
2. using Stated Preference (SP) Techniques; or
3. using a Benefits Transfer (BT) approach

When using a RP approach, economic values are *revealed* through a proxy market (e.g. deducing the economic value of noise insulation of roads through improved surfacing, as reflected in its impact on house prices). Thus RP analysis infers people's willingness to pay (WTP) for a service or a good based on observed evidence of how they act when making choices (DTLR, 2002). In contrast, a SP approach is based on what people state rather than what they do. It relies on asking people hypothetical questions about their (maximum) WTP for a particular benefit, or their (minimum) willingness to accept (WTA) compensation for accepting a particular loss or dis-benefit (University of Oslo, 2004). A BT approach relies on borrowing economic values (i.e. WTP) resulting from relevant case studies that adopted revealed and/or stated preference techniques, and then applying them to a new context (DTLR, 2002).

Economic valuations are preference-based, and therefore meet an underlying democratic principle (Jones-Lee and Spackman, 2013). Stated preferences are the most comprehensive and commonly used valuation technique. Interestingly, the use of WTP and WTA as measures of economic value is well-suited for CBA appraisal approaches. According to DTLR (2002):

> *"Benefits can be measured by WTP to secure the benefits. Costs may comprise WTA compensation for losses, plus resource costs (e.g. costs of inputs such as labour, capital, raw materials). Since market prices also reflect WTP, resource costs are also linked to WTP".*

Within the SPT, there are two alternative methodologies: contingent valuation (CV) and choice modelling (CM). The former relies on direct elicitation by asking people directly about their maximum WTP or minimum WTA for a good or service as a whole (or impacts). The most common elicitation formats are: open-ended questions, bidding game, payment card, and close ended single-bounded or double-bounded referendum. On the other hand, the latter concentrates on identifying people's preferences for the different characteristics or

attributes of these goods and services (DTLR, 2002; University of Oslo, 2004). The various forms of choice modelling are: choice experiments, contingent ranking, paired comparisons and contingent rating. The main difference between CV and CM is based on whether the focus is on the value of the whole or the individual characteristics of the good or service under question.
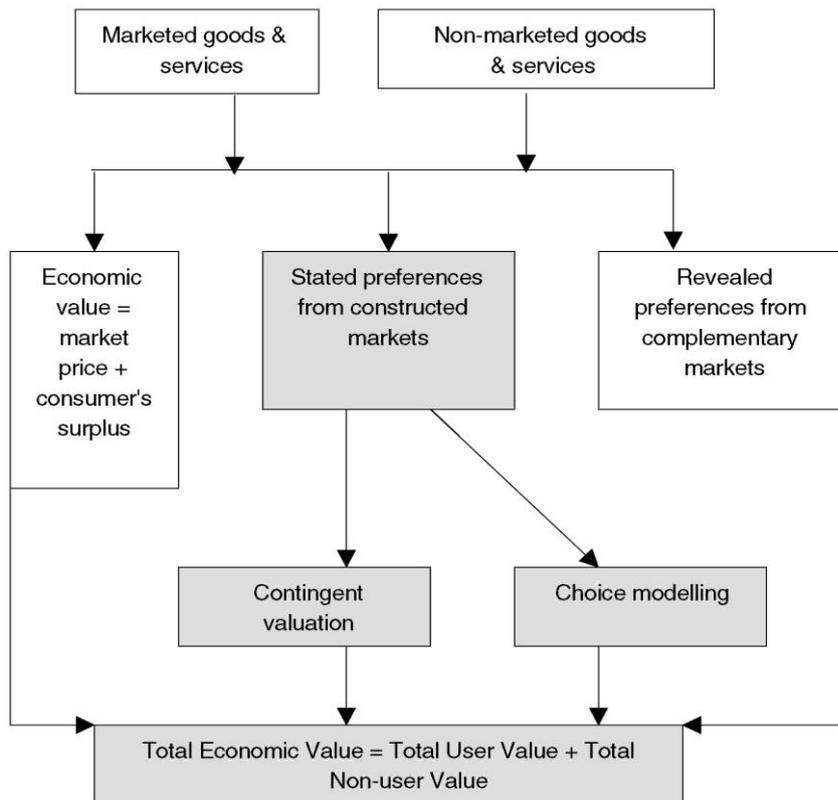
Figure 2.8: Economic valuation techniques (DTLR, 2002)

2.6 A REVIEW OF HUMAN VALUE / IMPACTS VALUATION STUDIES

The literature review identified a few amount of studies that have "*explicitly*" sought to identify, quantify and monetise human impacts / values / benefits (i.e. Highways Agency, 2009; Mayor and Coleman, 2011). However, this section also includes two other relevant studies that have *"implicitly"* considered investigating human impacts. These relevant studies were conducted by Department for Transport (DfT, 2011) and Transport for London (TfL, 2006), for the purposes of identifying and monetising ambience benefits (i.e. the quality of the environment that users experience. These precedent studies are briefly summarised below.

Highways Agency– "Value of Driver Information through Variable Message Signs" (2009): This study aimed to understand and quantify the benefits of driver information provided through variable message signs (VMS), and then to attribute a monetary value to the

identified benefits. Through literature review, the study found that driver information has the potential to deliver a number of benefits to the road user. Some of these, such as accident and journey time savings, and environmental benefits were already covered in the Highways Agency's appraisal framework. However, there were other these less tangible, but equally important, human benefits that were not evaluated. Thus, the Highways Agency was keen to understand and quantify these benefits, so they can form part of the evaluation for the implementation of VMS. The main human impacts and benefits of driver information that were considered in the study are shown in Figure 2.9.
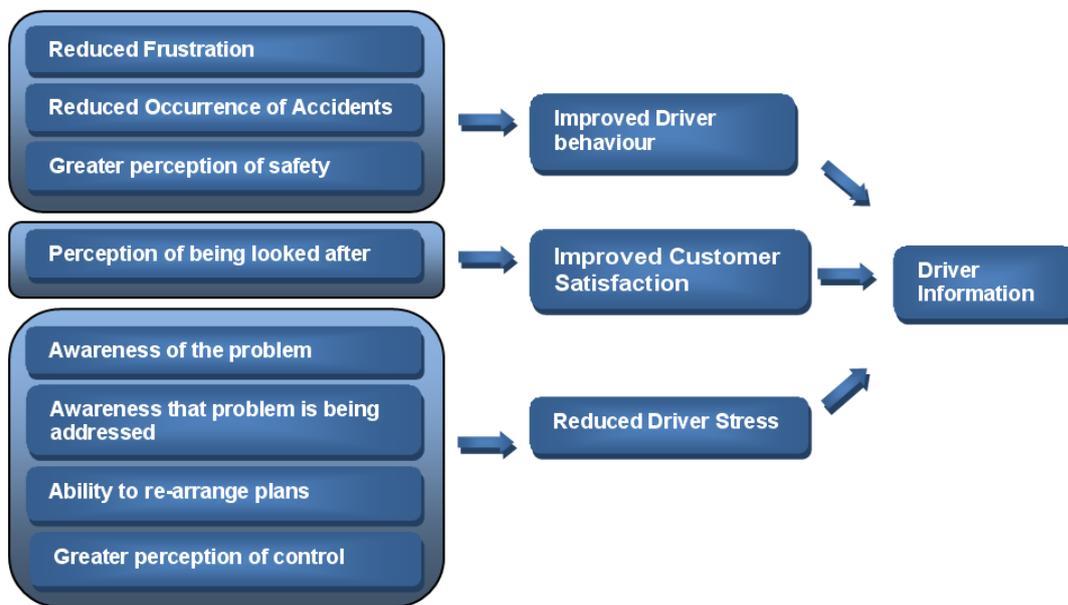
Figure 2.9: Human benefits and impacts of driver information (Highways Agency, 2009, p. 4)

The methodology adopted for the study was based on a series of focus groups conducted in a sample of locations in different Highways Agency regions, to ensure a balanced sample geographically. Also, to investigate whether (financial) values attributed to VMS would vary from a region to another, as the number of VMS in each region vary significantly. Participants were asked to place a value to the benefits of VMS by means of a face-to-face interactive exercise, which used the 'Willingness to Pay' concept within the context of a serious of scenarios that were presentenced to them. The study concluded by emphasising the credibility of the 'willingness to pay approach'; identifying a value of £7.08 per VMS per day; and providing a list of recommendations for improving the approach used for the study. The use of a larger sample to produce more robust and usable values was placed on the top of this list.

Mayor and Coleman– **'The Social and Emotional Benefits of Good Street Design - Brighton & Hove City Council Public Realm''(2011):** This study aimed to gain a better understanding of the social and emotional benefits of balanced street design. In other words, it aimed to investigate the social & emotional impacts of traditional and better balanced streets on users. The study used a mixed research approach for collecting this type of data. For example, a questionnaire associated with the use of photographs for eliciting opinions from the general public, but relied on the use of semi-structured (face-to face and telephone) interviews when dealing with businesses. A key challenge that faced this study was being able to identify a way of measuring social and emotional benefits. According to the authors of the study :

> *"Quantifying emotions is very difficult (there is still no consensus, for example, on exactly what happiness is), and we suspected that interviewees were likely to find it difficult to rationalise and articulate their emotional response to street design"* (Mayor and Coleman, 2011).

The study overcame this challenge by providing its participants with a set of predetermined emotions to help them conceptualise the question. This enabled participants to choose from examples provided, or use these as prompts to understand the question and then identify other emotions they felt were more relevant. As with the emotional question and investigation described above, establishing a way to collect users' views on the monetary value of good street design presented a challenge to the researchers of the study. The study adopted a 'Willingness to Pay' approach but it found it challenging to:

▪ *Decide on a funding mechanism* – due to the political sensitivity linked with asking the public users to be willing to raise funds to something they may feel should be done by the council anyway;

▪ *Avoid bias and receiving irrational monetary values* – as people may not be aware of the real value of what they are willing to pay for, or responses may be influenced by the dialogue with the interviewer and thus people may feel forced to give any value

In order to overcome this challenge, the study considered various scenarios and then decided on testing one approach – a mock "donation" process. Following this final questionnaires (interviews), incorporating both emotional and money questions, were refined through internal testing before being tested on User Groups. Under half of those interviewed (51 in number) stated that they would be willing to donate funds towards the development of a

similar well designed street environment. On average, the benefits of a good street design were valued by the participants to a sum of £34.49 per person. The study however acknowledged that the major limitation of the study was the use of an interview approach; that is because it led to a limited sample for the study.

Department for Transport– "Valuation of Townscapes and Pedestrianisation" (2011): This study's main focus was to develop, deliver and analyse a pilot WTP study, in order to understand whether a valuation framework could be adapted for monetising townscape benefits. The outcome of this study could then be used to identify and monetise the ambience benefits of pedestrianisation and/or townscape improvements (e.g. feeling comfortable, and opportunity for activity) The literature review identified previous valuation research on pedestrian amenity benefits using stated preference (SPT) using the contingent valuation method (CVM) and property market Revealed preference Technique (RPT). However, the study considered three additional valuation methods: discrete choice stated preference, priority evaluator / priority ranking (PR) and; cost saving approaches. With the agreement of a Steering Group, the study decided to use a WTP pilot study that combines SP and PR.

The study used a survey approach that was delivered both electronically and by paper, and it obtained 758 usable responses across four different UK sites. The survey was divided into two main sections. In the first, a number of questions were used to elicit specific information about the participants (e.g. where they live and mode of transport used). Additionally, participants were asked to mention their level of satisfaction with a number of factors and services that exist within their local area, using a five-point Likert scale. Like-wise, respondents were asked to identify the level of importance of various factors that affect their quality of life. In the second section, the participants were asked to choose between different scenarios of streetscape improvements. Within each scenario, respondents were asked to choose their preferences for three given options. Each option included a payment vehicle costing associated with it. The study concluded by emphasising the suitability of using a WTP approach as a valuation framework, and by providing indicative ranges of values for townscape improvement packages and elements. The study also recommended future studies to incorporate a focus group session as part of the methodology, to enhance the quality of the survey data.

Transport for London (TFL)– "Valuing the Public Realm" (2006): Traditionally, Urban realm business appraisals were focussed on identifying and quantifying safety benefits and time savings. However, other significant benefits such as ambience improvements were not

included due to lack of sufficient data and valuations. Therefore, the aim of this study was to develop a strategy that allows ambience benefits to be included in business cases for urban realm improvements. The data collection methodology adopted for this study has influenced DfT's (2011) study of the valuation of townscapes described above. However, the main difference is that the TFL study used a Choice Experiment SPT to ask participants about their WTP for the improvements they chose in the SP exercise. The study used three payment mechanisms (i.e. Council Tax, Public transport fares/joining cost, and Rent) and provided three price points: £2, £5 and £10 per year. Those who stated 'Yes' to all, were then asked to provide a value for their maximum WTP.

2.7 CONCLUSIONS AND RECOMMENDATIONS OF LITERATURE REVIEW

The purpose of this literature review report is two-fold. Firstly, to review up-to-date knowledge related to the impact of road usage and on whom, in order to develop a wider understanding of customers in the context of Highways England's operational directorate. Secondly, to review current knowledge on identifying and quantifying human impact, with the intention of defining methods by which a monetary value can be attached to the benefits of these human impacts. The recommendations of this literature review report will be used to support the succeeding empirical study that hopes to develop a methodology for evaluating the human impacts of Highways England's (HE) operational enhancements. HE already understands and quantifies time saving, safety and environmental benefits. However, being able to evaluate these less tangible, but equally important, human benefits can make business cases and appraisals more robust.

Through literature review, the current report identified five key areas that are significantly influenced by the existence and usage of roads, namely: (1) Economy; (2) Environment; (4) Society and neighbouring communities; (4) Safety of road users; and (5) Emotions and Behaviour of road users. It was found that a growing but relatively small number of studies attempt to investigate the factors (e.g. operational services) that impact on road users' emotional state and driving behaviour. Social and emotional benefits or dis-benefits are difficult to quantify, in particular, because of the intangible nature of emotions and values. However, putting financial proxies on these human values and benefits is vital, if we are to make fully informed decisions on the cost / benefit values of road investments or business cases for operational enhancements.

In the context of road usage in the UK, and the SRN in particular, the review identified a number of current and future challenges facing Highways England. These included: the rapid traffic growth, increased pressure on main roads, increased demand for assuring the delivery of value for money, and uncertainty about road users' behaviour and their individual value systems. In line with recent trends in SRN policies, these identified challenges urge the need for greater operational capability and funding certainty. Certainly, two key enablers for this are: (1) Gaining a wider understanding of HE's customers and to investigate their individual value-systems; and (2) Evaluating the social and human impacts of HE's operations. Robust valuation of these important impacts in monetary terms would influence policymaking, and enable decision makers to take more proper account of them.

The terms "customer", "consumer" and "client" are often used interchangeably to describe the relationship between service providers and recipients of these services. A review of the meaning of "customer" as understood and used in different disciplines (e.g. marketing, business and lean project management), led this study to introduce the concept of the 'customer system'. This concept argues that although the term "customer" seems to indicate a single person or a defined group of people or an entity (e.g. road users). Instead the 'customer-system' perspective, in the context of HE's operational directorate, offers four groups of customers that have different, and often conflicting, needs and interests. The preliminary concept of 'customer-system' presented in this report can be used as a guiding framework for investigating the individual value-systems of customers.

Assessing the impact of a policy, strategy, service or project means understanding the value it adds to the society, corporations and/or the individuals that are affected by it. In general, social impacts are often difficult to measure and quantify, because of their qualitative nature. However, one of the main challenges with assessing social impact is the existence of a wide variety of methods that can be used for its measurement. Each method has its own characteristics; so some are more suited to certain organisations than others. Such disparate options for choice can create confusion. Drawing on the work of Maas (2014), this report compared certain characteristics of 10 different measurement frameworks that can be used for 'monetising' social impacts. Interestingly, it was found that out of these 10 frameworks only two of them are developed to measure operational outputs and their impact, namely: SCBA and BACO (see Tables 3 and 4). All of these 10 monetisation frameworks, however, require the use of financial proxies or estimated monetary values, to evaluate impacts (or benefits of these impacts) that do not typically have a market value.

By analysing three broad techniques for estimating the economic values attached to non-marketed impacts (i.e. RP, SP and BT), it appears from the literature review that the 'Stated Preference' (SP) approach is the most widely used valuation technique. In fact, it is the only type of technique suitable in many situations. Furthermore, SP is consistent with CBA appraisal and decision-making approaches (DTLR, 2002). These findings, therefore, suggest that the SP technique could be adapted for studies attempting to quantify and monetise social and human impacts.

The literature review revealed that very few studies have sought to quantify and monetise human impacts, specifically within the context of roads and highways. A thorough review of four identified studies, evidenced the popularity and suitability of adapting the SP technique as a valuation framework (see Table 2.5). All of the four studies relied on the use of the SP as an economic valuation technique, and acknowledged its credibility. The studies, however, adapted different forms of the SP technique (i.e. CV or CM) depending on the characteristics of each topic under investigation.

Table 2.5: A comparison between human-impact valuation studies

Study	Data Collection Techniques	Valuation Technique
Highways Agency (2009)	A series of focus groups, and interactive face-to-face exercises (interviews)	'Willingness to Pay' concept with the use of various hypothetical scenarios – CV methodology
Mayor and Coleman (2011)	A mixed research approach: • Structured face-to-face interviews associated with the use of pictures when collecting data from the general public • Semi-structures (face-to-face or telephone) interviews when collecting data from businesses	'Willingness to Pay' approach based on one pre-tested scenario – CV methodology
DfT (2011)	Electronic and paper surveys	A WTP pilot study that combines SP and PR techniques
TfL (2006)	Surveys	Choice Experiment form of CM, SP technique

Overall, the review recommends the consideration of the 'Stated Preference' valuation technique for next stages of this study – Monetising the human impacts of Highway England's operational enhancements. The 'Willingness to Pay' approach will therefore be subject to empirical examination through a pilot study, as discussed in the following sections of the report.

SECTION 3: EMPIRICAL REPORT

This empirical report provides an analysis of the results and findings of a study that was conducted to develop a methodology for identifying and monetising the human impacts and benefits of HE's operational services. The study is based on data collected through a pilot study that comprised of nine in-depth semi-structured interviews, and a web-based questionnaire survey that received 188 responses. The empirical study explored and evaluated five main areas:

1) Road users' experience of the SRN and their level of satisfaction with HE's operational services
2) The influence of the SRN on the economy, society and environment
3) The impact of information provision on: (a) how customers feel and (b) driving behaviour
4) The human impacts/value/benefits of HE's operational services
5) The effectiveness and reliability of a bespoke methodology developed for monetising human impacts.

The report starts by analysing the sample of the survey study. Following this, the report provides a detailed analysis of empirical results obtained through the questionnaire survey and the qualitative pilot-study. Next, a summary of main findings of the study is presented. This includes details about how the bespoke monetisation methodology was developed and supporting information on how to use it. Finally, conclusions, recommendations, and suggestions for next steps are provided.

3.1 SAMPLE ANALYSIS

3.1.1 Respondent and Travel Characteristics

This section provides the details of the sample characteristics (see Table 3.1). The respondent characteristics of the study's questionnaire survey are relatively similar to those of previous NRUSS interview surveys. However. this study received more responses from the 25-44 years age group who seem to be the most frequent users of the SRN. This study also received fewer responses in the female group.

Table 3.1: Questionnaire-Survey's Sample Characteristics
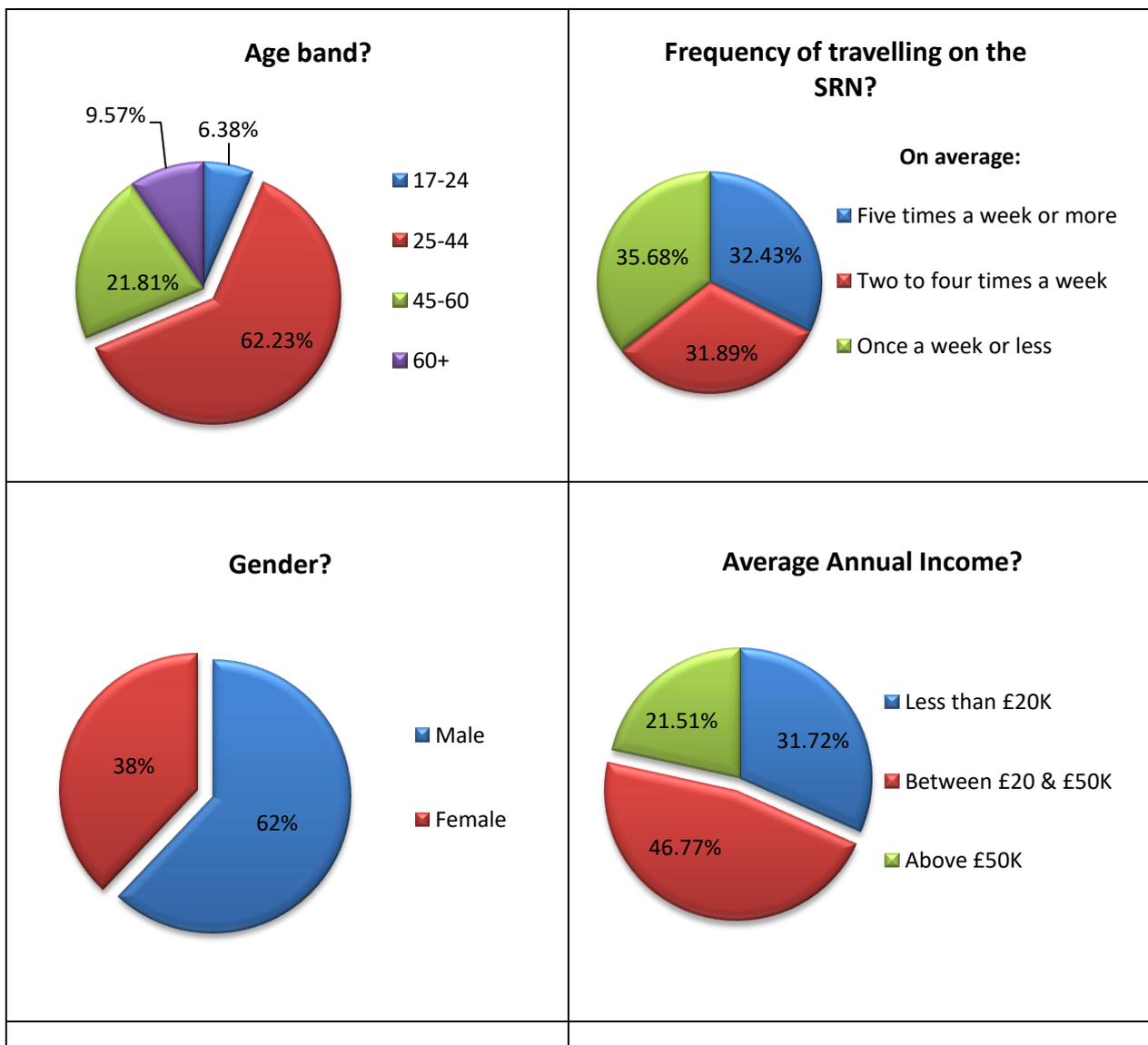
Working status?

- Employed — 76.06%
- Self-employed — 9.04%
- Non-employed — 4.79%
- Retired — 3.19%
- Other — 6.91%

Usual vehicle?

- Car — 79.26%
- Van — 2.13%
- Bus or coach — 12.77%
- Bicycle — 1.60%
- Motorcycle — 0.53%
- Taxi — 1.06%
- HGV — 0.53%
- Other — 2.13%

Way of using the SRN?

- As a driver — 74%
- As a passenger — 21%
- Other — 5%

Blue badge holder?

- Yes — 4%
- No — 96%

Area of residence?

- South West: — 25%
- South East: — 6%
- London: — 6%
- East of England: — 8%
- West Midlands: — 15%
- East Midlands: — 25%
- North West: — 9%
- North East: — 1%
- Yorkshire and the Humber: — 4%
- Other — 1%
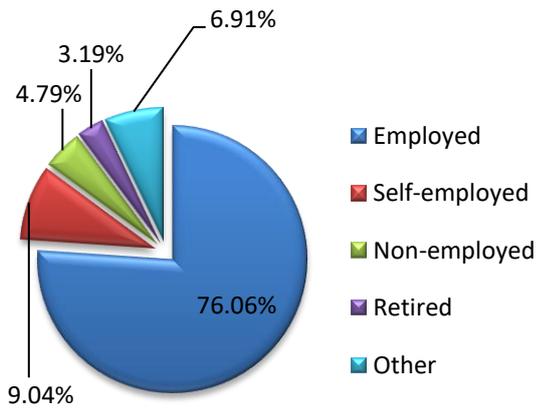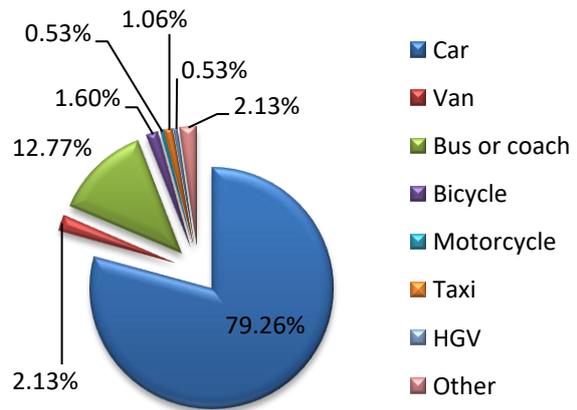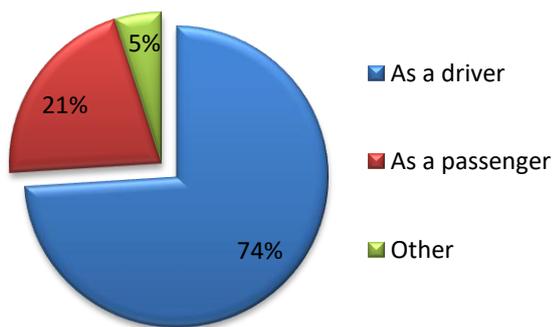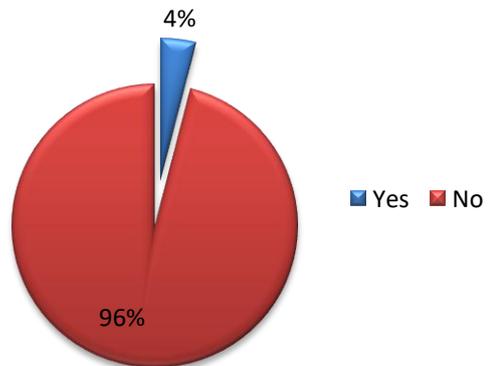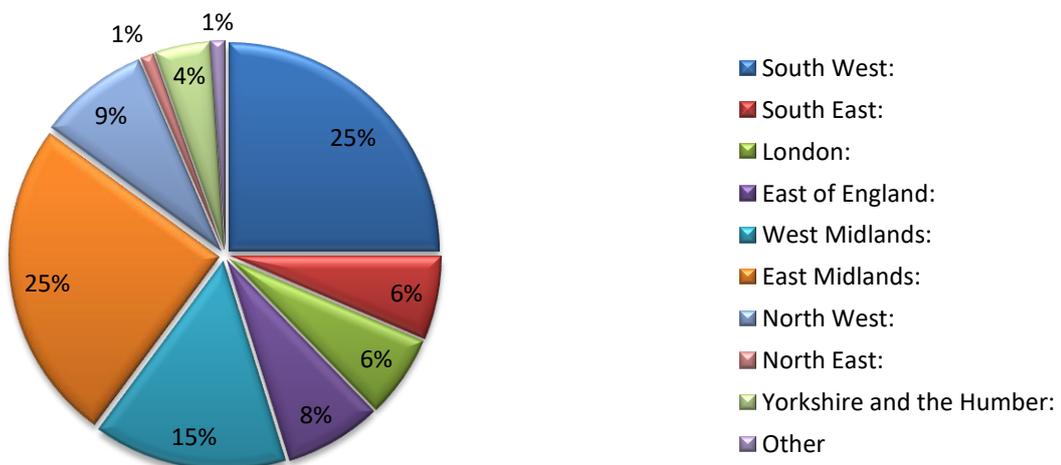
3.2 SURVEY AND PILOT STUDY RESULTS AND ANALYSIS

3.2.1 Introduction to the SRN and its impact on the Economy, Environment and Society

Roads play an important role in supporting economic growth and enhancing the productivity and social well-being of countries. Thus, the aim of the following set of questions was to:

- Discover the respondents main purposes for using the SRN

- Assess respondents' familiarity with the network of roads forming the SRN

- Identify the respondents' level of satisfaction with how the SRN is currently being managed and operated.

- Investigate how the SRN influences the economy, environment and society from the respondents' point of view.

Main purposes for using the Strategic Road Network (SRN):

What is your main purpose for using the Strategic Road Network [England's motorways and/or major 'A' roads and trunk roads]? (Multiple Choice option)		Responses	Percent
Social domestic pleasure (e.g. visiting family and friends and shopping):		140	74.47%
Commercial and business purposes:		46	24.47%
Going to work:		85	45.21%
If other, please specify:		2	1%

The specified comments made for the 'other' category were: using the SRN for going to school and travelling to university.

Roads of the SRN commonly used and listed by the respondents

Please list some of the roads on the Strategic Road Network (SRN) that you often use

Respondents were given the option to list as many roads as they wish. Those were then collated as shown in Table 3.2

Table 3.2: List of roads on the SRN that are often used by the respondents

	Motorways	Major/Main Roads
Road name	M1, M2, M3, M4, M5, M6, M11, M16, M18,	A1, A1(M), A2, A3, A5, A6, A10, A11, A12, A14, A15, A17, A18, A19, A20, A30, A34,

	M20, M25, M26, M27, M32, M40, M42, M45, M50, M54, M55, M56, M57, M58, M60, M61, M62, M65, M69	A38, A39, A40, A41, A42, A43, A45, A46, A47, A50, A52, A55, A60, A64, A65, A66, A140, A148, A149, A194, A167, A184, A303, A339, A379, A386, A406, A412, A414, A417, A421, A428, A435, A441, A453, A456, A500, A540, A556, A580,A590, A595, A610, A697

The motorways and major A road listed in the Table above are the ones that are often used by the participants of the study. By referring to the SRN map below (Figure 3.1), it appears that some of the A roads listed by the respondents do not form part of the SRN. This indicated that some of HE's customers are not able to differentiate between major A roads that are managed by Highways England's and others that are managed by their local road authorities.
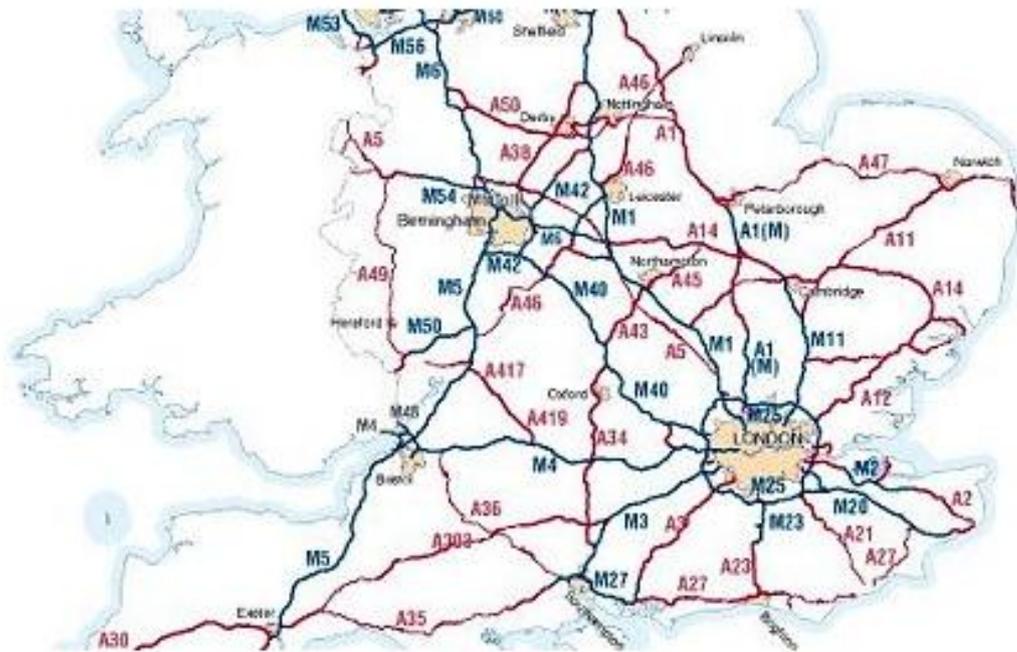
Figure 3.1: A map of the Strategic Road Network (House of Commons, 2015, p. 4)

Level of Satisfaction with Highways England's (HE) operational services:

Highways England's (HE) operational capability is based around:
- **Collecting information on road use and causes of delay across the network;**
- **Deploying on-road resources (Traffic Officers) to incidents;**
- **Operating 70 miles of Smart motorways;**
- **Control room capability for incident management and liaison with emergency services;**
- **Providing information to the public, e.g. through road signs and HE's website;**
- **Providing traffic management for road maintenance work.**

How would you describe your level of satisfaction with these services?

Level of satisfaction with HE's operational services
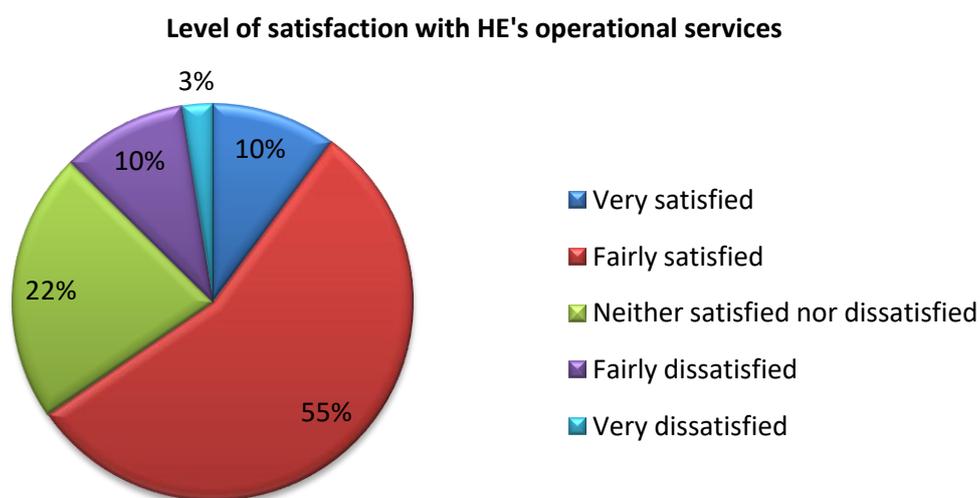
Figure 3.2: Respondents' level of satisfaction with HE's operational services

Overall, the majority of the participants of this study (around 65%) were satisfied with HE's current operational capability. On the other side. only about 13% of all participants were dissatisfied. Interestingly, an in-depth analysis of data revealed that the 'female group' tend to be more satisfied with HE's operational services than the male group (76% of the female group were satisfied, while only 61% of the males were satisfied).

Through interviews, participants were asked to describe their experience of the SRN and to probe on what they like or dislike the most about the SRN. Overall, most people interviewed were relatively satisfied with the performance of the SRN. However, most of them were frustrated with the huge amounts of road-works taking place recently. There were also concerns about the quality of the surfacing conditions of some motorways and major roads. Table 3.3 below provides a brief summary of responses received.

Table 3.3: Respondents' description of the SRN

Positive Responses	Negative responses
• *Means for quick communication and that's what the roads are all about* • *Fast roads, traffic flows very well* • *Safe roads* • *Smart motorway technologies*	• *Too many road works these days which is slowing up the traffic and adding up the frustrations to everybody* • *Some of the road surfaces are very bad like the M25 is pretty bad. I try to avoid it*

• *Mostly efficient*	• *Well maintained generally*
• *Normally wide enough*	• *Some are old roads and motorways*
• *A quite effective way to get from one place to another.*	• *Some lanes are narrow*
• *Road markings are good*	• *A lot of road works causing a lot of congestions*
• *Enough road signs*	• *On some motorways and most A-roads obviously, they are very dark - no lighting.*
• *Most of the motorway networks, the road surface conditions I'll say good*	
• *The information on smart motorways is clear*	
• *Well managed and signed*	

Influence of the SRN on the Economy

To what extent do you agree that the SRN influences the "UK Economy" through:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Reducing journey times?:	50(32.89%)	62(40.79%)	26(17.11%)	12(7.89%)	2(1.32%)
Reducing business costs?:	26(17.33%)	62(41.33%)	46(30.67%)	15(10%)	1(0.67%)
Improving journey time reliability?:	45(30.61%)	61(41.5%)	25(17.01%)	14(9.52%)	2(1.36%)
Allowing businesses to meet their customers' needs and reach out to new markets?:	34(22.82%)	58(38.93%)	42(28.19%)	13(8.72%)	2(1.34%)
Attracting inward investment?:	24(16%)	45(30%)	68(45.33%)	11(7.33%)	2(1.33%)
Increasing competitiveness through better connectivity?:	36(23.84%)	51(33.77%)	47(31.13%)	12(7.95%)	5(3.31%)
Creating job opportunities?:	34(22.97%)	51(34.46%)	50(33.78%)	10(6.76%)	3(2.03%)

Mean score out of 5
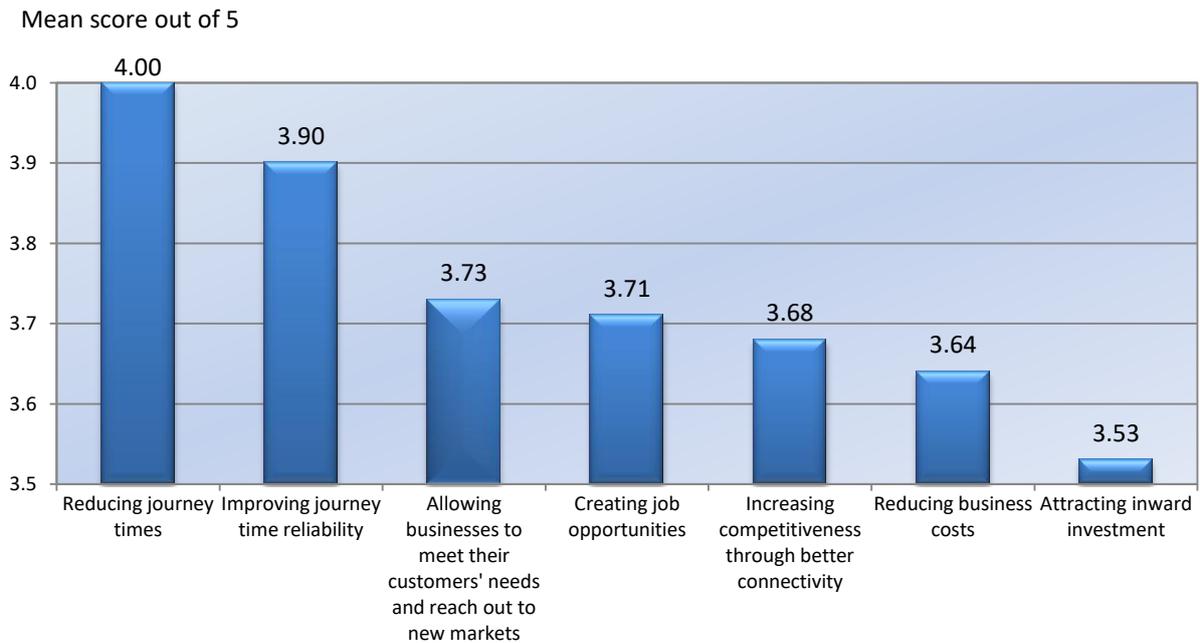
Figure 3.3: Respondents perceptions on how the SRN currently influences the Economy

Note:

The majority of the respondents (more than 50%) agreed with the study's identification of how the SRN influences the Economy

During interviews, participants had a good understanding about the importance of the SRN and its role in supporting growth and sustainability of England's economy. Most of the responses were focussed on its significance to businesses in terms of transport and logistics, and to individuals in terms of going to work on time. Interestingly, a few participants explored other critical impacts such as: creating job opportunities, competitiveness and productivity-related issues.

"You can work further from home because you won't take as long to get there".

" Transportation over the roads is in competition with railways and air-transportation, so you have to take into consideration all these three modes of transportation".

"Sometimes big lorries are standing in queues and not moving because of the traffic jam - they're not working!".

(Anonymous Participants, 2016)

Influence of the SR on the Environment

To what extent do you agree that the "Environmental impacts" of the SRN that need to be mitigated or reduced include:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Noise pollution?:	48(32%)	67(44.67%)	27(18%)	6(4%)	2(1.33%)
Air population?:	60(40%)	63(42%)	22(14.67%)	3(2%)	2(1.33%)
Water pollution – Contaminants in runoff pollution from roads?:	38(25.5%)	63(42.28%)	33(22.15%)	10(6.71%)	5(3.36%)
Fragmentation or reduction of wild life and ecologically sensitive habitats?:	42(28.19%)	60(40.27%)	33(22.15%)	11(7.38%)	3(2.01%)
Worsening of landscape and visual amenity?:	31(20.81%)	51(34.23%)	47(31.54%)	17(11.41%)	3(2.01%)
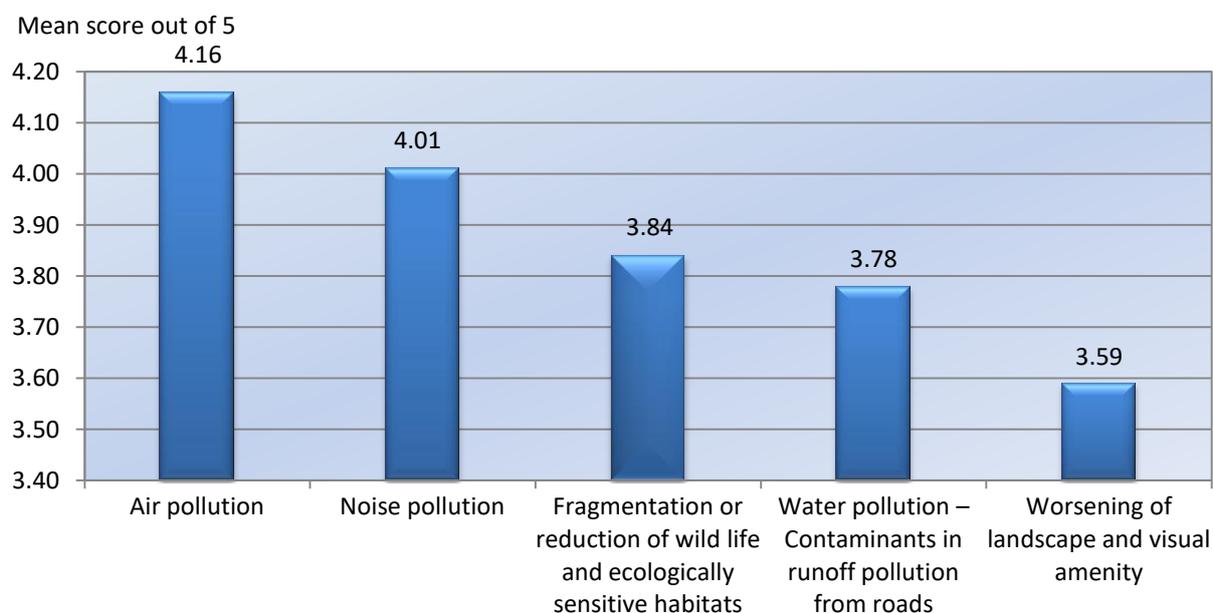
Figure 3.4: Respondents perceptions on how the SRN currently influences the Environment

Influence of the SRN on the Society and neighbouring communities

To what extent do you agree that the impacts of the SRN on the "UK Society and neighbouring communities" include:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Improving journey comfort to commuters and commercial road users?:	39(26%)	75(50%)	26(17.33%)	9(6%)	1(0.67%)
Protection/enhancement of historic buildings and places?:	12(8.11%)	35(23.65%)	67(45.27%)	31(20.95%)	3(2.03%)
Causing stress to individuals due to	13(8.97%)	40(27.59%)	70(48.28%)	20(13.79%)	2(1.38%)

change in property values?:

Improving connectivity between communities?:	30(20.27%)	91(61.49%)	17(11.49%)	9(6.08%)	1(0.68%)
Enhancing access to facilities (e.g. hospital, cultural centres, schools)?:	38(25.68%)	78(52.7%)	21(14.19%)	9(6.08%)	2(1.35%)
Taking account of local community wishes?:	10(6.76%)	35(23.65%)	74(50%)	26(17.57%)	3(2.03%)
Widening choices and providing new opportunities for travel and leisure?:	22(14.97%)	76(51.7%)	35(23.81%)	11(7.48%)	3(2.04%)
Integration with surrounding land use, urban/rural areas & transport systems?:	16(10.81%)	69(46.62%)	41(27.7%)	21(14.19%)	1(0.68%)
Causing disturbance to nearby residents due to noise & vibration resulting from movement of vehicles?:	17(11.41%)	61(40.94%)	48(32.21%)	20(13.42%)	3(2.01%)
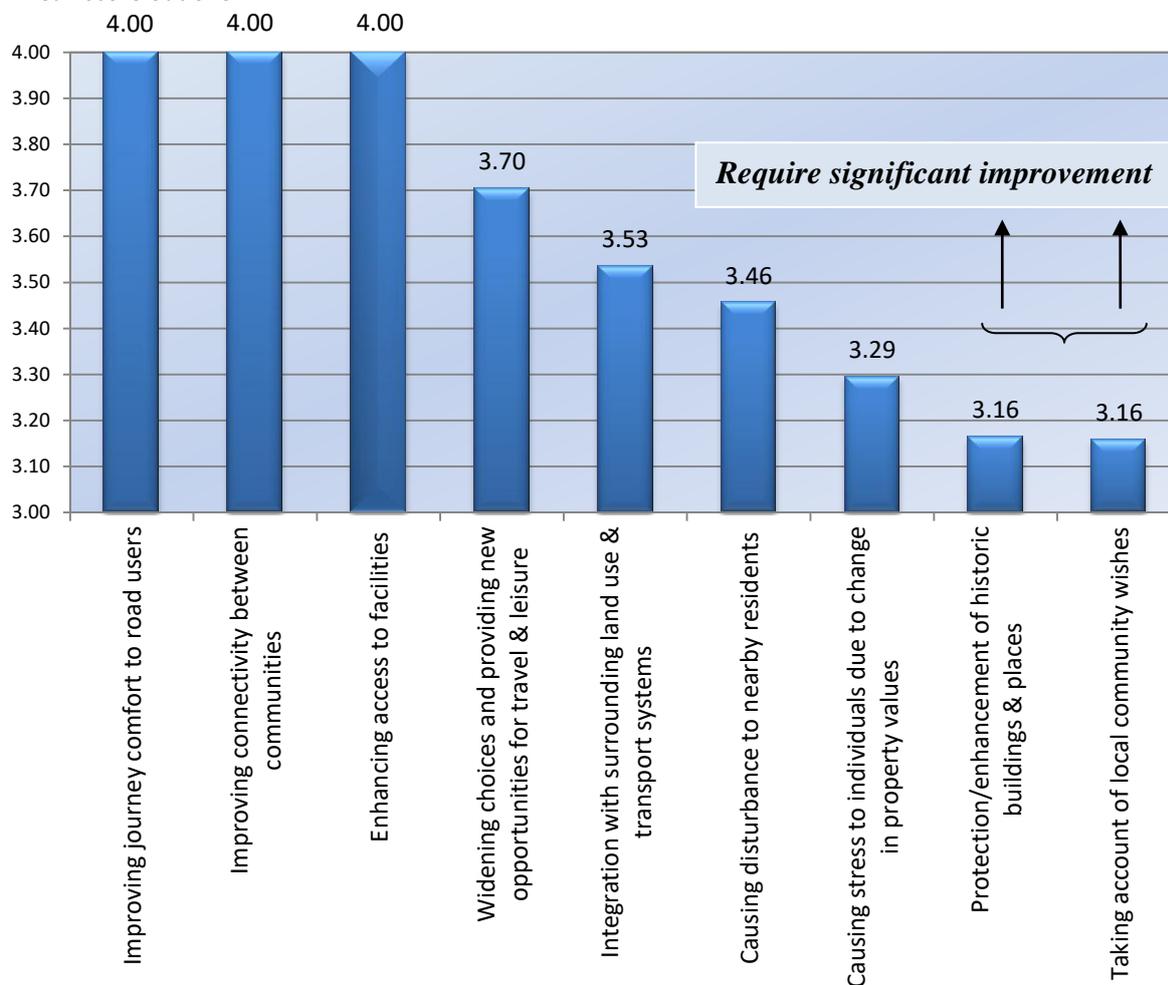
Figure 3.5: Respondents perceptions on how the SRN influences the Society

During interviews, respondents provided some fascinating points of view which illustrate their awareness of how the SRN impacts on their local communities and the society as a whole.

"If you do create a bypass, it can create passing trade for local businesses and it can have a positive impact up on people living there in the area. On the other side, the roads need to take up land - for example bypasses may actually destroy natural land in order to be produced and may go through villages. So, obviously, upset people that are currently living there.

"If there is a good road, I think it's proven that it increases house value, because it is then tempting for people to commute to work and they can live further out of the city".

(Anonymous participants, 2016)

3.2.2 The Impact of Information Provision on Road Users' Behaviours

Highways England is keen to gain a better understanding about the influence of information provision on how their customers feel. In an attempt to address this current shortfall in knowledge, the following questions were introduced to the questionnaire to:

▪ Recognise respondents' general attitude to travelling on the SRN

▪ Rank the types of information available to road users according to their importance

▪ Identify how customers prefer to receive these information

▪ Identify the impact of information provision on customers' feelings and driving behaviour

Respondents attitude to road travel

Attitude to road travel?

		Responses	Percent
Nervous:		10	5.32%
Confident:		131	69.68%
Neither nervous nor confident:		47	25%
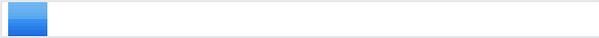
Prioritising types of information according to their importance to road users

How important is the availability of the following information to you as a road user?

	Extremely Important	Important	Neutral	Not Important	Not at All Important
Warnings of accidents ahead:	110(76.92%)	30(20.98%)	1(0.7%)	1(0.7%)	1(0.7%)
Information on alternative routes:	73(50.69%)	61(42.36%)	7(4.86%)	3(2.08%)	0(0%)
Safety messages related to road conditions:	69(47.59%)	53(36.55%)	15(10.34%)	6(4.14%)	2(1.38%)
Information about less busy periods:	19(13.19%)	57(39.58%)	45(31.25%)	19(13.19%)	4(2.78%)
Information about future road-works:	31(21.53%)	91(63.19%)	20(13.89%)	1(0.69%)	1(0.69%)
Warnings about an abortive journey (e.g. telling you that a road is so congested so that you decide not to make a particular journey):	62(43.06%)	66(45.83%)	11(7.64%)	5(3.47%)	0(0%)
Information about public transport:	19(13.19%)	40(27.78%)	54(37.5%)	23(15.97%)	8(5.56%)
Warnings of queues ahead:	49(34.03%)	84(58.33%)	7(4.86%)	3(2.08%)	1(0.69%)
Information on weather conditions:	21(14.69%)	68(47.55%)	36(25.17%)	15(10.49%)	3(2.1%)
Driving advice (e.g. 'Tiredness can kill. Take a break'):	12(8.33%)	43(29.86%)	53(36.81%)	29(20.14%)	7(4.86%)
Warning of delays ahead:	52(36.62%)	84(59.15%)	5(3.52%)	0(0%)	1(0.7%)
Information about direction and distance to service stations:	40(27.78%)	67(46.53%)	24(16.67%)	12(8.33%)	1(0.69%)
Information about future major events:	16(11.19%)	75(52.45%)	33(23.08%)	15(10.49%)	4(2.8%)
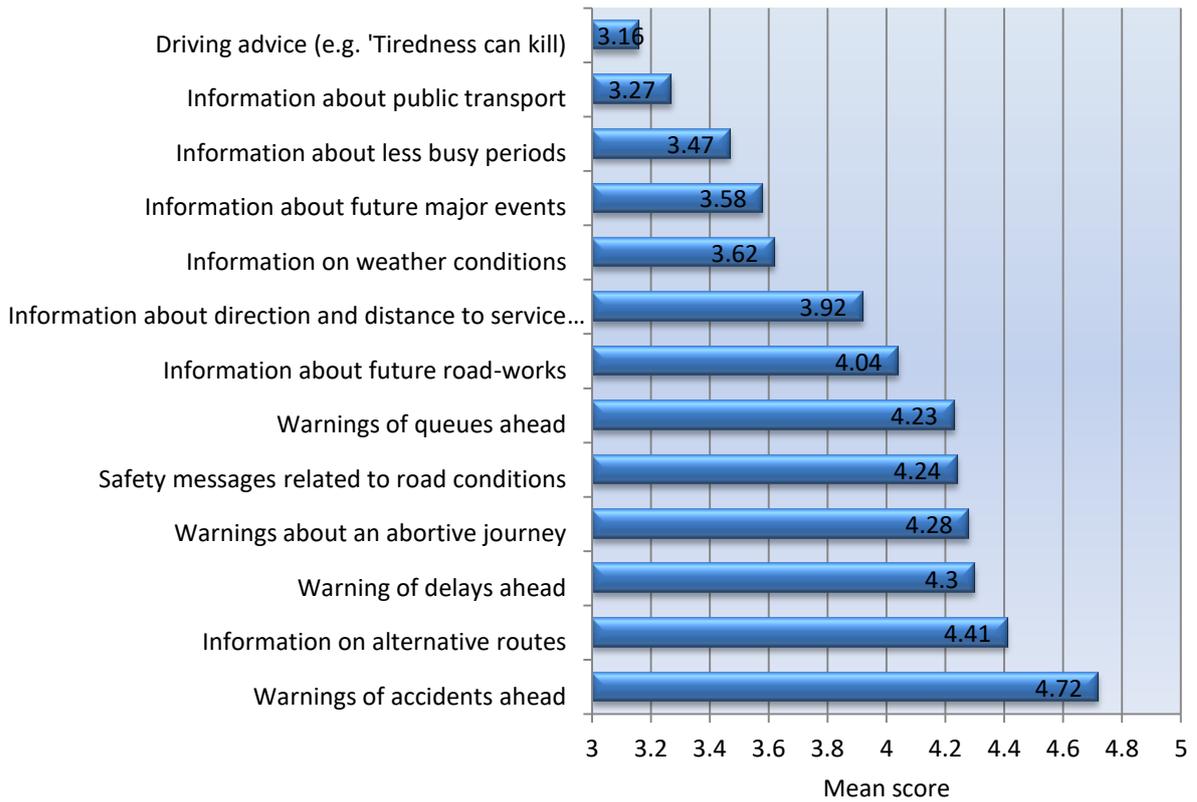
Figure 3.6: Prioritising types of information available to road users according to their importance to the respondents

Preferred means for receiving information

How would you like to receive these information? (Multiple Choice)

	Percent
Website	28.08%
Variable Message signs and electronic displays on the road	71.23%
App	48.63%
In-car device:	56.85%
Radio:	53.42%
Road signs and markings	62.33%
Information at petrol stations	30.14%
TV news bulletin	19.86%
If other, please specify	3%
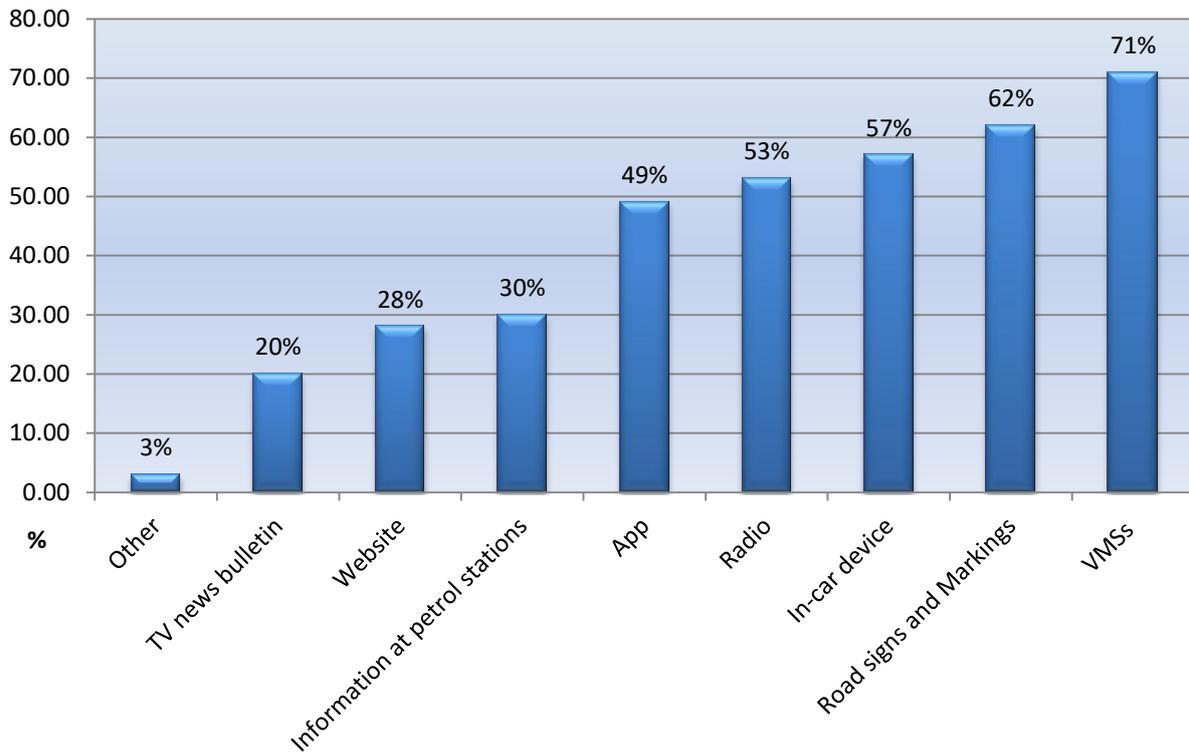
Figure 3.7: Ranking of SRN customers' preferred methods for receiving road-travel info, according to the respondents preferences.

Remarks:

- **Road signs and variable message signs are the most preferable means for communicating information to road users**

- **In-car devices seem to be rapidly growing in popularity**

- **Participants noted that information provided via VMSs need to be more accurate**

Key factors that influence driving behaviour

The following improves my driving behaviour:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Feeling safe:	57(40.71%)	61(43.57%)	19(13.57%)	2(1.43%)	1(0.71%)
Stress and frustration:	16(11.43%)	18(12.86%)	9(6.43%)	46(32.86%)	51(36.43%)
Awareness of the problem causing disruption:	35(25%)	76(54.29%)	23(16.43%)	6(4.29%)	0(0%)
Confidence that the problem is being	34(23.94%)	78(54.93%)	27(19.01%)	2(1.41%)	1(0.7%)

looked after:

Lack of information about diversionary routes:	12(8.63%)	11(7.91%)	23(16.55%)	60(43.17%)	33(23.74%)
Having the ability to re-arrange plans:	28(19.86%)	86(60.99%)	23(16.31%)	4(2.84%)	0(0%)
Being informed about alternate routes:	42(30%)	81(57.86%)	13(9.29%)	4(2.86%)	0(0%)
Trusting the road information that I receive:	61(42.96%)	69(48.59%)	10(7.04%)	2(1.41%)	0(0%)
Journey time reliability:	61(43.26%)	58(41.13%)	19(13.48%)	2(1.42%)	1(0.71%)
Increased occurrence of accidents:	7(5.04%)	23(16.55%)	29(20.86%)	30(21.58%)	50(35.97%)
Knowing in advance that a particular road is so congested:	43(30.94%)	69(49.64%)	17(12.23%)	8(5.76%)	2(1.44%)
Customer satisfaction (as a road user):	33(23.74%)	54(38.85%)	47(33.81%)	4(2.88%)	1(0.72%)
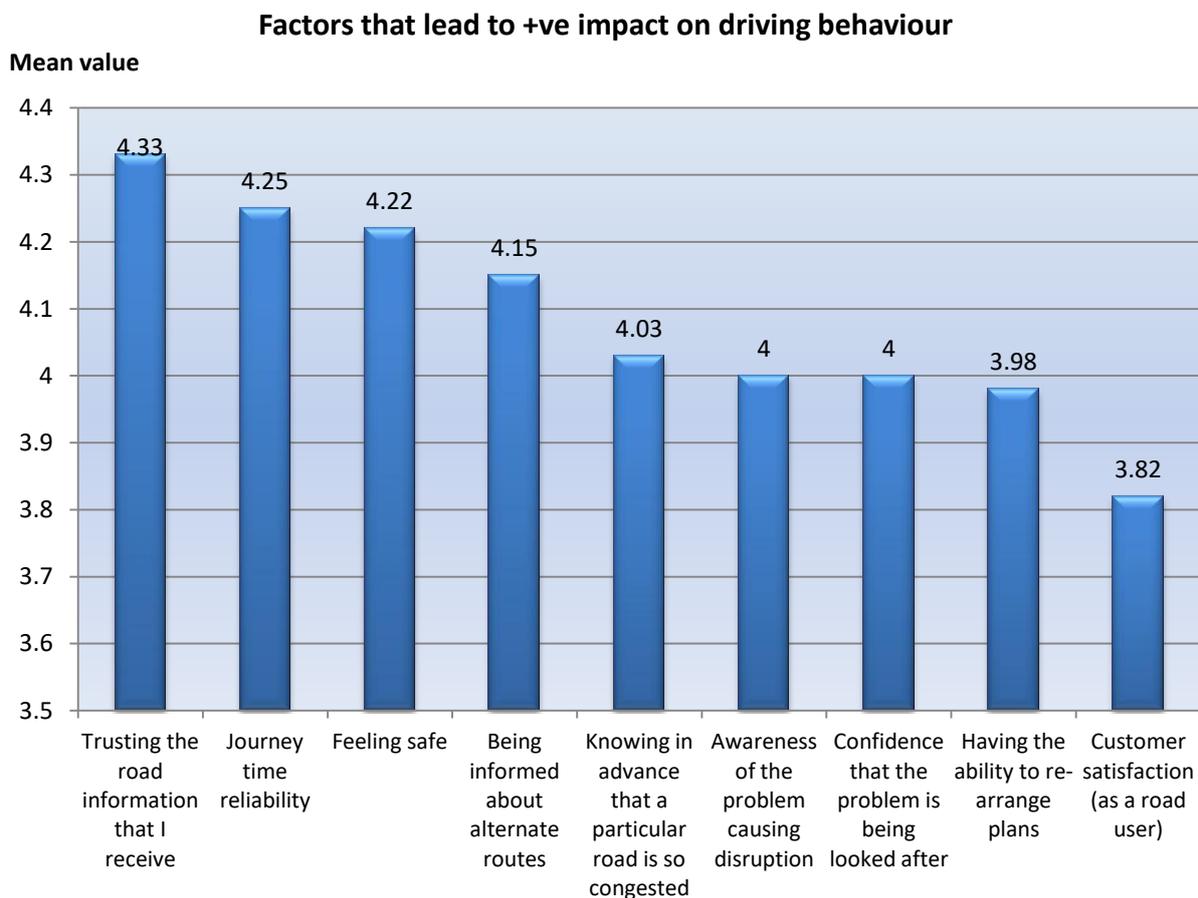
Figure 3.8: Ranking of factors improving driving behaviour
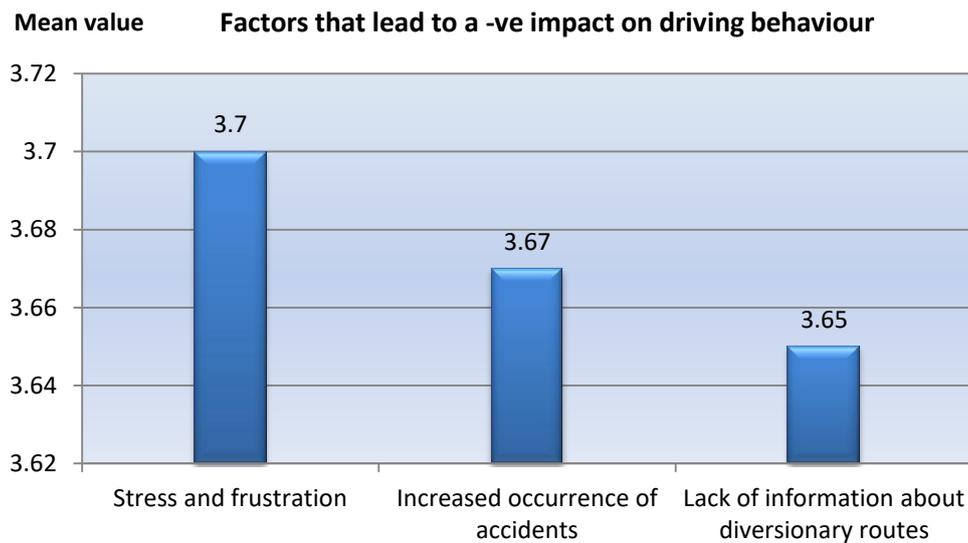
Figure 3.9: Factors worsening driving behaviour

Interestingly:

- **Around 7% of the participants mentioned that 'knowing in advance that a road is so congested' worsens their driving behaviour. This is because it affects their mood and makes them feel stressed and worried**

- **A few participants mentioned that 'feel safe' worsens their driving behaviour - this suggests that feeling safe can make them drive in a complacent manner, as opposed to driving defensively.**

3.2.3 Monetising Human Impacts and Benefits

HE is keen to understand and attribute monetary values to the human impacts / benefits attained from their operational services, so they can be used for appraisal and benefits realisation purposes. In order to address this gap in knowledge, the following questions were formulated to enable the study to:

- Gain more understanding about what worries customers when travelling on the SRN

- Identify the customers' perception on whether the SRN is in need for more 'capacity expansion' or 'capacity management'

- investigate how customers would like their money to be spent on the SRN

- Attribute a monetary value to the human impacts / benefits of HE's operational services

What things worry road users when travelling on the SRN?

In order to gain a better understanding about customers' needs and concerns, respondents were asked during interviews if there is anything that worries them on the SRN. A summary of main areas of concern are summarised in Table 3.4

Table 3.4 Respondents' concerns when travelling on the SRN

Concerns and areas for improvement	Respondents' quotes
Speed limits	▪ *The speed limit needs to increased, as the majority of road users are usually exceeding the speed limit which was set in 1965, cars and roads have improved drastically since then.*
Behaviour of other drivers	▪ *Lorries using the right lane* ▪ *Behaviour of other drivers in terms of lane changing. Because there are three lanes, you tend to find some drivers changing lanes quite often.* ▪ *A lot of people don't keep to the speed limit*
Lack of or inaccuracy of information (especially during night times)	▪ *The only thing which worries me because of the nature of my work that I have to travel a lot and in night from one place to another, is the traffic jam. I'm using Google Map which should know about the road closures and traffic jams, but sometimes I still get stuck in traffic because I don't have the information.* ▪ *sometimes when I drive at night, I have the information that 'Road works ahead - slow down' and there are no road-works anymore, because they finished the road works already before the night; but the information was not changed!* ▪ *Electrical road information signs need to be updated frequently to prevent misinforming the road users of previous incidents.* • *Not just offering one option as a diversion route. I think they need to account for people who are less confident especially on major roads. So people who are not from that area and so are not familiar with options and don't always have a GPS. For example, I have Google Maps on my I-phone but it doesn't always work. So, I do also rely on Highways England to mark and sign the roads for me* ▪ *For me online information is very important, so to ensure they provide accurate information online, and perhaps to work*

	together with other information providers such as Google Map to make sure that information is up-to-date
Poor quality of road surfaces	▪ *Some of the road surfaces are very bad like the M25 is pretty bad. I try to avoid it.*
Insufficient lighting	• *In some of the motorways they are not lit. Some of them are not lit at all... I definitely don't feel comfortable driving on a road that is not lit* • *You don't have to lit up the motorway itself in outside towns, but in different built up areas that would be useful especially in danger areas in corners and invisible sort of spaces.* • *On some motorways and most A-roads obviously, I donnu, they are very dark - no lighting.*
Traffic congestion	▪ *Sometimes, the amount of congestion making me delayed.* ▪ *If there is an accident because I know I may wait hours in a queue.*
Drainage related issues	▪ *I used to worry a lot about staying on a road that was slightly flooded, keeping my engine running standing still not being able to pass through that water.* ▪ *Some motorways have flooding due to poor drainage, which is dangerous due to the sudden impact on the speed and direction of the vehicles and poor road markings in hazardous weather conditions makes it difficult to identify the correct road lanes.*
Amount and duration of road works	▪ *Road maintenance durations need to be improved and reduced* • *There are a lot of road works causing a lot of congestions. The motorways I frequently use, in the past, there has been road-works continuously for three years non-stop. And I think they have just finished now. And so that's not ideal.*

Human benefits gained from operational services provided by Highways England?

During exploratory interviews, participants were asked to mention the (human) benefits that they gain from the operational services provided by HE. Overall, 'feeling safe', 'reduced stress', 'being able to re-arrange plans' and planning time reliability seemed to be the main factor as noticed from the quotes below. These identified benefits were then tested and quantified through the main web-based questionnaire survey

"It allows me to feel confident when driving. I feel SAFE - that's the main thing! I feel safe and I feel confident the majority of the time".

"I have been telling you cases when I don't like when there is congestion; but at least I feel safe when I'm on the road and I know that I'll get there even if I have to wait 5 hours for it to clear. That's the most important thing".

"I can be able to plan alternative routes, etc. in case I am informed".

"You can plan your journey to avoid getting stuck in traffic, thus you can have safer and less stressful journeys for the public and professional/commercial drivers".

"I can get to where I want to be without being delayed"

"I can plan ahead and I feel secure that I'm gonna make it on time".

(Anonymous participants, 2016)

Following this, respondents were given a hypothetical scenario and asked to provide their maximum willingness to pay to attain the aforementioned benefits. However, respondents were either struggling to provide a logical value and just guessing or they simply refused the idea of giving a monetary value to something they believe they were already paying for through their taxes. Thus, it was concluded that the adoption of the widely-used 'willingness to pay valuation approach' is inappropriate for the nature of this study (for more details, see section 3.3.4 of the report); and thus, accordingly, a bespoke method was developed and tested. This method asked participants to freely distribute a given budget to the aspects of the SRN in a way that reflects their personal preferences. There were no restrictions on the method of distribution and participants were able to put differing sums or no money at all on individual items. The questions used are shown below and the approach can very easily be replicated for further use:

The SRN is in need of:

In your opinion, the Strategic Road Network (SRN) is in need of:		Responses	Percent
More investment in construction of new roads:		42	26.75%
Greater maintenance capability:		54	34.39%

Greater operational / management capability:		50	31.85%
None of above:		11	7.01%
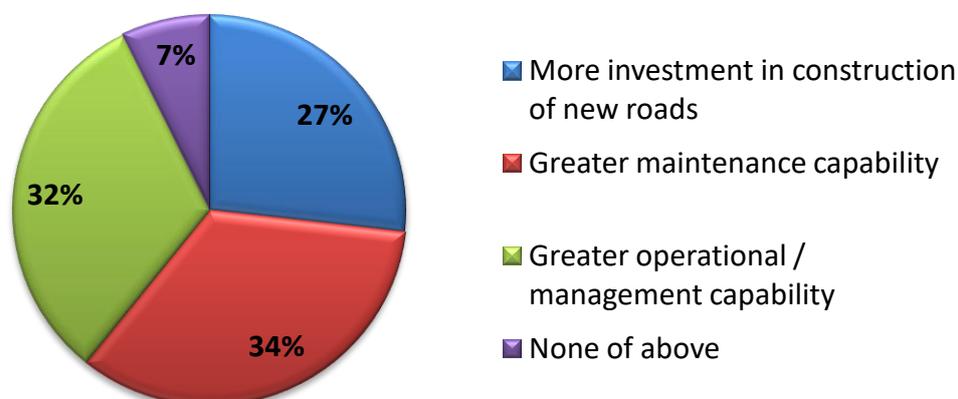
Figure 3.10: What the SRN needs according to respondents' point of view

Interestingly, most of the study's participants believed that the SRN is in need of improved management in terms of greater maintenance and operational capability (34% and 32% respectively) as opposed to the need for more investment in construction of new roads (only 27%). However, 7% of the respondents supposed that the SRN is not in need of any more investment of any kind. These results imply that the majority of the respondents (nearly 66%) believe that funds and efforts should be mainly focused on *'capacity management'* rather than *'capacity expansion'* of the SRN. This perception is aligned with recent and current Governmental policies that aim for improving the efficiencies of the SRN and securing value for money (refer to section 2.2.2 for further details).

How Customers would like their money to be spent on the SRN:

If you have £100 to invest in the SRN, how would you spend it on the following? Choose as many or few factors and any sum or nothing as you wish.				
		Average	**Highest**	**Median**
Repairing the road surface (potholes, cracks, bumps, patches):		**23.77**	80.00	20.00
Speeding up the repair process / road works:		**19.82**	100.00	10.00
Improving traffic and speed camera services:		**2.52**	50.00	0.00
Widening the roads:		**8.41**	100.00	0.00
Improving road signs and markings:		**4.71**	100.00	0.00
Improving drainage:		**2.86**	30.00	0.00
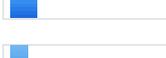
Improving lighting:		**4.20**	50.00	0.00
Improving motorway junctions:		**3.79**	30.00	0.00
Building new roads / bypasses:		**8.82**	100.00	0.00
Improving the way accidents / incidents are handled:		**6.38**	100.00	0.00
Keeping the carriageway free from debris:		**3.09**	40.00	0.00
Making sure the verges are free of litter and trimmed appropriately:		**2.72**	20.00	0.00
Investing in information technology (e.g. Smart Motorways, HE's traffic information website):		**8.90**	100.00	0.00
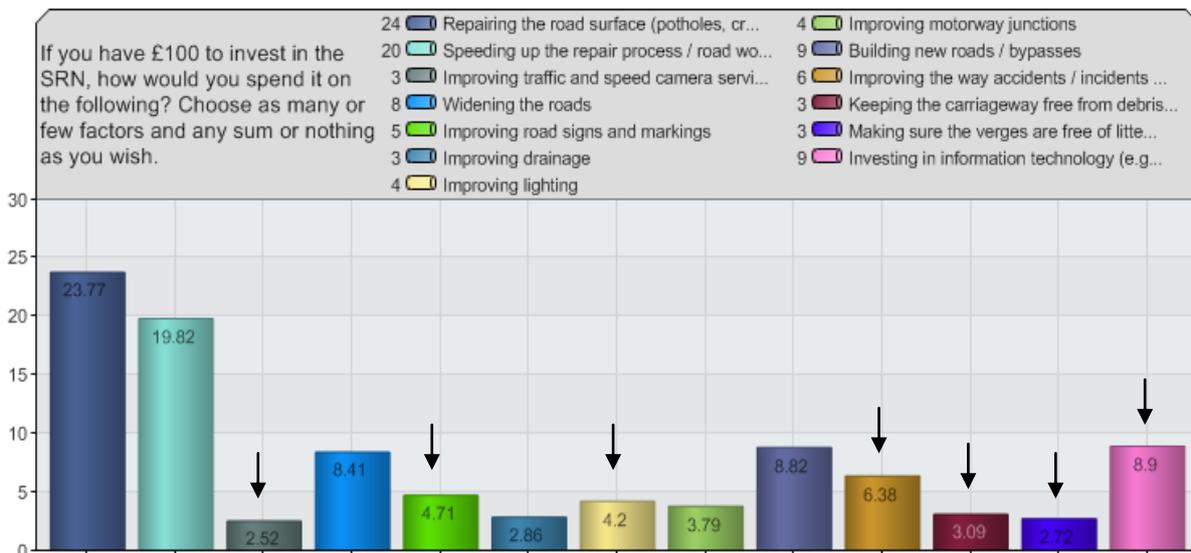
Figure 3.11: How participants would like their money to be spent on the SRN

Interestingly:

- **Nearly 32% of the specified budget was allocated by customers to Operational Services**

Attributing a monetary value to the human impacts of HE operational services

You have £100 to spend on the SRN. Please indicate how important the following benefits are to you by allocating money to them. Choose as many or few factors and any sum or nothing as you wish.

		Average	Highest	Median
Reduced stress and frustration:		**16.30**	100.00	11.00

Greater perception of safety:		**12.32**	100.00	7.50
Awareness of the problem causing disruption:		**13.14**	50.00	10.00
Confidence that the problem is being looked after:		**11.11**	70.00	10.00
Ability to re-arrange plans:		**8.47**	50.00	9.00
Greater perception of control of your journeys:		**7.04**	30.00	5.00
Improved journey time reliability:		**20.40**	100.00	20.00
Being prevented from having an abortive journey:		**11.21**	75.00	10.00
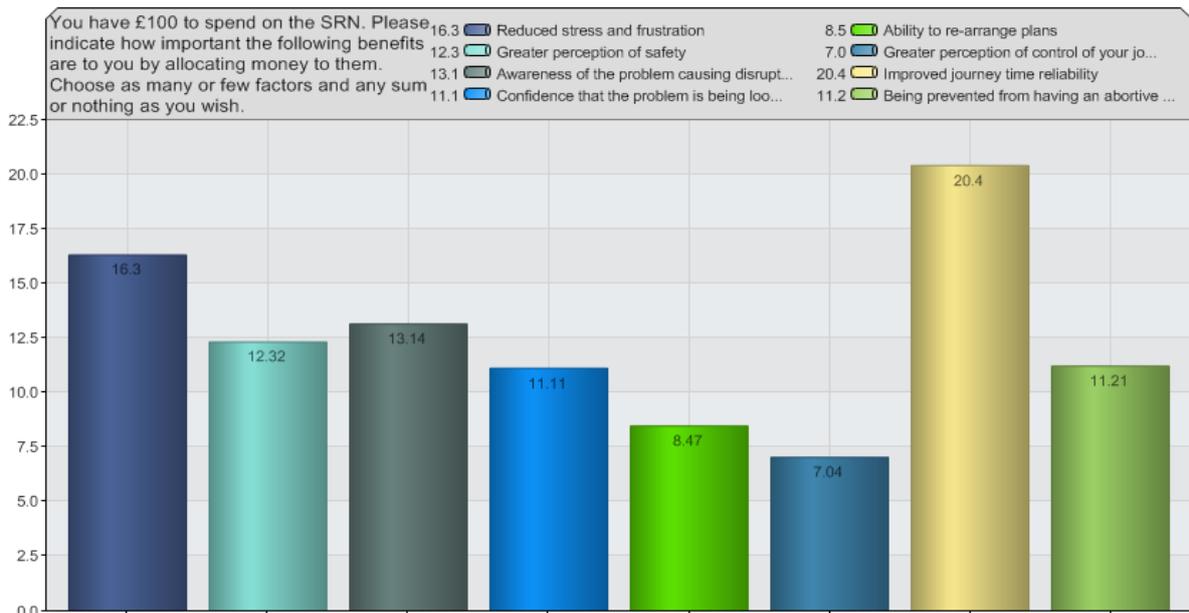
Figure 3.12: Monetising human impacts and benefits of HE's operational services, according to the respondents' preferences and needs

Comment:

- **'Improved Journey reliability' is the most important benefit to customers of the SRN. Thus, HE should focus on improving the operational services that support the delivery of this prioritised benefit.**

- **Interestingly, customers would like around 11% of their money spent on the management of the SRN to be allocated for operational services that provide them with the benefit of 'being prevented from having an abortive journey'**

3.3 A SUMMARY OF MAIN FINDINGS

3.3.1 Defining Who Constitutes a Customer

HE is keen to explore the current knowledge surrounding the impact of road usage and on whom in order to define the widest understanding of customers. Through a compressive literature review, the study found that he terms "customer", "consumer" and "client" are often used interchangeably to describe the relationship between service providers and recipients of these services. In addition, the term "customer" is often used to indicate a single person or defined group of people or an entity (e.g. road users). A review of the meaning of "customer" as understood and used in different disciplines (e.g. marketing, business and lean project management), helped the study to develop a model based on the concept of a 'customer system' (Figure 2.3 in the Literature Review Report). The model categorises the customers of HE's operational directorate into four broad categories, as follows:

1. Direct road users;
2. Indirect road users;
3. Partners and supply chain; and
4. Client and stakeholders.

In addition, each of the four categories mentioned above is also divided into further classifications (Refer to Literature Review section for details). This developed model establishes that there are different and conflicting interests among the customer-system, and thus it is vital to recognise and rationalise them.

3.3.2 The Impact of the SRN on the Economy, Society and Environment

The Strategic Road Network (SRN) is arguably the most important infrastructure asset in England with an estimated value of £110 billion. The study shows that road users are aware of the significant role that the SRN plays in supporting economic growth and enhancing the productivity and social well-being of England. As shown in Table 3.5, most of the respondents agreed with the study's identification of how the SRN influences the Economy.

Respondents were generally positive on how SRN influences the society and neighbouring communities, in particular in terms of: improving journey comfort to road users, improving connectivity between communities, and enhancing access to facilities (e.g. hospital, cultural centres, schools). However, two areas of concern were identified as requiring significant

improvement. These are: (1) taking account of local community wishes; and (2) taking into consideration the protection/enhancement of historic buildings and places. Results also indicated that HE should also give more consideration to the environmental impacts of their construction, maintenance and operational services, as acknowledged by the majority of the participants of this study.

Table 3.5: Ranking economic impacts of the SRN based on mean values obtained

Rank order	Impacts on the Economy	Mean Score out of 5
1	Reducing journey times	4.0
2	Improving journey time reliability	3.9
3	Allowing businesses to meet their customers' needs and reach out to new markets	3.73
4	Creating job opportunities	3.71
5	Increasing competitiveness through better connectivity	3.68
6	Reducing business costs	3.64
7	Attracting inward investment	3.53

3.3.3 The Impact of Information provision on how customers feel

Highways England is keen to develop a better understanding about the impact of information provision on how their customers feel. Overall, the study found that most of the participants (nearly 70%) feel confident when travelling on the SRN while only 5% feel nervous and 25% are neutral. Respondents identified the different types of information that their availability is important to them as road users. As shown in Table 3.6, most of the types of information provided to road users was regarded by the majority of the respondents as highly important, except for information about public transport and general driving advice.

Table 3.6: Types of road information and their importance to SRN customers

Rank order	Information type	Frequency Score	
		High importance (4+5)	Low importance (1+2+3*)

1	Warnings of accidents ahead	97.9%	2.1%
2	Warning of delays ahead	95.77%	4.23%
3	Information on alternative routes	93.05%	6.95%
4	Warnings of queues ahead	92.36%	7.64%
5	Warnings about an abortive journey	88.89%	11.11%
6	Safety messages related to road conditions	87.18%	15.86%
7	Information about direction and distance to service stations	74.31%	25.69%
8	Information about future major events	63.64%	36.36%
9	Information on weather conditions	62.24%	37.76%
10	Information about less busy periods	52.77%	47.23%
11	Information about public transport	40.97%	59.03%
12	Driving advice (e.g. 'Tiredness can kill)	38.19	61.81%

*Scale 3 is considered neutral and is categorised within the low importance group

The study also found that the SRN customers prefer to receive these information, acknowledged by them as important, via a variety of means listed in Table 3.7 in a ranking order. Despite the rapid increase in the use of Sat Nav Apps and in-car devices, roads signs and VMSs were selected by most of the respondents as their preferred method for receiving road-related information. However, it was noted by a few participants that there are concerns about the accuracy of information provided via VMSs especially during night times. Thus, an overall recommendation is that VMSs and electronic displays need to be continuously monitored and updated, to enhance the reliability of information provided to SRN users.

Table 3.7: How SRN customers want to receive information

Rank order	Means for receiving info	Frequency score
1	Variable Message signs and electronic displays on the road	71.23%
2	Road signs and markings	62.33%
3	In-car device:	56.85%
4	Radio:	53.42%
5	App	48.63%
6	Information at petrol stations	30.14%

7	Website	28.08%
8	TV news bulletin	19.86%
9	Other (e.g. News papers and Magazines)	3 %

The study investigated the impact of HE's operational services, in particular information provision, on how customers feel and behave. Figure 3.13 below illustrates the main human impacts and benefits of information provision that were assessed within the study. This relationship model was developed based on findings from literature review, qualitative data analysis of transcribed interviews, and empirical analysis of survey responses. Table 3.8 shows the key factors improving driving behaviour according to respondents' point of view.
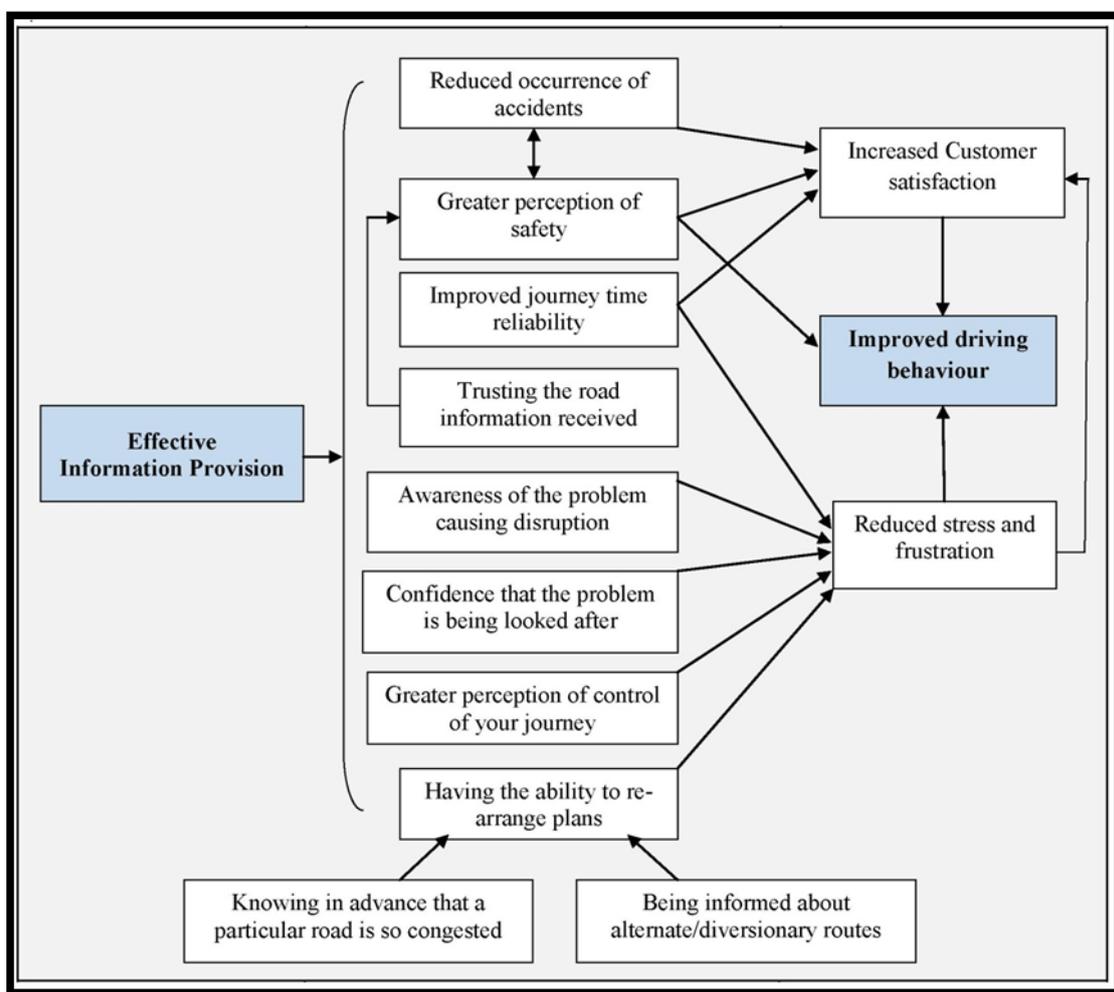

Figure 3.13: A relationship model of the human impacts and benefits of information provision services

Table 3.8: Key factors that influence driving behaviour

Rank order	Factors that improve driving behaviour	Mean score out of 5

1	Trusting the road information that is received	4.33
2	Journey time reliability	4.25
3	Feeling safe	4.22
4	Being informed about alternate routes	4.15
5	Knowing in advance that a particular road is so congested	4.03
6	Awareness of the problem causing disruption	4.00
7	Confidence that the problem is being looked after	4.00
8	Having the ability to rearrange plans	3.98
9	Customer satisfaction (as a road user)	3.82

3.3.4 Monetising Human Impacts and Benefits of HE's operations

Highways England's operational services deliver a wide range of benefits to SRN customers. Some of these, such as journey time savings, reduction in occurrences of accidents and environmental benefits are already well understood and assessed in HE's appraisal framework. However, there are other less tangible, but equally important, human impacts and benefits that are not yet evaluated. This study, therefore, aimed to develop a method that can be used for quantifying and monetising these human impacts and benefits. Initially, the study reviewed current knowledge on identifying and quantifying human impact/values/benefits, drawing on a range of scientific & social theory and practice. The review concluded by suggesting the adoption of the 'Stated Preferences' (SP) and 'Revealed Preferences' (RP) economic valuation techniques. However further reflection and empirical testing indicated their inappropriateness for the purpose of this study; and thus a bespoke method was developed as discussed below.

Reflections on the "Revealed Preferences" economic valuation technique and its suitability for the study

The RP approach reveal*s* monetary values through a complementary market. For instance, it could be used for deducing the monetary value of noise insulation of roads through improved surfacing, as reflected in its impact on house prices. Thus, it was suggested that the RP approach has the potential to be used for revealing economic values of specific operations or services. However, this approach was deemed to be unfit-for-purpose of this research project due to the generic nature of the operations and impacts under investigation.

Reflections on the "Stated Preference" economic valuation technique and its suitability for the study

The SP approach is based on asking people hypothetical questions about their (maximum) WTP for a particular benefit, or their (minimum) willingness to accept (WTA) compensation for accepting a particular loss or dis-benefit. Thus, the WTP approach was seriously considered and tested for the credibility of its use for this particular study. A summary of steps taken and findings is as follows:

➢ The literature review revealed that very few studies have sought to quantify and monetise human impacts, specifically, within the context of roads and highways.

➢ A thorough review of four identified studies, suggested the popularity and potential for adapting the WTP technique as a valuation framework. These included a study commissioned by Highways Agency (2009) to monetise the benefits of driver information provided through variable message signs (VMS).

➢ Through a pilot-study that comprised of nine exploratory face-to-face interviews, respondents were given a hypothetical scenario and asked to provide their maximum WTP for the human benefits they attain or require from current and/or improved operational services.

  ➢ The findings of the pilot study conducted for this research project indicated the inappropriateness of the use of the WTP technique for the current study. Participants either:
  o Struggled to provide a rationalised monetary value, and some of them were instead simply guessing; or
  o Refused the idea of providing a maximum WTP value to services that they already pay for through their taxes, despite being clearly informed about the purpose and main aims of the study through cover-sheet invitations and then again just before and during the interview process itself.

➢ Examples of responses received during the pilot-test included:

  "Nothing - It is their responsibility and I don't need to pay for it. I already use my Sat-Nav".

  "Number 1, I will tell you but as long as it is hypothetical, because I feel that it should never be charged for. It's almost like another tax and we pay taxes in

> *this country. So, I feel like that is my right to have it maintained. Look, if it was taken out of my taxes..."*

> *"To be honest, obviously, every motorist they pay road tax. Hmm, and I think, I wouldn't want to pay more. Everybody already pays that and if they want people to pay more. Then yeah most people won't be happy; I would not be. I'm already paying money towards the road".*

> *"I feel concerned that there might actually be a plan for privatising the SRN and charging people for its use".*

➢ Accordingly, it was concluded that the WTP approach is methodologically invalid for this particular study. It is more suitable for market-testing purposes of improvement products of firms and organizations in the private sector.

➢ A decision was therefore made that there is an ultimate need to devise a bespoke method that could enable the study to make-sense of data received from the respondents.

3.3.5 CLeMM - A Bespoke Methodology for Monetising Human Impacts/Benefits

The study adopted the Plan-Do-Check-Act (PDCA) style cycle methodology for monetising the human impacts and benefits of HE's operational services. In contrast to the WTP approach where participants struggled to provide logical monetary values to human benefits, the developed methodology relies on asking participants (chosen from the customer base) to distribute a fixed sum (i.e. budget) among predefined factors. This results in a method for monetising that is led by customers' preferences and their judgement of monetary value. A guidance for key steps and actions required throughout the cycle is provided in "The CLeMM User Guide".

An extensive set of questions were developed (see 3.2.1 – 3.2.3 above) in order to test the method, and the results are given in Tables 3.9 & 3.10 below. The questions were carefully considered in order to provide a monetised assessment of human impacts and could be used in further applications of the CLeMM tool. Alternatively, new questions could be inserted to add to or replace the tested ones.

The novelty of the CLeMM approach is the use of a budget of £100 as the measurement unit for monetising human impact. This sum was chosen because it is an easy figure for people

(customers) to visualise allowing their perceptions to lead the evaluation. An added bonus is that evaluations based on £100 easily convert into a percentage assessment and can therefore be scaled up to more meaningful financial sums. A summary of test results obtained are provided in Tables 3.9 and 3.10 below.

Table 3.9: Ranking order of how respondents would like their money to be spent on the SRN

Rank order	Operation/Service	Distribution of £100 budget
1	Repairing the road surface (potholes, cracks, bumps, patches)	23.77 %
2	Speeding up the repair process / road works	19.82 %
3	Investing in information technology (e.g. Smart Motorways, HE traffic information website)	8.91 %
4	Building new roads / bypasses	8.82 %
5	Widening the roads	8.41%
6	Improving the way accidents / incidents are handled	6.38 %
7	Improving road signs and markings	4.71 %
8	Improving lighting	4.2 %
9	Improving motorway junctions	3.79%
10	Keeping the carriageway free from debris	3.09%
11	Improving drainage	2.86%
12	Making sure the verges are free of litter and trimmed appropriately	2.72%
13	Improving traffic and speed camera services	2.52%
	Total Sum	**100%**

Interestingly, nearly 32% of the specified budget was allocated by respondents to 'Operational Services'. This result is very consistent with their previous answers when 31.85% of all participants suggested that the SRN is in need for greater operational and management capability.

Table 3.10: Monetising and Prioritising human impacts/benefits based on respondents preferences and needs

Rank order	Human Impact/Benefit	Distribution of £100 budget		
		Average	Highest	Median
1	Improved journey time reliability	20.40	100.00	20.00
2	Reduced stress and frustration	16.30	100.00	11.00
3	Awareness of the problem causing disruption	13.14	50.00	10.00
4	Greater perception of safety	12.32	100.00	7.50
5	Being prevented from having an abortive journey	11.22	75.00	10.00
6	Confidence that the problem is being looked after	11.11	70.00	10.00
7	Ability to re-arrange plans	8.47	50.00	9.00
8	Greater perception of control of your journeys	7.04	30.00	5.00
	Total Sum	100		

3.4 CONCLUSIONS

This study was conducted to define the widest understanding of customers in order to address the perceived shortfall in understanding the human impact of HE's operations, and to develop a methodology on how to monetise human impacts and benefits. The study introduced the concept of the 'customer-system' that has the potential to be used as a guiding framework for investigating the individual value-systems of customers. The concept categorises customers into four main groups, namely: (1) Direct road users; (2) Indirect road users, (3) Partners and supply chain, and (4) Client and stakeholders. This customer-system perspective establishes that there are different conflicting interests among the classified groups of customers, and argues that this must be recognised.

Evidence from the study indicates that participants are generally aware about the significance of the SRN and its influence on England's economy and social well-being. The results also show that most of the participants are satisfied with HE's operational services. A number of key areas for improving the SRN's economic and social impacts were raised by the participants. These include: attracting inward investments, taking account of local community wishes and protecting/enhancement of historic buildings and places. In addition, the participants' responses suggest the need for giving more consideration to the SRN's environmental impacts, with a focus on mitigating or reducing noise and air pollution.

The study investigated participants' general attitude to road travel and found that the majority of the respondents feel confident. The study identified and ranked various types of information that their availability is important to road users. The top six among these are: (1) Warnings of accidents ahead; (2) Warning of delays ahead (3) Information on alternative routes; (4) Warnings of queues ahead; (5) Warnings about an abortive journey; and (6) Safety messages related to road conditions. Despite the rapid increase in the use of Sat Navs and in-car-devices for road travel, the study found that VMSs and road signs and markings are participants' most preferable means for receiving information. A number of participants, however, raised concerns about the accuracy of information provided via VMSs and electronic displays during night times. This therefore suggests the need to enhance the reliability of information provided to SRN customers.

The study identified a number of human impacts and benefits of HE's operational services through literature review and exploratory interviews. A qualitative analysis of collected data helped the study to develop a relational model of major human impacts and benefits considered within the study. This model also describes the impact of information provision on customers' driving behaviour. Through further empirical investigation, a number of key factors improving driving behaviour were identified and ranked. The top five factors are: (1) Trusting the road information that is received; (2) Journey time reliability; (3) Feeling safe; (4) Being informed about alternate routes; and (5) Knowing in advance that a particular road is so congested. Interestingly, a few number of respondents mentioned that increased perceptions of safety worsens their driving behaviour. According to them, feeling safe encourages them to drive in a complacent manner, as opposed to driving defensively. Thus, further studies are recommended to conduct a deeper examination on the relationship between drivers' perceptions of risk and driving behaviour.

A cutting-edge review of current knowledge on evaluating human impacts and benefits showed that very few studies have sought to quantify and monetise human impacts, specifically, within the context of roads and highways. Findings from literature suggested the potential for adapting the commonly used 'WTP' economic valuation technique. However, the pilot-study, conducted as part of this study, revealed the inappropriateness of the use of the WTP technique for the current study. This finding is supported by a study conducted by Mayor and Coleman (2011) that aimed to monetise the social and emotional benefits of good street design. Their study adopted a WTP but found it difficult to:

- *Decide on a funding mechanism* – (e.g. whether people will pay through donations or taxes) due to the political sensitivity linked with asking the public users to be willing to raise funds to something they may feel should be done by the council anyway;

- *Avoiding biased and/or irrational monetary values* – as people may not be aware of the real value of what they are willing to pay for, or responses may be influenced by the dialogue with the interviewer and thus people may feel forced to give any value

Accordingly, a bespoke methodology for evaluating and monetising human impacts (CLeMM) was developed (see Appendix A), where respondents were asked to distribute a budget among pre-defined factors. The methodology was tested through a web-based questionnaire survey and reviewed through feedback received and self-reflection. The devised methodology was found to be reliable and allowed the study to obtain logical monetary valuations of human impacts and benefits, as illustrated in the results and findings sections of this report. The study indicated how the participants would like their money to be spent on the SRN meaning the methodology is customer led. More than half of the budget available to participants was chosen by them to be spent on: (1) Repairing the road surface; (2) Speeding up road works; and (3) Investing in IT. Similarly, the participants chose to spend most of their budget on attaining the following human impacts: (1) Improved journey time reliability; (2) Reduced stress and frustration; (3) Awareness of the problem causing disruption; and (4) Greater perception of safety. It is important, however, to stress that the purpose of the monetary valuations obtained by this study is to demonstrate a methodology that can be used in order to extend the approach.

3.5 OVERALL RECOMMENDATIONS OF THE STUDY

Based on the findings from the literature review, the pilot study and the questionnaire survey, and evaluations of the bespoke PDCA methodology for monetising human factors, the following recommendations are provided:

- HE's customer base should not be limited to *"Direct Road Users"* only (e.g. drivers and passengers of the SRN). Instead, the customer base should also include those who are not directly using the road but are still affected by the road existence, condition and usage *"Indirect Road Users"* (e.g. neighbours and local communities).

- It is important to recognise the different conflicting interests that exist among the 'Customer-System' guiding framework offered by this study.

- HE should check that their customers' needs and priorities are aligned with the social changes/ human impacts that they seek as an organisation

- HE should enhance the reliability and accuracy of information provided, especially via VMSs and electronic displays during night times.

- HE should pay more attention to the following social impacts: (1) taking account of local community wishes, and (2) protecting/enhancement of historic buildings and places

- HE and its supply-chain should give more consideration to the environmental impacts of their construction, maintenance and operational services.

- HE should give significant consideration to the following services: (1) improving quality of road surfaces and (2) Speeding up road works and repair surfaces; and (3) Investing in Information technology.

- HE should avoid the use of the commonly used WTP valuation technique due to the methodological concerns highlighted within this study.

- The bespoke methodology for monetising human impacts (CLeMM) developed and evaluated by this study should be adapted and refined according to project context and settings.

- The monetary values obtained by this study are illustrative rather than definitive. The values in this test study should not be interpreted as financial proxies; but instead for illustrating a methodology that can then be used to develop financial proxies through more specific focus of the questionnaire and greater customer sampling.

3.6 RECOMMENDATION FOR FURTHER RESEARCH

- This study was mainly focussed on recreational motorist road users. Further studies should be conducted with a focus on other groups of customers, e.g. non-motorist road users and commercial road users. Due to the difficulties associated with targeting survey response rates from these specific groups of customers, structured interviews administered using Computer Assisted Personal Interviewing (CAPI) would be recommended.

- Further studies are recommended to explore and analyse the different conflicting interests among the four main categories of the customer system model offered by this study.

- This study is related to another research project titled "*Realising Social Value within the Design and Delivery of Highways England Infrastructure Projects".* However, this study was limited to monetising the human impacts of HE's (non-engineering) operational services. Future studies are recommended to adopt the Bespoke methodology developed by this study to evaluate and monetise the human impacts of the engineering operations delivered by HE's supply-chain (e.g. Tiers 1 and 2 contractors).

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APPENDIX 1

Samples of Transcripts of Interviews Conducted

All personal information were screened for confidentiality purposes.

<u>Interviewee number 2</u>

ID	Gender	Age band	Driver or Passenger?	Working status	Average Annual Income	Vehicle often used
P2	F	25-44	D & P	Employed	Between £25K and 50K	Car as a driver; Coach as a passenger

Duration 40 minutes

1- Why are roads important?

To enable us, to enable people to commute and go and see relatives and daily life to take place.

That's brilliant...and to go to work?

Exactly, commuting!

2- So, from your experience of using the SRN, how would you describe the SRN to someone else? what are the good and bad things you find about it? What do you like and not like about the SRN?

They are well maintained generally. Hmm, and they are mostly efficient. They are normally wide enough and I don't normally have problems with travelling, so i can't really say anything negative at this moment.

3- Can you list to me some of the roads on the SRN that you often use?

Yeah the A38 - that's the main one between Plymouth and Exeter - I use that one frequently; and the A386 - and that's the main road that connects between Tavistock and Plymouth - I use that one on a daily basis; And I use motorways less frequently; e.g. The M5 to London but that's a few times a year. The M5 and M1.

So can you talk to me more about the good things about those motorways and main roads that you use?

Hmm, so the roads are smooth. They are well signed - The signage is good; I don't tend to get confused while driving. Roundabouts seem to make sense; in some areas this is not always the case but generally. Like I said already, lanes tend to be wide enough, especially on motorways three lanes is useful.

So how does the width of the lane impact on you?

It's just in terms when there is congestion or road works, it tends to still allow some flow.

And you said one of the things you like on the SRN is that you feel it's well managed and operated efficiently?

I feel safe when driving. Even, if there are road works, the roads are well managed and signed. It does not cause me anxiety when driving and obviously the lining of the road like to ensure where I have to drive, especially when going around a roundabout. It's not always the case. Some roundabouts could be better. Some roundabouts I have become confused about which lane I should be in. But, generally I feel safe while driving because it's clear.

And do you find roundabouts on motorways?

No. I tend to find them mainly linking A roads to motorways, in Plymouth I'm talking.

4- So from what you said, in your opinion, the SRN is in need for more investment in construction of new roads or greater maintenance and operational capability? And Why?

Hmm, when you say operational capability, hmm when there is maintenance it does cause congestion. And there is maintenance quite often you know which is necessary. Hmm, when this happens, of course it does cause lots of traffic delay. So if there could be precautions and steps taken to help avoid this at times in busy areas, particularly I'm talking about when I go to London and you can wait for hours.

Do you have any suggestions for improving this - like ideas?

Maybe some possible other routes to allow for diversions that don't mean taking country lanes that get blocked because everyone is taking those routes for example.

5- Here is a hypothetical question: - If you were in charge of the money available to invest in the SRN, what are the items that you will decide to spent it on?

I do believe that maintenance is important and I do believe that the Highways Agency (Highways England now, sorry) spends well on maintenance.

Maintenance of what? What are the problems on roads that you find require maintenance?

Of course I don't know exactly the works that they are doing but it tends to be around ensuring the road surfacing is appropriate, safe and smooth without pot holes and so on. And I'm aware that they also like I said signage and ensuring road markings are clear to ensure drivers are safe. So, that I believe is important; but I also believe that in major areas (I'm not necessarily talking Plymouth - I mean in major cities) hmm maybe some step should be taken to help lessen congestion, especially when road works are taking place; or during busy

Okay, that's interesting. I'll give you now a number of items and I want you to give me a score to each item on a scale of 5 in terms of its importance to you while putting into consideration current conditions (5 being most important and 1 being least important)

- Repairing the road surface (potholes, cracks, bumps, patches)?

  4, taking into consideration that it is well maintained already so I'm not gonna give it a five. It is important.

- Speeding up the repair process / road works?

  That would reduce inconvenience of course. That is important. I will give it a 4.

- Widening the roads (e.g. adding a lane or increasing width of lanes)?

  You mean to allow for extra lanes? I think for now maybe a 3.

- Improve road signs and information provision?

  I feel it's done well the majority of time. So, I'll give it a 3.

- Improving drainage?

  Yes, there is flooding at times. I think a 3.

- Improving lighting?

  I think the lighting is already good, so a 2.

- Building new roads / bypasses?

  Yeah for me that's very important. I think score 5. I think it's an option especially in those busy areas, to allow for diversion and to allow extra options to reduce the load on those important roads. It also reduces damage.

- Improving the way accidents / delays are handled?

  Yeah it's important for anyone, so 5.

- Keeping network free from litter and debris?

  Yeah, I feel it is clean. So, I'll say a 2 to that one.

- Making sure grass and foliage is kept at an appropriate length?

  A 2. I think it is done well already but of course it should be accounted for.

- Investing in information technology (notification of incidents / works and alternate routes)?

  Yes, I think a 3 for that one. I do find quite a lot of notifications.

6- In your opinion, what are the SRN's major impacts on the UK Economy, Society, Surrounding community and Environment? So let's start by impact on Economy?

Of course it is important for the Economy. It is allowing for trade to happen and transportation of goods. Major businesses rely on it (e.g. National Express). SO, it is important and there are obviously examples that I don't know about but those are the key examples that I can think of now.

Okay...and it helps people to go to work and it creates job opportunities?

Of course and it allows, if you have good roads here, you can work further from home because you won't take as long to get there. For example, where I live in Plymouth, the distance counts because the roads are not fast roads. But if I lived in London, I can travel the same distance in maybe half the time.

That's very interesting. So how about impact on the Environment?

The positive impacts on the Environment?

Positive or negative.

Of course cars create pollution and the roads need to take up land. Therefore, for example bypasses may actually destroy natural land in order to be produced and may go through villages. So, obviously, upset people that are currently living there. That is of course not a bonus (positive). At the same time, if it is allowing for buses and large vehicles, then that means that people don't have to drive individual vehicles; they can takes buses which can have a positive impact on the environment in terms of more people travelling in one vehicle. That's probably my only positive because of that the cars are not great.

Yes. So what about impact on the society and surrounding community?

Yes, it can have a negative impact in terms of land being used to create roads. At same time, in positive terms it can bring trade. Especially if you do create a bypass, it can create passing trade for local businesses, especially if Highways England supported it in terms of signage. I do feel it can have a positive impact up on people living there in the area.

Do you think it can have an impact on land and house prices?

I do feel that if there is a good road, I think it's proven that it increases house value, because it is then tempting for people to commute to work and they can live further out of the city.

Okay that's brilliant. I'll move now to part three of the interview. In this section I'll be talking about the benefits you gain from HE's operational services. So as an introduction question:
7- In general, is there anything that worries you when using the SRN?

If there is an accident because I know I may wait hours in a queue. And I think that's linked to what I have already said. And although I'm confident, if I'm in an unfamiliar area, I don't know about diversions and so on. So, I tend to have to stay at that road. So, of course I know if there is an accident I'm then stuck for hours potentially.

Okay, hmm what about the speed limit?

I think 70 mph is a sensible speed limit. However, of course, many people break the speed limit. They do tend to stay at the outer lane although some driving is a little bit erratic. But generally I feel safe. Three lanes allow for you to choose an appropriate speed for you and an appropriate lane, depending on how those around you are driving.

Behaviour of other drivers?

That's related to speed as well. I answered that mostly. Just the only other thing is lane changing. Because there are three lanes, you tend to find some drivers changing lanes quite often.

What about route finding?

Markings are clear but as I said already if I needed a diversion for any reason, I'm not this confident to do that. I'm not sure if that's down to rout marking or that's most likely down to me being in an unfamiliar area. But on my day-to-day basis of driving, I have no issues.

Do you feel that road signs which are specifically related to diversion routes maybe they can be improved a bit?

Possible yeah, options, and I know that's difficult because if HE put a diversion route everyone will take it and that road will also be crowded.

So you mean they may still be able to offer various alterative diversion routes or any other more efficient way?

Yes.

Maybe, in my opinion, and I'm not sure if you'll agree with me or not. There are traffic officers which move in patrol cars.....?

That would be really useful especially for less confident drivers or people who are not familiar with that area like how I am when I go to London.

The impact of the weather on road usage?

The roads do flood at times. And I have a larger car and wind and so on so I'm not so affected but when I did drive a small car of course it is worrying you, especially if it is very congested. I used to worry a lot about staying on a road that was slightly flooded, keeping my engine running standing still not being able to pass through that water. Of course that is a concern.

8- In general before or when you go on the SRN, what sort of information do you need?

Ok. I try to find out about any delays. Hmm, I can listen to the radio, But often if you are travelling to another area, unless you look online, you're not going to know. I tend to rely on radio.

Can I give you different types of information and ask you to give them a score according to their importance to you (5 being most important and 1 being least important):

- Warnings of accidents ahead?
  5.

- Warning of delays ahead?
  5

- Warnings of queues ahead?
  5 - For me they are all inter-related.

- Information on alternative routes?
  5

- Information about less busy periods?
  3 - because you may not have a choice.

- Safety messages related to the road conditions?
  4

- Information on weather conditions?
  3 - safety for me is more important. You can find out about weather easily but I wanna know how the weather is affecting that road for example. That for me is more important. You can have okay weather but it may change; or for example the weather is good today but there was a storm the day before and it affected the road, therefore it is the safety n the road at that point which matters.

- Information about future road works?
  Yeah in case you're coming back on a return journey. So, 3 because as long as you're getting them on the day, but it's helpful. To know about the future is also good.

- Information about public transport?
  I don't use it much. So 2.

- Safety messages - driving advice (e.g. slow down)?
  It is useful (I know the signs that ask you to slow down) but it's not specific. It doesn't tell you what sped to slow down to often. So, 3 unless it is giving you specific advice (e.g. specific speed limit for being safe, not just slow down because you don't know - that's too subjective).
  Yes, but sometimes it alerts ou that there is a bend ahead, an uphill, etc?
  Of course that's useful but you gave me the slow down suggestion. If it is specific then 4.

- Expected journey times?
  That is useful especially if you need to plan ahead. Hmm, 5.

- Information about future major events (so for example if there is a cycling event)?
  Yeah, although it tends to be in the news. For those living in busy areas it might be a 4 or a 5. But for me a 3.

- Anything else (which I have not mentioned)?
  No, I do believe that it covers it.
  May be information about where to find emergency calls on the road?
  No I have my mobile
  Service stations?
  Service stations are frequent enough.
  What about information about location and distances of service station? - I'm just trying to open up ideas.
  No (problem), I understand. If you could have information about (I'm not sure how they can do it) but may be for example if you went to the HE website and you mentioned your route, may be they can highlight to you the service stations on the way. So you can actually plan which ones you would most likely stop at. That may be a useful feature. Hmm, rather than randomly stopping. Yeah, and especially that some get very congested while some are less busy. So, ma be a warning on the road like this service station is being very congested why don't you try the next one; coz they do get very busy at times and that can add time to your journey time unnecessarily.

9 - So, how would you like to receive these information?

Text notifications are very quick and easy.

Text on your phone?

Yes. But if you can access the website and like as I said if you can type in your route. Something like AA offers. You type in your route and they give you almost like a GPS but mainly for those services (e.g. any warnings, info about service stations. Anything linked to your journey that could affect the duration or your safety and so on).

So how?

Through a website. May be if they create an App that would be amazing.

Okay. Can you give me a score out of 5 to the following according to your preference (5 being highly prioritised):

- Website/app?
5

- In-car device?
Yes and no because you have to charge it. So, 3.

- VMS?
Yeah they are usually useful especially if my phone battery ran out of charge. So 4 or 5. let's say 4.

- radio?

Depends on what radio station you're listening to. It is important - So, 4.

- audio message?

For me personally no. So may be a 3.

- TV news bulletin?

I'm not watching TV when I'm travelling. Not at all - so, 1.

I'm saying before or during your journey?

No, I prefer (information received) during. The updates are the most important.

So can you remind me of your scores for the radio, audio message and TV news bulletin?

Radio I think I said 3, audio message 1 and TV news bulletin like 2!!!!!!!!

10- <u>If HE's operational capability is based around:</u>
- collecting information on road use and causes of delay across the network
- Deploying on-road resources (Traffic Officers) to incidents,
- Operating 70 miles of Smart motorways, monitoring whether the hard shoulder can be safely used and clearing incidents to keep traffic moving to allow the hard shoulder to be used as an 'extra' lane
- Control room capability for incident management and liaison with the emergency services,
- information provision to the public, e.g. through road signs, VMSs and the HE traffic information website.
- Provision of traffic management for road maintenance work

- What are the benefits that you gain from the operational services provided by HE?

Having my needs met the majority of the time. They know what their customers need through the information they give and they try to act on up on it.

How does it impact on you?

How does it impact on me? I have not experienced accidents and so on in terms of personal needs, so I have never been across a traffic officer unless you mean the police that also gets involved. I have seen how the police come quickly you know and respond which is obviously as a result of them communicating with them effectively. So, I have seen that that's really useful.

Yeah but how does it impact on you - like on how you feel?

It allows me to use the roads, safely!!! [the respondent was getting a bit frustrated due to being confused about the meaning/aim of the question]. I don't understand. I am not quite sure what you mean, but, generally...

For example, these services allow the road to be managed efficiently, so...

Yeah that's obvious from what you've said and what they do, of course it is allowing me to use the road properly. Without those, the roads will not be effective and it wouldn't be usable at times. So, the fact that they clear accidents and they involve the police and the ambulance and they get information from users and put them into action. All of those things are having an impact on me whether it's directly or indirectly.

Yes, that is interesting. The next question will be more specific.

11- What is the impact of HE's operational services (network management) on how you feel when using the SRN?

It allows me to feel confident when driving. I feel SAFE - that's the main thing! I feel safe and I feel confident the majority of the time. I have been telling you cases when I don't like when there is congestion; but at least I feel safe when I'm on the road and I know that I'll get there even if I have to wait 5 hours for it to clear. That's the most important thing.

Have you been on motorways in other countries?

Yes, very different. Not very different I mean obviously in European countries, for example, in Germany I know they can travel on any speed, as long as they deem it safe - that's too subjective for me, but it works for them. I feel safer with the speed limit of 70 mph. You have some breaking it, but generally it is monitored. The only time I don't feel is when there are many lorries, especially sometimes when they pass quite quickly, it almost pulls your car towards them. So, I feel that there should be a strict limit on big vehicles; because I have a larger car as I said. But if I had a smaller car or a motorbike I would feel extremely unsafe.

Are not HGV supposed to drive on the left lane?

I have seen them driving (on the right lane) and changing lane. I don't think they should, but I have seen it. So, may be that could be more strictly monitored.

I'll give you a list of factors related to the impact of these services on how you feel when using the SRN. And I want you to give me a score from 1 to 5 whether you agree or not (5 being strongly agree and 1 strongly disagree):

- reduced driver stress and frustration?
  4

- greater perception of safety?
  4, just because of the truck thing I said.

- awareness of the problem causing disruption?
  Most of the time I know. I don't always know until I get to that point. May be a 3 because I'm not always aware.

- awareness that the problem is being looked after?
  4, yes I do know that they are dealing with it.

- ability to re-arrange plans?

I don't feel I get enough. So, 3. And i don't feel i have the confidence on major roads to do that.

- greater perception of control of your journeys?
  3, I don't really.

- improved driver behaviour?
  When people feel they know what's going on and they know it's being dealt with, yes, yeah, so 4. There are obviously some exceptions to that. Sometimes I get annoyed cos I don't know the reason (for the delay) until I get closer for example to the accident; cos the tail back can sometimes be miles, so they don't have enough may be signs to put it that far back. So, if you are waiting an hour back, then of course you have no idea.

  And knowing about the reason for the delay, does it help you?
  Yes!! At least you know what it is, so yes. Otherwise you feel you're waiting aimlessly.

- Improved journey time reliability?
  Yes, 4.

- Feelings of Empowerment and being Listened to?
  Yeah, 4.

- Any other impacts which I have not mentioned that you wanna add?
  You have already mentioned 'safety' and that was my main one.

17- What can HE do to help to enhance your journeys on the SRN? You have already talked about the lorries and something about diversion routes?

Yeah, possible diversions, so yeah not just offering one option as a diversion route. I think they need to account for people who are less confident especially on major roads. So people who are not from that area and so are not familiar with options and don't always have a GPS. For example, I have Google Maps on my I-phone but it doesn't always work. So, I do also rely on Highways England to mark and sign the roads for me.

You also talked about Highways England's website?

Yeah if I have an App on my phone that would be amazing, because everyone has normally an in-car charger. So I can keep my phone on and keep using it throughout the duration of my journey.

That's brilliant. Okay so the final section, it is a hypothetical scenario:

14- Imagine how your day-to-day life if the SRN was not managed or operated by any authority.

It will be chaotic. Of course, it will be chaotic.

* In this case, what would be your maximum willingness to pay per month to receive the benefits you gain from the operational services currently delivered by Highways England, assuming that this money will be:

A- donated?

Number 1, I will tell you but as long as it is hypothetical, because I feel that it should never be charged for. It's almost like another tax and we pay taxes in this country. So, i feel like that is my right to have it maintained. Look, if it was taken out of my taxes...

So let' start by donation for improvement. You will say zero?

I feel I pay taxes.

B- Okay, so if it is deduced from the taxes you already pay?

Hmm, to feel safe on the roads, it will probably be higher if I use major roads more but may be like £20/month. But if I was may be in London, may be like £50/month because I'll be using major more, and there may be more congestion and more potential accidents and delays.

So, say from £20-50£/month?

Yes.

Okay. Thank you very much. Do you have any questions before I end this interview?

No.

Okay, thank you.

* Important remark:

The participant told me following the interview that the last question about her maximum willingness to pay, made her feel concerned that this might actually be a plan for privatising the SRN and charging people for its use.

However, I reminded her about the contents of the cover letter invitation. And re-mentioned the aim of this study and how that it aims for helping with benefits realisation and for funding certainty and increased budget applications. And the participant was happy and felt comfortable with my clarification.

Interviewee number 6

ID	Gender	Age band	Driver or Passenger?	Working status	Average Annual Income	Vehicle often used
P6	M	60+	D	Retired	Less than £20K	Car

Duration: 24 minutes

How would you describe the SRN to someone? So what are the things you like and don't like so much about the SRN in the UK?

First of all, it's a means for quick communication and that's what the roads are all about in my mind. And the only thing too many road works these days which is slowing up the traffic and adding up the frustrations to everybody who is using those fast roads. Basically, this is it I think.

So in general, how do you think HE's motorways and main roads are currently managed?

Hmm, currently there is a report on the motorways, there are many roads that have to be repaired due to the recent events of the weather and heavy usage. And so therefore all the delays and everything, and just basically slowing down the traffic and the safety most of all.

Okay, can you mention to me some of the motorways and main roads on the SRN that you often use?

Basically, just using the M5 to Bristol, the M4 to London and not very often the north motorways.

Okay, thank you very much. In general, do you think that the SRN is in need for more investment in the construction of new roads or a greater management and maintenance capability?

Hmm, due to the cost, the cost of the motorway itself, it's very difficult to build new roads because it sometimes exceeds the budget of the different districts. But there is still room for manoeuvre in expanding and adding up maybe just one lane for slow moving lorries and so on allowing all traffic to move ahead a little bit without any disturbance.

If you were the main in charge and in charge of the money available to invest in the SRN. How and what will you spend your budget on?

Well, it's very difficult to answer questions like that but I'll be looking at the sections of motorways which gotta be invested first. So research has got to be done in that sort of respect before you can start talking about spending money.

Okay, that's brilliant. I'll give you some items which have been identified as problems on roads. And I want you to give each of them a score from 1 to 5. Which of these you might consider as a priority in your investments if you were the man in charge and which you would give it less importance. So I'll provide you with some items now and I want you to score them from 1 to 5, 5 means high priority for your investment and 1 being less priority.

Repairing the road surfaces - so things like pot holes ,cracks, bumps, batches?

That comes under safety, so number 4

Speeding up the repair process and road works?

That's number 4

Widening the roads?

Wherever that is possible that would help. So number 3

Improving road signs and information?

I think they're already organised pretty well and while considering the use of Sat Nav applications these days I think that's very well organised in my opinion. So that's probably number 1.

Improving drainage?

This is a critical area that I don't know myself but surely that has been taking into consideration when designing roads. I think they're pretty well managed. So I'd say number 2.

Improving lighting?

All the reflections and so on. It's pretty good. I mean you don't have to lit up the motorway itself in outside towns, but in different built up areas that would be useful especially in danger areas in corners and invisible sort of spaces. So number 3

Building new roads or bypasses?

Only to improve the link to main roads and unloading from the main traffic that would be very useful. So say number 4

Improving motorway junctions?

They're pretty good. I'd say number 3.

Improving the way accidents are handles?

I don't think there is much improvement, just only the distance basically. The quickest way to reach, maybe by helicopter or just by ambulance, and the hospital or the call centre that will handle it. And I think that is quite well organised. But I still I reckon there is not much improvement, because they're doing everything they can. So I'd say number 3.

Keeping the SRN free from litter and rubbish and stuff?

I think still lots of people need to be educated and sometimes that is causing danger to the motorways on a great scale. I reckon that's number 5.

Making sure the grass and the landscapes surrounding the roads are in a good condition?

I think this again should be addressed properly because at many bends and corners, the roads are not visible ahead. So, I would say 5.

Investing in information technology? So used for example for notification of incidents, road works, diversion routes. It could be displayed through VMSs

I mean again that type of information in my opinion is not in that great importance, due to the fact that these traffic master control on a Sat Nav navigation can give all this information and the re-direction and everything. Majority people these days rely on the Sat-Nav navigations anyway. So, I mean very expensive technology just to display information already available. Basic is necessary but going any further that will be a little bit going over the top I think in my opinion.

How do you think the performance of the SRN can have an impact on the UK Economy?

Basically any transportation over the roads is in competition with railways and air-transportation, so you have to take into consideration all these three modes of transportation. And how important each of them carries some value. So, I think through roads, a lot of goods are transported through roads supplying the shops and everything else. Do research on that scale then you can find an answer to the question yourself.

So, it helps with facilitating business and encouraging people from inside and outside the UK to invest in more businesses?

Yeah, those people they rely on it. On quick supplies of materials which basically businesses which could be on some scale even foundation for the Economy. So it is important. Roads are still I think priority.

Okay, thank you. I'll move now to the second section of the interview. I'll be looking at the impact of some of the services provided by HE. So, it's impact on you and your day-to-day life style and so on. So, is there anything that worries you, in general, on the SRN?

Not really, not from my point.

Okay, so in terms of speed limits, do you have any concerns about that?

It's a good speed - 70 miles/hr. The current speed on motorways is quite adequate. Some other motorways in other countries don't have speed limit but that's not safe. Here in the UK, looking from the safety point of view, you don't have a lot of very fast cars but safety comes up as number one in my opinion. I think that's a fair comment.

Thank you. Does the behaviour of other drivers concern you when using the SRN?

Well, you find that behaviour comes from only the drivers who are under pressure. That is due to slowing-up traffic or somebody using the wrong lane. For instance, lorries using the right lane and so on.

How about route finding? When using the SRN, do you find it easy to find the directions you want?

Basically as I said previously, people rely on the Sat-Nav navigation. Lorry drivers they have got their own Sat-Navs designed for lorries. Normal drivers and passengers they're using normal Sat-Navs. And motorbikes, they've got their own ones. So, it provides the quickest way to get to destination and everyone is using that. But obviously, in addition, the transport department obviously they're providing other design systems - the markings of the roads and the destination and everything is adequate in my opinion.

Okay, that's brilliant. What is the impact of information provision on how you feel when using the SRN? So, by information provision I'm talking about things like providing you with information about diversion routes, road information in general through traffic road signs. I'm asking you about what impact it has on you and how you feel when using the SRN? So, I'll give you some items and I want you to scale them from 1 to 5. 5 means it has a strong impact on you and 1 means the least.

Reduced driver stress? 5

Reduced frustration? 5

Greater perception of safety? That's all connected in my opinion - so 5

Feeling looked after? The Government is obviously aware that the traffic must move on and as swiftly as they can, but on some occasions they obviously cannot help due to accidents and so on, and also due to nature incidents like floods or tree falls and anything could happen, even diesel slip. So, it's about 3

Ability to re-arrange plans? Again you have Sat-Nav and through traffic master control you have information which directs you, because obviously through over the top through GPS you get information directly to your Sat-Nav. And it tells you if there are delays and it can even time it, so nobody has to worry about that, I have just got to follow up. Score is 4.

Greater perception of control? It's the same thing, it's just the assurance that I'm going the right direction and that I am safe. So 4 again.

Improved driver behaviour? 4

Customer satisfaction? 4 as well.

Improved journey time reliability? They're doing the best they but for improvement I'm sure they can still find a way. So number 4 I would say.

How does information provided (e.g. traffic road signs and VMSs) by HE influence the way you drive on the SRN?

Sometimes this is confusing but then again people when they're driving everyday on their roads, but if you're driving only on some occasions you probably can find it confusing. Those signs appear from nowhere and don't give you enough time to really get into the brain so you can react in a proper manner. But, yes for the drivers who are using it all the time, that's 'bread and butter' for everyday; but not for everybody.

What sources of information do you refer to when going onto the SRN?

Sat Nav.

What information do you need before going on a journey on the SRN?

Basically, how long it's gonna take, the main roads that I'm gonna use and so mentally I prepare myself for that journey. And then I just follow up the instructions, that's all.

Okay, I'll give you some types of information and let me know how important they are for you (by giving me a score out of 5):

Information about incidents? It's nice to know them before you get there. So, I'll say about 4.

Information about road works? 4 again

Journey times? 3

Diversion routes or alternate routes? 4

Less busy periods? 3

Upcoming events? That's gotta be addressed in a sense that people are not gonna spend 10 hours in a traffic if something is coming up. So I would say about 4 as well.

Safety messages? That's 5.

Okay. Any other messages or types of information you think need to be provided to you which I have not mentioned or you want to add to it?

No, not really. basically we covered all I think with that respect.

Have you seen those VMSs on motorways?

Yeah, slow down or some link closures or something and things like that. Yeah, they're quite helpful.

What's your perception of the accuracy of information provided by these VMSs?

Accuracy probably is correct. If it says the lane is closed, then it will be closed. Then the reason for it is that they know what they're doing.

Yes, sometimes it can for example tell you tell there is a delay for 30 minutes, do you perceive this information as reliable?

Hmm, because it says so but basically to make sure you know sometimes the Sat Nav can correct you as well. You know if you've got a good Sat Nav; I'm not saying everybody has but you've got to go by something. That's helpful information.

In terms of services related to information provision on the SRN through different means, what can the HE do for improvement?

The information given already is quite adequate.

If VMSs is estimated to be worth £7/day/each sign, what would be your maximum willingness to pay per month for increasing the accuracy of its data as well as other sources of information provided by HE's operational services, if this money will be provided from your Taxes?

Nothing - It is their responsibility and I don't need to pay for it. I already use my Sat-Nav.