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Investigating opportunities for sustainability behaviours within Paramedic and Ambulance Service practice

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**UNIVERSITY OF
PLYMOUTH**

Faculty of Health: Medicine,
Dentistry & Human Sciences

-

**Investigating opportunities for sustainability behaviours within
Paramedic and Ambulance Service practice**

By

Peter Allum, 218797

A thesis submitted to the University of Plymouth in partial fulfilment

for the degree of

Doctor of Philosophy

School of Nursing and Midwifery

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Authors Signed Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other university award without prior agreement of the Doctoral College Quality Sub-Committee. Work submitted for this research degree at the University of Plymouth has not formed part of any other degree, either at the University of Plymouth or another establishment.

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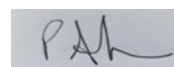
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Investigating opportunities for sustainability behaviours within Paramedic and Ambulance Service practice

By

Peter Allum

Abstract

The National Health Service (NHS) is under increasing pressure to adopt radical strategies for change, in order to meet UK national targets of net zero emissions by 2050. This thesis aimed to explore and investigate sustainability behaviours of UK ambulance service personnel and how they contribute to a reduce, re-use, recycle (RRR) ethos.

Phase one, a systematic literature review (n=114 studies) explored sustainability in Emergency Medical Services (EMS). Phase two phenomenological study explored the role and experiences of NHS ambulance strategic managers (n=6 participants) in England, when implementing their organisational Green Plans. Phase three ethnographical observation explored the sustainability activities, attitudes and behaviours of operational ambulance personnel within two English NHS ASTs (n= 66 participants).

Phase one findings identified that rising global temperatures, caused by worldwide carbon emissions, will place an amplified demand on EMS, through an increase in morbidity and mortality rates. It also showed a dearth of empiric sustainability research involving UK ambulance services. Phase two findings

revealed an insight into the Sustainability Managers' challenges of implementing sustainability policy, the factors that incentivise change, staff resistance and tactics to overcome it, short-term and long-term aims, and their opinions with future objectives. Phase three observational findings discovered a diversity of sustainability attitudes and behaviours amongst the staff, where three behavioural groups were identified: firstly, those who were already sustainability pro-active, secondly, those who were willing in attitude, but lacked the facilities, resources, support or means to apply behavioural changes in their practice and finally, those yet to be convinced to adjust towards sustainability behaviours.

This thesis provides an original and valuable insight into the sustainability and carbon reduction strategies employed within EMS organisations. Further opportunities may be generated from the findings, which could lead to cost savings across other EMS settings and the wider business communities globally.

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Glossary of Terms and Abbreviations

AACE	Association of Ambulance Chief Executives
ABMS	Ancillary Battery Management System
AST	Ambulance Service Trust
BMS	Building Management System
BMW	Biomedical waste
BREEAM	Building Research Establishment Environmental Assessment Method
CASP	Critical Skills Appraisal Programme
CEO	Chief Executive Officer
CMP	Carbon Management Plan
CO ₂ e	Carbon dioxide equivalents
CoP	College of Paramedics
COP26	26th UN Climate Change Conference of the Parties
CPPD	Continual Professional and Personal Development
CS	Consent Sheet
DCAs	Double crewed ambulances
DEFRA	Department for Environment, Food and Rural Affairs
DH	Department of Health
DVLA	Driver and Vehicle Licensing Agency

ECA	Emergency Care Assistant
ECG	Electrocardiogram
ED	Emergency Departments
EEAST	East of England Ambulance Service NHS Trust
EMAS	East Midlands Ambulance Service NHS Trust
EMS	Emergency Medical Service(s)
EMT	Emergency Medical Technician
ePCR	Electronic Patient Clinical Record
EV	Electric vehicle
FE	Focussed Ethnography
FPA	First Person Accounts
GB	Great Britain
GCs	Green Champions
GCC	Good Corporate Citizen
GHGP	Greenhouse Gas Protocol
GrEAN	Green Environmental Ambulance Network
H&CS	Health and Care Sector
HCPC	Health and Care Professions Council
HEIs	Higher Educational Institutions
IPA	Interpretative Phenomenological Analysis

IT	Information Technologies
LAS	London Ambulance Service (NHS Trust)
MH	Mental health
MPG	Miles Per Gallon
MtCo2e	Million tonnes of carbon dioxide equivalents
NEAS	North East Ambulance Service NHS Trust
NHS	National Health Service
NIO	Negotiated Interactive Observation
NWAST	North West Ambulance Service NHS Trust
OLEV	Office of Lower Emission Vehicles
OM	Operations Manager
OO	Operational Officer
OZEV	Office for Zero Emission Vehicles
PCR	Patient Clinical Record
PIPs	Participant Information Pages
PPE	Personal Protective Equipment
PPEd	Paramedic Practice Educator
PTS	[non-emergency] Patient Transport Service
R&D	Research and Development
RDM	Research Data Management

RRA	Reflexive – Relational Approaches
RRR	Reduce, Re-use, Recycle
RRVs	Rapid Response Vehicles
SACRM	Sustainability and Carbon Reduction Management
Sat-Nav	Satellite Navigation
SCAS	South Central Ambulance Service NHS Foundation Trust
SDMP	Sustainable Development Management Plan
SDU	Sustainability Development Unit
SECAmb	South East Coast Ambulance Service NHS Trust
SLR	Systematic Literature Review
SME	Statutory and Mandatory Education
SMT	Senior Management Team
SWASfT	South Western Ambulance Service NHS Foundation Trust
TA	Thematic Analysis
TBL	Triple Bottom Line
tCO ₂ e	Tonnes of carbon dioxide equivalents
UK	United Kingdom
UIN	Unique Identification Number
UN	United Nations
UoP	University of Plymouth

US	United States
VDI	Vehicle Daily inspection
WHO	World Health Organisation
WMAS	West Midlands Ambulance Service University NHS Foundation Trust
YAS	Yorkshire Ambulance Service NHS Trust

Chapter One – Introduction to the Thesis (Setting the Scene)

1.0 Introduction

This research thesis has been a personal eight-year journey. It chronologically maps three primary research phases. These phases promote a contemporary understanding of the impact of climate change on Emergency Medical Services (EMS) in addition to exploring the experiences, behaviour, attitudes and knowledge of United Kingdom (UK) EMS sustainability and carbon reduction management (SACRM) Managers, Paramedics and other EMS personnel, towards reducing their organisation's carbon emissions. Each phase of the thesis has evolved over time, taking into account the highly rapid changes and escalating global concern with extreme climatic change and the drive towards a net zero carbon economy.

1.1. UK perspectives on climate change, CO₂e reduction and sustainability

Greenhouse gas emissions, measured in carbon dioxide equivalents (CO₂e), is affecting climate change, which in turn is leading to rising sea levels, alterations to weather patterns and oceans becoming more acidic (The Royal Society, 2022). Since the 1995 Kyoto Protocol agreement, the UK Government initially passed a statute obligating the country to a legally binding commitment, to halve emissions by 2027 (relative to the 1990 emission levels) and 80% reduction of emissions by 2050 (Great Britain, Climate Change Act, 2008).

A more recent change within the UK National Climate Change Act target, was the announcement of a reduction of emissions by 78% before 2035, reaching net zero emissions by 2050 (The Climate Change Act 2008 (2050 Target Amendment) Order 2019; GOV.UK, 2021a). Net zero emission is defined as emissions levels that could be offset, by using schemes such as technological carbon capture and storage or creating forests, to balance the comparable quantity of CO₂e (GOV.UK, 2019). The UK Government's National Adaptation Plan requires the assessment of risks from climate change, preparation of strategies to address them, and encouragement of critical organisations to adopt similar sustainability approaches (Committee on Climate Change, 2019).

Sustainability characterises an organisation's competence for satisfying the demands of the current population, whilst still guarding the capability of future populations to meet their demands (Quinn and Baltes, 2007). Having a sustainable approach requires a balance between the present and the future needs (Naylor and Appleby, 2012). The 'Triple Bottom Line (TBL)' was a theory promoted by John Elkington (1998) (Figure 1.1). It remains synonymous with sustainability and corporate social responsibility and demands equal consideration between three overlapping and interdependent 'lines' of economic, ecological and social performance indicators. Society is contingent on the economy; the economy is influenced by the global ecosystem, whose condition embodies the ultimate bottom line (Elkington, 1998; Avramenko, 2018).

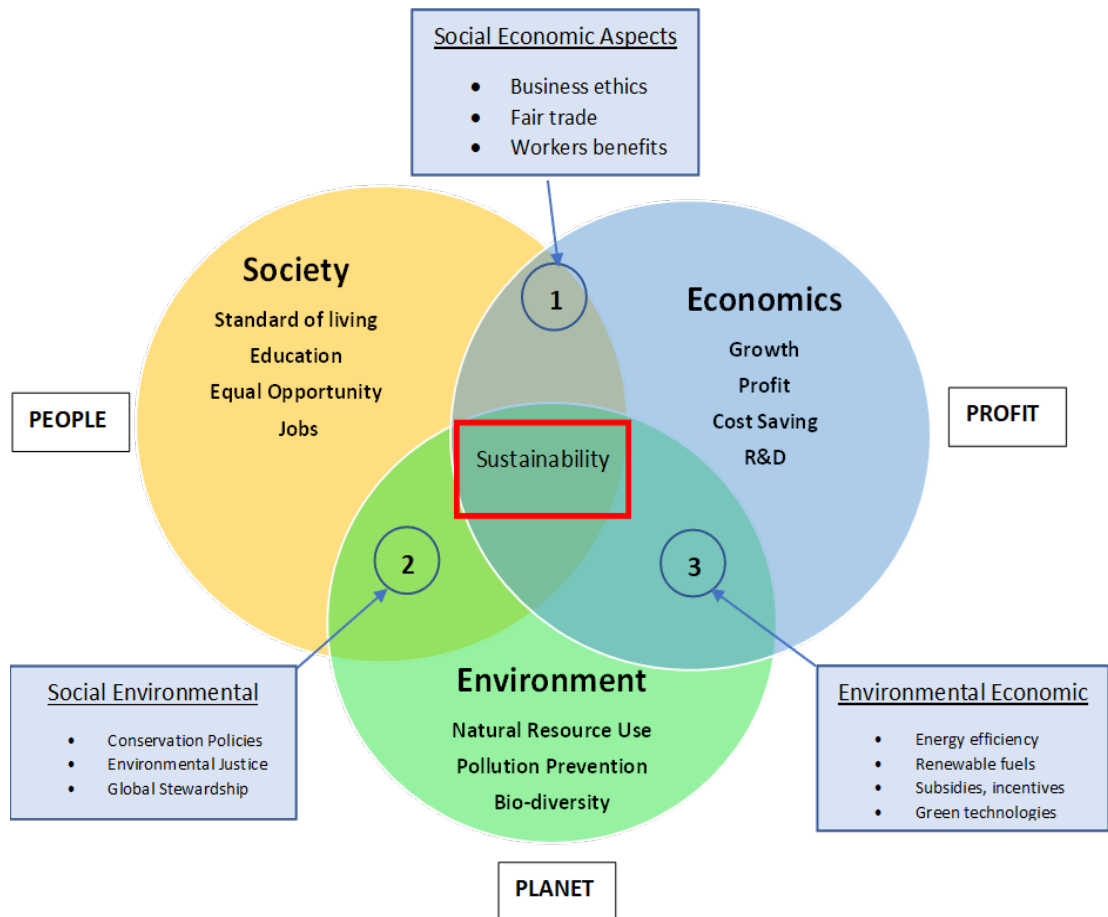


Figure 1.1: Relationships based on the Three Pillars of John Elkington’s The Triple Bottom Line of Sustainability (Elkington, 1998; Avramenko, 2018).

This TBL structure focuses organisations on the economic, environmental and social value they add, or in some cases, destroy. A sustainable organisation is one in which its operations can be continued *ad infinitum*, without negatively modifying the features that foster healthy communities and the natural environs (Quinn and Baltes, 2007; Merriman and Sen, 2012; Svensson *et al.*, 2018).

Roetman and Daniels (2011) added a fourth ‘bottom line’ advocating that ‘Human Health’ forms a bedrock of sustainability suggesting that a sustainability agenda can improve the morbidity and mortality rates within global welfare. This was endorsed by Naylor and Appleby (2012; 2013) who argued that the co-

benefits of improving environmental sustainability not only reduces CO₂e through improved efficiencies, but can also synergistically have a health promotional effect, thus removing demand on healthcare services. Consequently, the term of business sustainability is synonymous with the concept of carbon reduction management and often used interchangeably (Schaltegger and Csutora, 2012). SACRM are organisational accountabilities and there is a mounting expectancy that health care providers will implement stratagems to reduce CO₂e (Augustson and Patow, 2011; Gimenez, Sierra and Rodon, 2012) The worldwide health sector primarily safeguards and promotes health, however it is thought to contribute approximately 4.4% of global net emissions (Health Care without Harm, 2019). In recognition, the COP26 conference in Glasgow introduced an inaugural health programme, declaring several initiatives, including 'Raising the voice of health professionals as advocates for stronger ambition on climate change' and 'Developing low carbon sustainable Health systems' (World Health Organisation (WHO), 2021a).

1.2 NHS Perspectives on climate change, CO₂e reduction and sustainability

Over the past decade, there has been an accelerating expectation that the National Health Service (NHS) can provide a major contribution in reducing CO₂e within the UK (Sustainable Development Unit (SDU), 2009; Great Britain (GB), Department of Health (DH), 2010; GB, HM Government, 2013; National Audit Office, 2015; NHS England and NHS Improvement, 2020). The Health and Social Care Act 2022, for the first time, has made sustainability a statutory

duty for all NHS England organisations, through cross-referenced compliance with the Climate Change Act 2008 and Environment Act 2021.

The NHS contributes approximately 25% of all public sector carbon emissions (nearly 4% of total emissions) in England, equivalent to the total emissions profile of Croatia (Naylor and Appleby, 2012; NHS England and NHS Improvement, 2020), so the scale of this sector's activities indicates that it does have a key impact on the environment (SDU, 2016). In their sustainable development strategy for the NHS, Public Health England (2014:5) advocated that a sustainable health and care system has to operate using the most environmentally friendly resources available, whilst still aiming to protect the future health of the nation. This symbolises a reduction in CO₂e, lessening waste and pollution, limiting the use of threatened resources, creating resilience against a shifting climate and developing positive societal strengths and assets. These determinations echo the UK perspectives promoted by Roetman and Daniels (2011), but also emphasise flexibility and the need for NHS Trusts to adapt and react to climate change, placing additional focus on planning and responding to extreme weather conditions. This closely links with corporate responsibilities under the Civil Contingencies Act (2004) and consequently legal liability for enacting civil protection health plans.

The SDU initially set a carbon reduction strategy for matching the existing CO₂e targets of 80% reduction by 2050 (Public Health England, 2014: NHS England, 2018a). The SDU (2016) reported that CO₂e of the combined English Health

and Care Sector (H&CS) during 2015 was approximately 26.6 million tonnes of carbon dioxide (MtCO₂e) representing 39% of all public sector emissions (Figure 1.2).

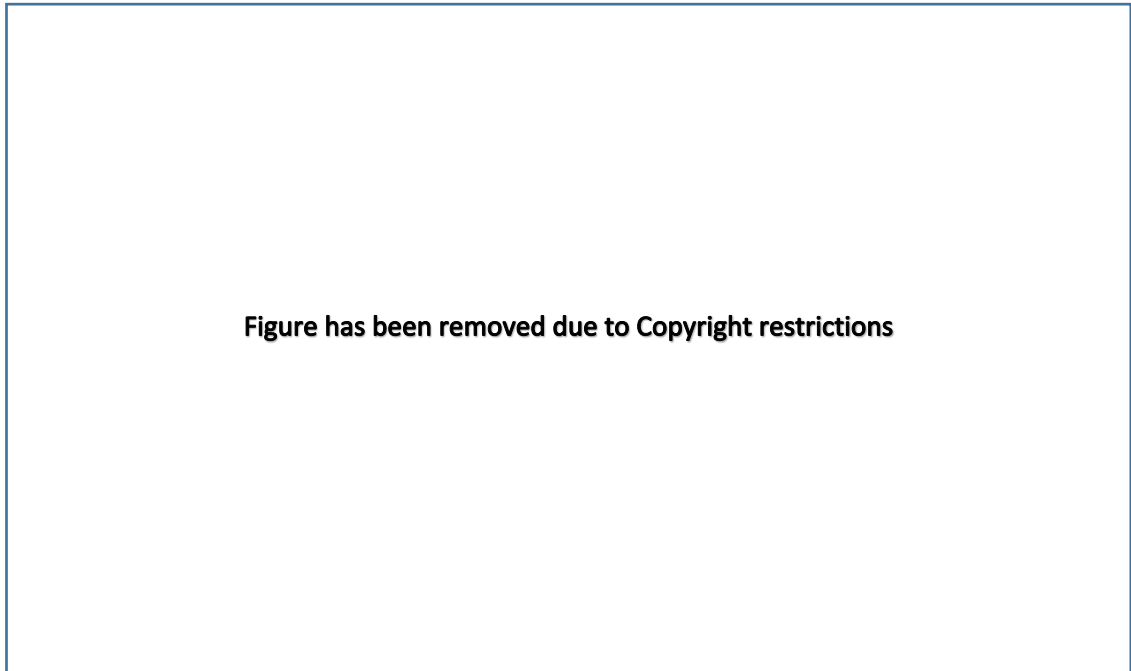


Figure 1.2: Health and Care Sector (H&CS) carbon footprint (SDU, 2016:3)

The CO₂e calculation (at that time) comprised of emissions from energy use within buildings, travel associated with operational activity and procurement of NHS goods and services, public health, and social care. There had been a 12% reduction of CO₂e emissions between 1990 and 2015; however, the SDU strategy still required a further projected 22% reduction missing the Climate Act target threshold targets of 2020 (SDU, 2016). This therefore implies that the H&CS consistently needs a concerted effort to reduce estates emissions, alongside additional sustainability strategies, particularly as patient and

healthcare activity is growing (GB, DH, 2009; SDU, 2016). These strategies are outlined in Figure 1.3.

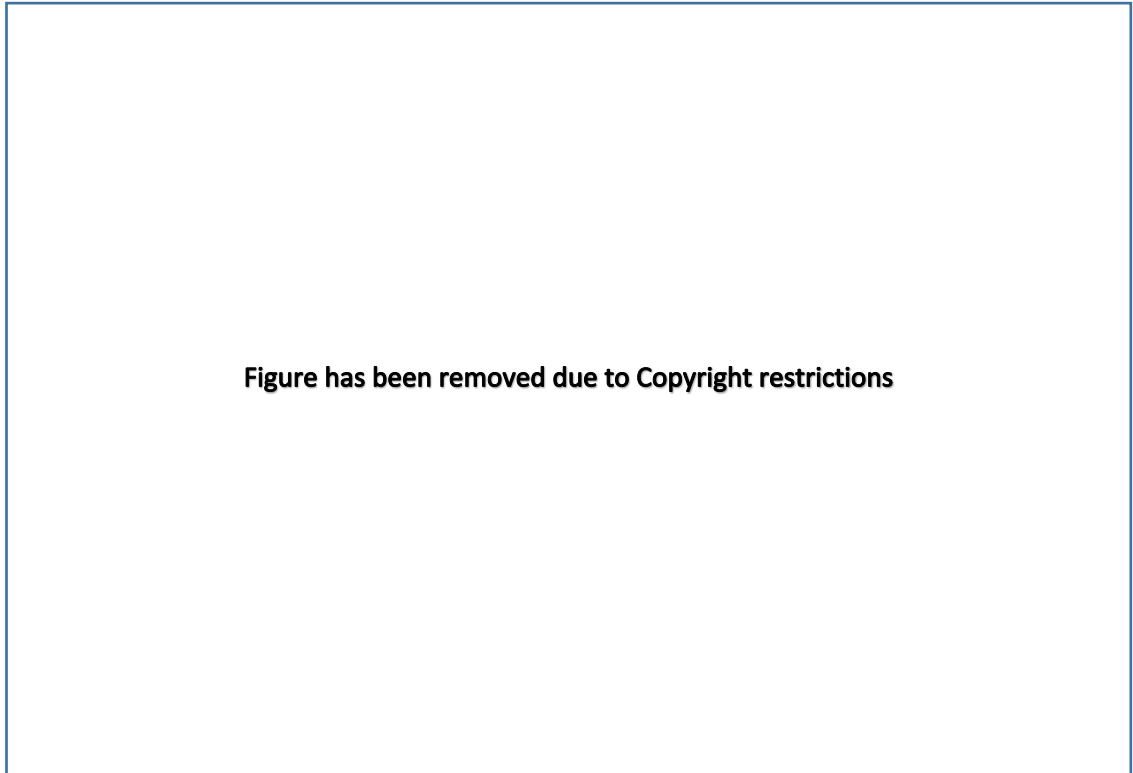


Figure 1.3: NHS, public health and social care system wedges to 2050 (SDU, 2016:7)

So many more opportunities for carbon reduction will need to be identified over the next 28 years. The NHS is under huge financial pressure and budget holders will have to make difficult decisions on the allocation of resources and efficiency savings (Institute for Sustainability Solutions, 2012). Consequently, this may mean spending more on initiatives, which have a longer-term effect rather than a short-term saving.

More recently, the NHS is under increasing pressure to adopt even greater and more radical strategies for change in order to meet the recent announcement of alterations to the UK national Climate Change Act target, of net zero emissions by 2050 (The Climate Change Act 2008 (2050 Target Amendment) Order 2019). The NHS is now measuring its targets against the full scope of emissions, advocated by the Greenhouse Gas Protocol (GHGP), which is comparable against similar international measurement standards for transparent accounting (World Business Council for Sustainable Development, 2015). These are highlighted in Table 1.1. In addition, the NHS is working towards reducing emissions generated from patient and visitor commuting, to and from NHS services, as well as medications prescribed for home use (NHS England and NHS Improvement, 2020).

Table 1.1: GHGP Scopes (World Business Council for Sustainable Development, 2015)

GHGP Scope 1	Direct emissions from owned or directly controlled sources, on site
GHGP Scope 2	Indirect emissions from the generation of purchased energy, mostly electricity
GHGP Scope 3	All other indirect emissions that occur in producing and transporting goods and services, including the full supply chain

Targeted areas for the NHS are now arranged into The NHS Carbon Footprint and the NHS Carbon Footprint Plus, as outlined in Figure 1.4.

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Figure 1.4: The NHS Carbon Footprint and the NHS Carbon Footprint Plus (NHS England and NHS Improvement, 2020)

Significant progress in carbon reduction has been made by the NHS, with an estimated 62% decrease in emissions since the original 1990 baseline levels for the NHS Carbon Footprint and a 26% reduction in its NHS Carbon Footprint Plus plan, seen in Table 1.2 (NHS England and NHS Improvement, 2020).

However, there are still substantial challenges, in order to make further improvements, and move towards a net zero emissions target before 2040 for the NHS Carbon Footprint and 2045 for the NHS Carbon Footprint Plus.

Table 1.2: NHS emissions from 1990 to 2020 (NHS England and NHS Improvement, 2020)

Carbon Footprint Scope	1990	2010	2015	2019	2020 (Est)
Climate Change Act – carbon budget target		25%	31%		37%
NHS Carbon Footprint (MtCO ₂ e)	16.2	8.7	7.4	6.1	6.1
NHS Carbon Footprint as a % reduction on 1990		46%	54%	62%	62%
NHS Carbon Footprint Plus (MtCO ₂ e)	33.8	28.1	27.3	25.0	24.9
NHS Carbon Footprint Plus as a % reduction on 1990		17%	19%	26%	26%

1.3 UK Ambulance Trust perspectives on climate change, CO₂e reduction and sustainability

UK Ambulance Service Trusts (ASTs) can meaningfully support activities to meet NHS SACRM targets. There are ten ASTs in England, providing emergency access to healthcare (Association of Ambulance Chief Executives (AACE), 2019). Since the introduction of The Climate Change Act (2008), most ASTs have recognised that their activity and operations have a large contributory effect on the local, regional and global environments (North West Ambulance Service NHS Trust (NWASt), 2020; South Western Ambulance

Service NHS Foundation Trust (SWASfT), 2021). Subsequently, firm commitments were made through strategic planning to minimise their impact on their carbon emissions (Green Environmental Ambulance Network (GrEAN), 2012).

There are two key requirements for all NHS organisations. Firstly they are to develop and embed a board approved Sustainable Development Management Plan (SDMP), Carbon Management Plan (CMP) or, as they are contemporarily now known, a Green Plan. For the purposes of the thesis, these will all be referred to as the 'Green Plan'. These Green Plans are then endorsed through the organisation's board or governing body as part of their governance processes (SDU, 2009; 2013b; 2016; NHS England and NHS Improvement, 2021a). Secondly, they are to consistently measure and monitor progress towards meeting CO₂e targets (GrEAN, 2012; NHS England and NHS Improvement, 2021a). Accordingly, there have been some publications of AST strategic policy, outlining systematic and methodical strands for reduction in CO₂e emissions. Within the Green Plans, strategies are being developed to monitor, audit and make changes in areas such as sustainable (low carbon) procurement and transportation; diminutions of energy, fuel, water consumption; and improved waste disposal with greater emphasis on recycling (GREAN, 2012; NHS England and NHS Improvement, 2021a).

From previously published empirical research (Blanchard and Brown, 2009; 2011; Brown *et al.*, 2013; Brown and Blanchard, 2015), there are three pertinent

areas highlighted, for reducing carbon emissions within ASTs. These are the consumption of fuel used by operational vehicle fleets as well as non-operational vehicles (pool cars and staff lease cars); the consumption of energy and utility sources within static estate buildings; and the management of the product supply chain (including the production of waste generated by the procurement and use of consumable and non-consumable equipment).

1.4 Early EMS research underpinning climate change and sustainability

Preliminary searching of the evidence base, at the start of the thesis, had indicated that there was a scarcity of empirical research around the managing of SACRM in EMS (Hess *et al.*, 2009). There was, however, evidence that suggested climate change was producing an increase in global temperatures, resulting in negative health effects (Hess *et al.*, 2009; Bassil *et al.*, 2011; Kue and Dyer, 2013; Thornes *et al.*, 2014). Consequently, this caused increased ambulance demand, inability to meet response time targets and increased patient transfers to Emergency Departments (EDs) (Hess *et al.*, 2009; Murray, Howie and Biant, 2011).

Earlier studies have also tried to quantify the CO₂e of ambulance activities, for example mapping the energy consumption and emissions for North American and Australian EMS agencies (Blanchard and Brown, 2009; Blanchard and Brown, 2011; Brown and Blanchard, 2012; Brown *et al.*, 2012a; Brown *et al.*, 2012b; Brown *et al.*, 2013). These studies demonstrated that global EMS organisations were energy intensive. Preliminary estimates of overall emissions

for the Australian EMS ranged from 216,369 to 546,688 tonnes of CO₂e (tCO₂e) per annum, with North American EMS emissions estimated between 660,000 – 1.6 million tCO₂e (Blanchard and Brown, 2011; Brown *et al.*, 2012b). The total carbon footprint for UK ASTs was estimated in 2012 as 214,972 tCO₂e, which was considered as a very conservative estimate, as specific carbon emission calculation tools were in their infancy (GrEAN, 2012). Even a decade ago, Brown *et al.*, (2012a) recommended that in order to minimise the impact of EMS operations and facilitate adaption to a low-carbon economy, there was a greater need for cross-disciplinary research in this area.

1.4.1 Fuel use – a rising issue

Fuel consumption, and its rising cost, was one of the early characteristics accepted as a threat to sustainability in the UK (Williamson, 2011; Harmer and Hignett, 2018). Blanchard and Brown (2011) established that roughly 75% of energy consumption of an EMS organisation occurs through vehicle fuel use. However, not all of the fuel use could be attributed to transportation mileage. It was believed that engine idling (used to charge medical apparatus) could constitute 65% of an ambulance shift, with 0.9 litres of fuel used every hour (Hess *et al.*, 2009; Williamson, 2011). Or as Apodaca-Madrid and Newman (2010) identified, in their evaluation of ambulance activity in Colorado, United States (US), it can range as high as 1 gallon to 2 gallons of fuel (4.55 litres – 9.09 litres), depending on vehicle type, what critical equipment was drawing power or whether air conditioning was being used.

NHS England (2022a) postulate that 3.5% of all road traffic in England is due to NHS related travel, which is attributable for 14% of the NHS carbon footprint. ASTs in the UK use approximately 150,000 litres of diesel daily and the national ambulance fuel bill is steadily increasing to around £26 million annually (Health Business, 2017). One AST reported that the mileage and number of ambulance journeys is increasing by 5% annually (Yorkshire Ambulance Service NHS Trust (YAS), 2020). Not only is diesel and petrol use polluting, releasing high amounts of CO₂e emissions, it accounts for up to 72% of EMS activity (Blanchard and Brown, 2011). It is also a carcinogenic substance affecting air quality and increased morbidity and mortality in public health (Manisalidis *et al.*, 2020).

Some ambulance providers have initiated mitigation efforts, for engine idling, by fitting methanol fuel cells. YAS had forecast a saving of £1.75 - £2.4 million through the application of these (Williamson, 2011). Other organisations in the US have trialled solar panels, saving approximately \$7,000 per vehicle annually in fuel use (Lawrence, Suddaby and Leca, 2011) or creating savings of \$10,000 over 2 years (Apodaca-Madrid and Newman, 2010). Nevertheless, these do come with an initial financial cost for retrofitting, before savings can be acquired.

Other initiatives in reducing overall fuel costs are trials with smaller and lighter vehicles (Harmer and Hignett, 2018), hybrid engines within rapid response vehicles (RRVs) and double crewed ambulances (DCAs) (Hawkins, 2008) and hydrogen cell vehicles (GreenFleet, 2016). Most interestingly, though, has been

the experimentation of electric RRVs (Baker *et al.*, 2013); however, there is much more to be known on how these initiatives are adopted and expanded, especially as the technology for fuel alternatives has evolved over the last few years.

1.4.2 Waste management – a behavioural cost

Decreasing the volume of waste produced by clinical practice is an absolute necessity, as it significantly adds to the CO₂e emissions of NHS Trusts (NHS England, 2018a). Healthcare waste management practices are expensive, polluting and wasteful (Manzi *et al.*, 2012; Nichols *et al.*, 2012). The Department for Environment, Food and Rural Affairs (DEFRA) had planned national targets of increasing recycled waste to 50% of waste by 2020 (Great Britain. DEFRA, 2013; 2018). Although there is a growing cascade of empirical research into analysing waste management in healthcare (Kumar, Somrongthong and Ahmed, 2016), there is still a scarcity of research which applies specifically to waste management in EMS, both nationally and internationally, leaving an area which has yet to be explored or researched (Nichols and Allum, 2015).

Some publications studying effective NHS waste management focus on the attitudes, behaviours and knowledge towards waste management. The discussion indicates a need for behavioural change with recycling or disposal practices (Manzi *et al.*, 2013; Nichols *et al.*, 2013; Nichols and Allum, 2015). This is congruent with ASTs' Green Plans for educating personnel, through improved communication and encouraging behaviours consistent with their

suggested policies (Nichols and Allum, 2015; Richardson, Allum and Grose, 2016). However, as policies are introduced and plans are overtly communicated from a strategic perspective, there is little research available on how those policies translate at the operational level.

South Central Ambulance Service NHS Foundation Trust (SCAS)'s policy on waste management (2015) acknowledged that there was an increasing cost pressure related to waste disposal and in particular the use of landfill. SCAS advised that this was the least environmentally friendly option, as well as appearing to be the most costly, because it was subject to an annually steeped increase in landfill tax. Furthermore, there was insufficient data available from contractors that they used, to enable them to accurately verify the amounts of waste that they recycled as a Trust as opposed to general waste going to landfill. There is also an additional question from staff as to whether there are the facilities available to correctly dispose of waste (Hutchens and White, 2009; Nichols & Manzi, 2014). On ambulances, this may account for a large proportion of domestic waste being disposed as clinical waste, leading to an inflated amount of general waste being incinerated, which has a much higher cost. This is a predominant concern in healthcare and there is literature evidence on difficulties associated with waste segregation behaviour (Pereira, 2013, Manzi *et al.*, 2012; 2014)

Nichols *et al.*, (2013) highlighted that sustainable healthcare waste practices are required for both financial and environmental reasons. They advocated that

additional research in healthcare waste management was essential, especially with exploring behaviour, attitudes, education and awareness within the context of practice. This was reiterated in a review of EMS waste management (Nichols and Allum, 2015). Since 2015, the gaps in the evidence base remain unaddressed for EMS organisations. As a result, the research indicated that there was a need to comprehend the drivers that generate waste in ASTs, its management and its disposal. Exploring SACRM behaviours within ASTs in the UK and the evaluation of their intervention strategies towards waste management is uncharted research territory (Nichols and Allum, 2015).

1.4.3 EMS Employee engagement – a need for education

SACRM in EMS practice may also need to be addressed through education. The delivery and content of EMS or paramedical curricula varies across countries. To become a registered Paramedic in the UK, each applicant needs to undertake an educational curriculum that is approved by the Health and Care Professions Council (HCPC). Educational programmes have to meet the HCPC Standards of Education and Training (2019a), incorporating the HCPC Standards of Proficiency for Paramedics (2019b) and the Standards of Conduct Performance and Ethics (2019c). Although individual taught content might vary amongst education providers, it is essential that all paramedical syllabi should adopt the UK professional body curriculum guidelines (College of Paramedics (CoP), 2017; 2019). Ongoing education for both Paramedics and other ambulance staff is met through continual professional and personal development (CPPD) and statutory and mandatory education (SME) provided by the employing organisation. However, the topics of SACRM are not overtly

included in the CoP curriculum guidelines (2017; 2019) and potentially there is a paucity of evidence suggesting that SACRM education is contained within EMS and Paramedic training worldwide (Richardson, Allum and Grose, 2016).

Compared with the nursing and medical professions, UK ASTs appear to have been slow to embed sustainability education. Other NHS professions have already been successful in engraining sustainability into their curricula and a multitude of innovative approaches has been promoted in their literature (Richardson *et al.* 2014; Richardson, Allum & Grose, 2016; NURSUS project, 2019). EMS personnel use substantial resources, especially with utilities and consumable equipment. EMS practice is already being affected by climate change (Hess *et al.*, 2009; Thornes *et al.*, 2014) and parameters of scarce natural resources; therefore, educating ambulance staff to understand the consequences of a changing climate is paramount. Undergraduate Paramedic students could be change agents within the Paramedic discipline and hence they could be targeted, making an emotional and intellectual appeal for adopting pro-sustainability behaviours within educational programmes (Williams, *et al.*, 2008). By embracing a sustainability ethos, lessening carbon heavy practices and engaging with organisational objectives, Paramedic students and eventual graduates can be at the forefront for influencing sustainability in EMS practice. They can become the future promoters for SACRM behaviour (Richardson, Allum and Grose, 2016). A more detailed discussion on the literature can be found in Chapter two.

1.5 Justification for the Thesis

Whilst the initial research highlighted that some inaugural work had been completed within EMS organisations by the identification of fuel costs, poor waste management and a lack of professional education, little was evident on other energy or utility reductions, or procurement supply chain adaptations. These were all areas for which there was a heavy dependence on the compliance and cooperation of individual staff members to engage with sustainability initiatives.

This thesis set out to identify current practice, attitudes, behaviours and knowledge around climate change and sustainability of AST staff, highlighting any intervention strategies employed. The findings were intended to help inform and develop new intervention strategies, evaluated by future recommended research proposals. This could then lead to cost savings across a number of ambulance stations within ASTs located in the UK and have transferability across other EMS settings and wider business communities, globally.

1.5.1 Thesis Aim

The overall aim of this thesis was to explore UK ASTs' adoption of reduce, re-use, recycle (RRR) approaches in practice. The origins of the RRR principle is debateable, however the slogan is believed to have been coined from the first national Earth Day in 1970 (Recycle Nation, 2022). RRR is also known as the 3Rs of sustainability that promotes reducing waste and energy consumption, re-using items wherever possible and recycling waste (including sorting into appropriate waste streams) (NHS England, 2022b). By investigating the

attitudes, behaviours and underpinning knowledge of UK ambulance personnel in how they contribute to a RRR ethos, further opportunities for sustainability may be generated. The thesis aim was then considered in terms of its objectives.

1.5.2 Thesis Objectives

Objective #1 Was to conduct a systematic and critical review of published literature around sustainability in Emergency Medical Services (EMS), based on a clearly formulated question, identifying relevant studies for appraisal of quality, thus allowing a summary of the evidence and an interpretation of the findings (Khan *et al.*, 2003; Hart, 2018). This scoped the EMS sustainability research since the introduction of the UK Climate Change Act (2008), critically explored the impacts of climate change on EMS delivery, established current sustainability initiatives, identified challenges in implementing sustainability strategies, and identified the gaps in EMS research to inform the future phases of research.

Objective #2 Was to explore the role of English NHS AST strategic managers who have a responsibility for SACRM, with their current experiences, perceptions, feelings, attitudes, behaviour and knowledge, when implementing initiatives through their organisational Green Plans.

Objective #3 Was to use ethnographical methods to observe and explore the sustainability activities, attitudes and behaviours of operational ambulance personnel within NHS AST stations located in England. This enabled a critical review of their approach to SACRM. Participant observation, in both a

peripatetic working environment and activity spent on static ambulance stations allowed the investigation of the facilities, habits and customs of how operational ambulance staff met the objectives of their organisational strategies. This enabled a greater understanding of the situations in which they operated, the sustainability practices employed and the justification their behaviour. This also assisted an investigation of whether the overt organisational objectives from the Green Plans were being understood and met by operational staff.

Objective #4 Was to observe, and identify how resources were being used and the waste disposal habits employed by operational staff at a number of ambulance stations within NHS ASTs located in England.

Objective #5 Was to explore the issues, which may reduce resource (fuel, energy and utilities) consumption, the supply chain and waste segregation efficiency, in order to facilitate better RRR practices amongst operational ambulance personnel.

1.5.3 Phases of the research within the thesis

Phase 1 (Objective 1)

This encompassed a systematic review of the published literature that is pertinent to SACRM in EMS delivery. This phase is detailed in Chapter two, where the search strategy is discussed and publications are critically analysed. The systematic literature review (SLR) was conducted across three periods. Firstly, the main foundational review was conducted between April 2014 and August 2015, encompassing the published literature from 1st January 2008 to 31st August 2015. This then enabled the formulation of the aims and objectives

for the Phase 2 study. Following this, an update of the literature review was conducted for the period 1st September 2015 to 31st December 2017. This then supported the construction of the aims and objectives for the Phase 3 study. The final review continued the appraisal of published literature for Phase one and was conducted in July 2022, for the inclusion of any final contemporary publications from 1st January 2018 to 1st July 2022 into the thesis discussions, before submission.

Phase 2 (Objectives 2 and 5)

This phase involved phenomenological methodology, utilising semi-structured interviews through a purposive sample of SACRM managers from ten English NHS ASTs. Further details of the methodology and methods can be found in Chapters three and four. This research design enabled exploration of current experiences, perceptions, feelings, attitudes, behaviour and knowledge when implementing their strategic Green Plans. Interviews were audio recorded, transcribed (data preparation) codified (data management) and thematically analysed, using Braun and Clarke's (2013a; 2013b) seven step process of analysis. This phase gathered qualitative data and contributed towards explaining values, opinions, particular behaviours and views of strategic SACRM managers within their own social contexts. The full findings and discussion can be found in Chapter five. These findings led to the formulation of objectives for Phase 3.

Phase 3 (Objectives 3, 4 and 5)

This phase was ethnographical in approach and utilised the findings from Phase 2 to widen the research by conducting a participant observation study of operational ambulance staff and how resources (fuel, energy and utilities) were being utilised, along with the waste disposal habits within AST activities. A purposive sample of nine ambulance stations from two NHS ASTs in England were chosen within this observational study to allow for geographical variance (for differences in station culture) and also different sizes of station (urban or city main base station; rural base station; small or 'part time' station). The study involved data gathering through the use of Lofland's Framework (1971:1995), a systematic observation of activities and acts relating to fuel use, energy use, resource use, waste disposal and management of environmental space, at given points in time. Meaning was then extracted from participants using informal interviews, which were audio recorded and thematically analysed. The main reason for this observational phase was to eyewitness the environment of AST staff as they conducted their daily employment. It was also an opportunity to listen to what personnel say, as well as how they use words and behaviour to rationalise and influence what they and other people are doing (Denscombe, 2010; Green and Thorogood, 2018).

1.5.4 Chapter one summary

The primary aim of this research thesis was to address key objectives on healthcare sustainability, established by the NHS SDU, the Greener NHS and supports the implementation of DH policy for NHS sustainability (NHS England

and NHS Improvement, 2020; NHS England and NHS Improvement, 2022).

Investigating the current approaches and their effectiveness in reducing carbon emissions, enables the generation of a greater understanding and offers an original contribution to theory for future dissemination. This research informs and facilitates positive behavioural change, identifies factors that lead to good practice and impacts on existing knowledge by finding and sharing areas of good practice.

Chapter Two (PHASE 1) Climate Change and Emergency Medical Services: A Systematic Literature Review (SLR) and Critical Analysis of the Literature.

2.0 Introduction

Increases in climate change and global warming are having a detrimental effect on humanity. The average temperature of the earth increased by 0.85° C between 1880 and 2012 (International Panel on Climate Change, 2014; Patel *et al.*, 2019). Future predictions point to a global temperature rise of 1.8 to 6.0° C by 2100; a sea level rise of 0.18 to 0.59m; and amplified extremes of weather conditions, due to the man-made consequences of deforestation and greenhouse gas emissions (Hess *et al.*, 2009, Kim *et al.*, 2012; Kravchenko *et al.*, 2013; DeVine *et al.*, 2017).

There is particular emphasis on how these changes can affect human health, morbidity and mortality (Khalaj *et al.*, 2010; Kue and Dyer, 2013; Packer *et al.*, 2022). Barack Obama vehemently declared to world leaders, prior to the 2015 COP21 Paris Climate summit, that "Any so-called leader who does not take this issue seriously is not fit to lead" (BBC News, 2015). This suggests that there is an ethical and strategic obligation for all citizens to actively engage with the debate on carbon footprint reduction as well as to seek and adopt intervention strategies which promote a 'greener' lifestyle.

2.1 Methods and Strategy

For the Phase One SLR, ten healthcare related databases were systematically searched and citations were sought from appropriate reviews. The following databases were searched - AMED; CINAHL; Cochrane Library; Embase; Medline (EBSCO); Medline (Ovid); PsycInfo; PubMed; SOCINDEX; Web of Science. A search of 2 specific journals related to Paramedicine was also conducted (Journal of Paramedic Practice; Journal of Pre-Hospital and Disaster Medicine).

Searches were conducted in three phases during the thesis. An initial search was conducted between April 2014 and August 2015. This included the date range from the Climate Change Act, 2008 to August 2015. The sources obtained informed the formulation of the research question for the Phase two research (in Chapters three, four and five). A second search was conducted to update the SLR, using the same search strategy, for the dates August, 2015, to the end of December, 2017. The updated literature enabled further consideration towards the construction of the research question for the phase three research (Chapters six, seven and eight). Finally, the same search strategy was used to conduct a third search for the dates January 2018 to May 2022 to contemporise the literature review prior to completion of the thesis. The combined results of the three searches and each individual database search can be seen in (Appendices 1 and 2).

2.1.1 Aim of the Phase One SLR

The aim of this SLR was to explore and evaluate published literature on Emergency Medical Services (EMS) and SACRM by grouping sources according to their focus on the impacts of climate change on EMS systems; any strategic direction for EMS services; interventions being incorporated into practice; and the attitudes and behaviour of the EMS workforce. Specifically, the review questions were:

- How has climate change affected practice in EMS? (Effects)
- What are the challenges with implementing sustainable practices within EMS? (Strategy)
- What sustainability practice or interventions have been applied to reducing the carbon footprint of EMS practice? (Actions)
- What opportunities exist for changing the cognitive, affective and conative components of individuals, in relation to better sustainable practices in EMS delivery? (Psychological)

2.1.2 Search terms used

sustain* OR sustainability OR sustainability behaviours OR sustainability behaviors (US spelling) OR sustainability attitudes OR Carbon footprint OR climate change OR waste OR energy OR recycle

AND

Emergency Medical Services OR ambulance OR ambulance service* OR
paramedic* OR paramedic service OR pre-hospital OR out-of-hospital

2.1.3 Inclusion Criteria

- Sources reporting impacts of climate change on SACRM in Emergency Medical Service delivery
- Sources reporting impacts of climate change on sustainability within Ambulance Services
- Sources reporting impacts of sustainability within prehospital / out of hospital care
- Sources that have analysis and discussion of sustainability in relation to leadership, education, attitudes and behaviours
- Sources discussing SACRM views, opinions or developments in relation to EMS delivery
- Sources that contain a cost / benefit analysis in relation to sustainability
- Policy documents relating to sustainability in EMS delivery
- Sources published in English

Box 2.1 Inclusion Criteria

2.1.4 Exclusion Criteria

- News articles
- Sources not obtainable with an English translation
- Editorials
- Commentaries
- Sources not reporting empirical research
- Sources not published in peer reviewed journals
- Sources published before 2008 (prior to the Climate Change Act, 2008)

Box 2.2 Exclusion Criteria

2.1.5 Filtering, Data Collection and Analysis

The Primary Researcher (the thesis author) screened the titles and abstracts and potentially relevant papers were retrieved for further scrutiny, which were then assessed against the inclusion criteria. Those papers that met the inclusion criteria were critically appraised using a Critical Skills Appraisal Programme (CASP) process (CASP, 2018). This was to systematically examine and scrutinise each publication for unrecognised bias, trustworthiness, validity, value, and relevance (Katikireddi, Egan and Petticrew, 2014). Every included publication was then categorised according to their focus with data being extracted and categorised according to the emphasis of the publication (Hart, 2018). Critical analysis was used to recognise significant issues, strategies and initiatives, for discussion. For each journal, the Primary Researcher initially conducted the selection, quality assessment, data extraction and analysis and

then another person from the supervisory team independently corroborated a sample. Any differences in opinion or divergences were resolved by involvement and discussion of the third member of the supervisory team, not previously involved.

2.1.6 Overview of the combined findings from the literature from 2008 to 2022

A table showing the number of literature sources from the ten databases can be seen in (Appendix 2). Following a database search a combined total of 19,029 potentially relevant publications were identified, from which 18,710 were excluded after screening the title and abstract. It was found that the term 'sustainability' and 'energy' can have multiple generic literal meanings in the context of healthcare provision, so it appeared in an extensive number of identified publications, which were not in the perspective of carbon reduction management. So, to ensure that the search was comprehensive, all the potentially relevant titles and abstracts were reviewed.

Of the remaining 319, seven were unable to be retrieved, and 177 were duplicates, leaving 135 for further scrutiny and quality review using CASP (2018) tools. Following this step, 21 were excluded due to not meeting the inclusion or falling within the exclusion criteria (Section 2.1.3 and Section 2.1.4); however, 16 of those were considered for additional background reading. The remaining 114 papers were categorised according to their focus (Figure 2.1).

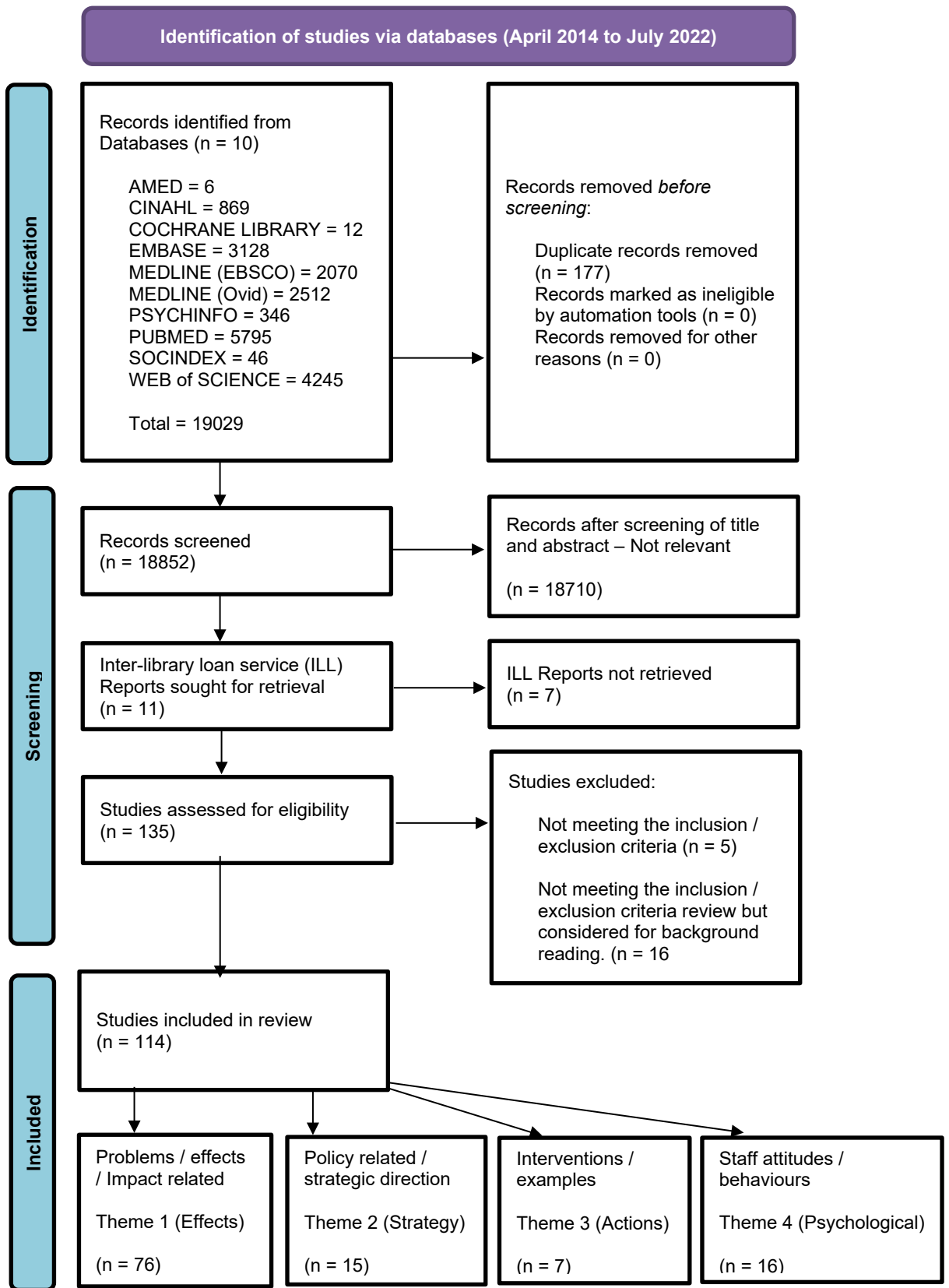


Figure 2.1 Systematic review search results flow chart (PRISMA, 2021).

2.2 Theme 1: How has climate change affected practice in EMS? (Effects)

2.2.1 Global Effects of climate change on EMS delivery

The majority of publications included (n=76) centred around the effects of rising global temperature, the effect on extremes of climatic conditions (heatwaves and cold snaps) and the consequent impact upon health, morbidity and mortality. A table of these publications can be found in Appendix 3.

2.2.2 Effect of climate change on mortality and morbidity with Emergency Department admissions

There are conservative estimates from the World Health Organisation (WHO) that climate change causes approximately 150,000 additional global deaths per year, but this figure is projected to rise to almost 250,000 per year by 2030 (WHO, 2021b). This is based on evidence gathered on the health effects of thermal extremes, volatile weather, wildfires and the natural disasters that result, such as outbreaks of infectious diarrhoea, increased risk of malaria and lack of supplies resulting in malnutrition (Hess *et al.*, 2009; Pourshaikhian *et al.*, 2019; Ghada *et al.*, 2021; Sorensen *et al.*, 2020; WHO, 2021b). These effects are projected to multiply within the succeeding decades due to higher ambient temperatures, secondary to anthropogenic climate change (Li *et al.*, 2015; DeVine *et al.*, 2017; Cheng *et al.*, 2019; Ranadive *et al.*, 2021).

Studies from this phase one SLR, show that changes with our climate have the propensity to proliferate temperature related morbidity and consequently

mortality, across the world (Li *et al.*, 2015; Onozuka *et al.*, 2019; Tham *et al.*, 2020). Heavy storms, hurricanes and extreme precipitation from unstable weather patterns are associated with injury, mortality, gastroenteritis outbreaks and often cause population relocation through evacuation. With increased demand, comes increased call volumes to EMS organisations, as well as response times being impeded by environmental obstacles, such as flooding, snow, ice, fallen trees and fog (Mahmood *et al.*, 2017).

Several indicators have been used to assess the association between heat extremes and illness or death rates, such as ED visits, emergency hospital admissions and EMS dispatches, although there is wide variation in results, due to dissimilar areas, weathers and demographic features of the research locations (Li *et al.*, 2015). There were limitations in synthesising the effect estimates due to their heterogeneity and inconsistent methodologies and heat wave definitions, which make it difficult to obtain an overall quantitative result, however the evidence does suggest that climate change is already having an impact on EMS delivery.

The effect of cold ‘snaps’

Climate change can be associated with abnormal cold ‘snaps’ resulting in increased global morbidity and mortality rates and significantly increased ambulance dispatches (Turner, Connell and Tong, 2012; Thornes, 2013; Chen *et al.*, 2014; Thornes *et al.*, 2014; Mahmood *et al.*, 2017; Doan *et al.*, 2021; Sangkharat *et al.*, 2020; Wu *et al.*, 2021; Packer *et al.*, 2022). In the UK,

Thornes *et al.*, (2014) reported that in Birmingham, Category A calls (the most urgent in call triage, at the time of publication), required an ambulance response within eight minutes, from the time that the 999 call was received to the attendance of a clinician to the incident. The performance target was to attend 75% (or more) of Category A calls within this time. Thornes *et al.* (2014) observed that in December 2010, due to the significant increase in cold weather incidents, the response rate dropped below 50% for three consecutive days, with an average response duration of 15 minutes. The volume of calls, as well as the effect of the weather on driving safety conditions, likely affected response time failure.

Globally, admissions to ED can rise due to cold-weather related trauma, as well as cardiovascular and respiratory conditions especially with vulnerable risk groups of the elderly and children (Murray, Howie and Biant, 2011, Kim *et al.*, 2012; Xu *et al.*, 2013; Ponjoan *et al.*, 2017; Pourshaikhian *et al.*, 2019; Sangkharat *et al.*, 2020; Ghada *et al.*, 2021). Adverse cold weather events also have their additional financial cost to health services (Wondmagegn *et al.*, 2019; Wondmagegn *et al.*, 2022). Murray, Howie and Biant (2011) found that overall ED attendances in Edinburgh remained constant in seasonally anticipated cold weather, but there was a strong connection between severe weather warnings and increased trauma related presentations due to low energy slips and falls. Conversely, there was also a decrease of 'non-urgent' presentations in ED at the same time during the study period. This may be due to patients with minor injuries or illness having limitations of transportation or reluctance to travel in icy or snowy conditions (Murray, Howie and Biant, 2011).

The effect of heatwaves

Global warming has consistently been associated with increases in average temperature and the enhanced variability of weather, with longer-term forecasts indicating warmer weather in the future (Kim *et al.*, 2012). Heat extremes are predicted to exert a larger influence on human health than cold (Bustinza *et al.*, 2013, Kravchenko *et al.*, 2013, Kue and Dyer, 2013; Bai *et al.*, 2014b). A large collection of international studies, identified that the regularity, intensity and duration of heatwaves, due to global climate change, has resulted in increased mortality and morbidity rates, leading to increased ambulance activity and ED admissions (Hess *et al.*, 2009; Schmier and Ebi, 2009; Khalaj *et al.*, 2010; Kim *et al.*, 2012; Son *et al.*, 2012; Williams *et al.*, 2012a; 2012b; Bustinza *et al.*, 2013; Wang *et al.*, 2013; Xu *et al.*, 2013; Bishop-Williams *et al.*, 2015; Lee *et al.*, 2014; Li *et al.*, 2015; Wang *et al.*, 2015; Calkins *et al.*, 2016; Cheng *et al.*, 2016; Kang *et al.*, 2016; Onozuka and Hagihara, 2016; Winqvist *et al.*, 2016; DeVine *et al.*, 2017; Riley *et al.*, 2018; Xu *et al.*, 2018; Cheng *et al.*, 2019; van der Linden *et al.*, 2019; Tham *et al.*, 2020; Williams *et al.*, 2020; Campbell *et al.*, 2021; Kranc *et al.*, 2021; He *et al.*, 2021; Kegel *et al.*, 2021; Li *et al.*, 2021; Wang *et al.*, 2021; Wu *et al.*, 2021; Yoo *et al.*, 2021).

One anomaly noted when comparing international and intercontinental studies is that there is a variety of heatwave definitions. This is an issue with comparison across international studies as the definition varies by location with different temperature metrics (Kinney *et al.*, 2008; Knowlton *et al.*, 2009). Heatwaves may be defined as a protracted duration of unusually high

atmosphere related heat stress (in relation to usual temperature) during a specific season at a particular locality, which leads to provisional adjustments in human lifestyle behaviours and notable health related complications affecting societies (Kravchenko *et al.*, 2013). The Australian Bureau of Meteorology re-defined a metric based on average daily temperatures and now use the Excess Heat Factor terminology to denote a heatwave indicator (Borg *et al.*, 2019; Varghese *et al.*, 2019). When using these various definitions and critically analysing these unusual heat events across the world, it is apparent that a strong correlation does exist between abnormally high temperatures for each researched regional context and increased death rates, ambulance dispatches and hospital admissions. This is important to note as there is evidence to show that regional populations that have regular and consistently higher temperatures, which are the norm, can adjust or acclimatise to mitigate the effects of rising heat through alleviation strategies (Knowlton *et al.*, 2009; Williams *et al.*, 2012b; Kravchenko *et al.*, 2013). It is when temperatures exceed the norm that heatwaves have their greatest impact. Periods of excessive temperatures happening in areas usually familiarised to colder climates, have been found to have greater increases in mortality; with the minimum temperature thresholds for heat related mortality reducing when latitude increases (Kravchenko *et al.*, 2013).

The comparison of case-crossover and time series analyses, conducted by Tong, Wang and Guo (2012) in Brisbane, Australia, revealed that during the three identified heatwaves (defined as $>37^{\circ}$ C for two or more consecutive days) within the study period 1996-2005, there was a consistent and statistically

significant increase in estimated odds ratio for non-external cause (non-traumatic) mortality and emergency hospital admissions. Similar studies in Perth and Adelaide showed comparable results (Mayner, Arbon and Usher, 2010; Williams *et al.*, 2011, 2012a, 2012b) and research conducted in Europe and North America also highlighted the link between heatwaves and increases in morbidity rates and rising ED admissions (Linares and Diaz, 2008; Knowlton *et al.*, 2009; Bustinza *et al.*, 2013; Kravchenko *et al.*, 2013).

2.2.3 Effects of climate change and extremes of temperature on health within the ‘out of hospital’ community

High temperatures are reportedly shown to be associated with mortality (Bai *et al.*, 2014a; Wang *et al.*, 2015; Riley *et al.*, 2018). Kravchenko *et al.*, (2013) reported that up to 90% of the increase in mortality rate was attributable to periods of excessive heat. Some studies have scrutinised the connection between excessive temperatures and ‘out of hospital’ cardiac arrest (OHCA) and also reported similar conclusions (Chen *et al.*, 2014; Kang *et al.*, 2016; Onozuka *et al.*, 2019; Doan *et al.*, 2021; Kranc *et al.*, 2021). Table 2.1 summarises the key effects of heat extremes on health from the literature.

Table 2.1 Key effects of heat extremes on health

Effect on Health	
Sunburn, heatstroke, heat cramps, heat syncope, and heat exhaustion	Sunburn, heatstroke, heat cramps, heat syncope, and heat exhaustion are the common conditions that occur with excessive environmental temperatures (Khalaj <i>et al.</i> , 2010; Kravchenko <i>et al.</i> , 2013). These combined with other comorbidities can lead to more severe conditions. Episodes of sustained heat has an additional effect on morbidity, because of its intensity and duration (Li <i>et al.</i> , 2015).
Cardiovascular disorders	High temperature on cardiovascular and cerebrovascular disease is due to the body's inability to cope with excessive heat (Li <i>et al.</i> , 2015; Cheng <i>et al.</i> , 2019; Sorensen <i>et al.</i> , 2020). Heat stress decreases cerebral blood velocity and impairs orthostatic tolerance. When combined with water loss through sweating and dehydration, along with a reduced plasma volume, the release of platelets is triggered, alongside an increase in red and white blood cell counts, viscosity and plasma cholesterol levels. This leads to a rise in the risk of death from arterial thrombosis during hot weather (Linares and Diaz, 2008; Kravchenko <i>et al.</i> , 2013). This effect is leads to a quick cardiovascular death and thus increasing mortality rates in the prehospital environment, prior to admission to ED (Tong, Wang and Guo, 2012).
Renal related morbidity	This causes a notable increase in ED admissions (Knowlton <i>et al.</i> , 2009; Khalaj <i>et al.</i> , 2010; Williams <i>et al.</i> , 2012a; 2012b; Li <i>et al.</i> , 2015; Borg <i>et al.</i> , 2019) as renal health is affected by dehydration and hyperthermia, during extreme heat. This results in an electrolyte and water imbalance and putting strain on the kidneys (Hess <i>et al.</i> , 2009; Li <i>et al.</i> , 2015).
Mental Health (MH) admissions	MH admissions surge during heatwaves (Hess <i>et al.</i> , 2009, Khalaj <i>et al.</i> , 2010; Williams <i>et al.</i> , 2012a; Yoo, <i>et al.</i> 2021), as those with disorders are vulnerable through taking associated medications which affect the thermoregulation process (Khalaj <i>et al.</i> , 2010; Williams <i>et al.</i> , 2012b). Neuroleptic and anticholinergic (antiparkinsonian) medications have a relationship with heat intolerance, causing a supressing effect on the thermoregulatory centre, which leads to anhydrosis (Kravchenko <i>et al.</i> , 2013). In addition, these medications cause cutaneous vasoconstriction, limiting the amount of heat dissipation through convection and radiation (Cusack, de Crespigny and Athanasos, 2011). Yoo <i>et al.</i>

	(2021) and Kubo <i>et al.</i> (2021) also suggest that violence, aggression and self-harm, caused by exacerbations of mental illness, increases the incidence of conflicts and suicide.
Alcohol and opioid use	These can intensify vasodilation, which leads to increased perspiration and adds to further dehydration. Furthermore, alcohol is a potent diuretic resulting in disproportionate fluid loss, further exacerbating the dehydration. The combination of alcohol and opioid use can directly lead to hyperthermia (Cusack, de Crespigny and Athanasos, 2011). Also, as hyperthermic symptoms become manifest in alcohol and opiate users, they become more unable to obtain further supply, causing unplanned acute withdrawal. Alcohol withdrawal can be fatal due to electrolyte and metabolic imbalance, made worse by the heat stress (Cusack, de Crespigny and Athanasos, 2011).
Illicit sympathomimetics (amphetamines, cocaine, MDMA etc.)	<p>These cause an elevation of body temperature and decreased blood flow to the cutaneous layer of the skin. This diminishes heat loss. There is a stimulation of the hypothalamus, activating the hypothalamic-pituitary-adrenal axis, increasing body heat. Coupled with an increase in stimulated muscular activity, these effects result in an increase of body core temperature (Cusack, de Crespigny and Athanasos, 2011). During periods of high temperatures, death from sympathomimetics is more likely (Hess <i>et al.</i>, 2009).</p> <p>These effects can be further exacerbated as mental impairment associated with mental illness and alcohol and opioid use, may affect individuals' perception of how they can adapt and manage with the change in temperature (Khalaj <i>et al.</i>, 2010; Cusack, de Crespigny and Athanasos, 2011). Very often people in this health group are socially isolated and have restricted access to community assistance (Kravchenko <i>et al.</i>, 2013).</p>
Migration of vector-borne and zoonotic diseases	Hess <i>et al.</i> , (2009) and Sorensen <i>et al.</i> , (2020) argue that within the US, climate change could possibly cause disease supporting ecosystems to migrate and introduce unexperienced vector-borne and zoonotic diseases within new environmental regions, which may catch EMS systems unaware. Illnesses like Lyme disease; Hantavirus pulmonary syndrome; plague / dengue fever/ West Nile disease / Rocky Mountain spotted fever; and malaria are some of the examples discussed. This effect could also occur across the globe with similar diseases in other climatically similar conditions.

Air pollutants	Respiratory conditions can be exacerbated and can contribute towards the temperature-mortality relationship (Hess <i>et al.</i> , 2009; Williams <i>et al.</i> , 2012a; 2012b; Sorensen <i>et al.</i> , 2020). Temperature extremes can affect both childhood and adult asthma by affecting asthma triggers such as bacterial and viral infections, or the growth of indoor allergens (Xu <i>et al.</i> , 2013; Kim, Lim and Kim, 2014). Low temperatures are linked to abrupt cooling of the air, which leads to enhanced inflammation of the airways. Cold temperatures also expedite bacterial survival in water droplets and boosts cross infection from indoor crowding (Xu <i>et al.</i> , 2013). High temperatures encourage the growth of indoor allergens and when combined with other air pollutants associated with high temperatures (pollen, mould, ozone, fine particulate matter, etc.) can lead to health vulnerability in summer periods, with risk groups identified as children aged 0-4 years (Schmier and Ebi, 2009; Xu <i>et al.</i> , 2013)
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2.2.4 Risk Groups within the ‘out of hospital’ community

Patients who disproportionately rely on EMS delivery are also vulnerable to the effects of climate change (Hess *et al.*, 2009; Sorensen *et al.*, 2020), although incidents of extreme temperatures cause different risks in different age and genders (Li *et al.*, 2015). From the temperature-morbidity relationships analysed, those over 65 years old were revealed to be a susceptible cluster in most studies (Sorensen *et al.*, 2020). As the body gets older, the organs involved in thermo-regulation deteriorate, leaving older people more vulnerable to high temperatures, especially over sustained temperature durations (Li *et al.*, 2015). When combined with co-morbidities from aging and the medication prescribed for those conditions, the risk increases due to their weakened ability to cope with extreme temperatures (Kim *et al.*, 2012; Li *et al.*, 2015; Uejio *et al.*, 2015). Very young children are also vulnerable to heat fluctuations, as their

regulatory systems have not yet developed, with increased metabolic rates, lesser cardiac output and possibly spend greater time outdoors with few preventative measures (Li *et al.*, 2015; Sorensen *et al.*, 2020).

Kravchenko *et al.* (2013) and Sorensen *et al.* (2020) also highlight that particular subgroups who have limited access to EMS services are also more susceptible to excessively high temperatures. These include urban populaces; outside labourers; some racial and ethnic sub groups (with low socio economic status); individuals with chronic illnesses; or those who are geographically remote (Knowlton *et al.*, 2009; Kravchenko *et al.*, 2013; Li *et al.*, 2015).

Lengthier heatwaves, which are more regular and intense, are anticipated for future decades (Kravchenko *et al.*, 2013). Meteorological services can predict the arrival of a heatwave up to 72 hours in advance with a high degree of reliability and so are an essential component in the implementation of health strategies that incorporate heat wave response plans (Linares and Diaz, 2008; Khalaj *et al.*, 2010; Kim *et al.*, 2012; Bustinza *et al.*, 2013; Kravchenko *et al.*, 2013). Expanded educational programmes for at-risk groups and care givers, public service announcements, air conditioning, and access to cooling centres for high risk groups are the most adopted health protective adaptations that can ameliorate the effects of heatwaves and help save lives (Knowlton *et al.*, 2009; Kim *et al.*, 2012; Kravchenko *et al.*, 2013). Similarly, weather warnings in cold spells with icy or inclement weather can be issued up to 48 hours in advance, offering a window of opportunity to mitigate against possible increased fracture

incidence (Murray Howie and Biant, 2011; Turner, Connell and Tong, 2012).

Public health measures to warn and inform the public can be issued, with local authorities gritting the roads and pavements and local EDs, Minor Injury Units or Trauma Centres can ensure adequate resources are available (Murray Howie and Biant, 2011).

2.2.5 Effect of climate change on Ambulance Services responses and transportations to Emergency Departments

EMS attendance and transportation rates can be a useful indicator used to evaluate the effects of climate change (Bassil *et al.*, 2009; Kim *et al.*, 2012; Wolf, McGregor and Analitis 2014; Li *et al.*, 2015). Evidence shows that there is a clear association between rising temperatures and increased levels of ambulance attendances (Bassil *et al.*, 2011; Williams *et al.*, 2011; Hartz, Brazel and Golden, 2013; Kue and Dyer, 2013; Wolf, McGregor and Analitis, 2014; Li *et al.*, 2015; Graham *et al.*, 2017; Li *et al.*, 2021).

During hot weather conditions in London (UK), for every one degree Celsius increase above a mean temperature of 20 degrees Celsius, evidence shows that the quantity of ambulance call-outs rises by an average of 1% (Thornes, 2014; Mahmood *et al.*, 2017). Sudden and severe falls in temperature have a similar negative effect as for every 1 degree Celsius below a mean temperature of 2 degrees Celsius, Category A performance rate (the most urgent calls) declines by 1.5% (Thornes, 2013; Mahmood *et al.*, 2017). All of these can place considerable logistical strain on EMS, EDs and Disaster Response

Management services, as well as an increase in the economic burden of healthcare organisations, around the world (Hess *et al.*, 2009; Xu *et al.*, 2018; Wondmagegn *et al.*, 2022). Further studies are summarised in Table 2.2.

Table 2.2 Summary of climate change on EMS activity and transportations to EDs

Increased EMS activity
Alessandrini <i>et al.</i> (2011) concluded that in Emilia-Romagna, Italy, with every 1 degree escalation in the average ambient temperature between 25-30° C, ambulance dispatches increased by 1.45% (95% CI, 0.95-1.95) for non-traumatic illnesses and 2.74% (95% CI, 1.34-4.14) for respiratory illnesses. Here they found that the risks increased with age and cardiovascular illness was positively associated with temperature increases.
Bassil <i>et al.</i> (2011) concluded that in Toronto, Canada, with a one degree rise in maximum daily temperature there was a 29% increase in emergency vehicle call-outs for heat related illnesses (p<0.0001) and with a one degree rise in average temperature there was a 32% increase in ambulance call-outs (p<0.0001).
Williams <i>et al.</i> (2011) identified that ambulance attendances can range between a 7% increase at maximum temperatures of 39° C (95% CI 1-13%) and 23% (95% CI 14-33%) across South Australia.
Kim <i>et al.</i> 's (2012) study from seven metropolitan areas of South Korea (representing 47.1% of the total population), where the total daily ambulance calls from 2006-2007 were compared against hourly outdoor temperature and relative humidity meteorological data, reported that there were linear rises in ambulance call-outs for non-traumatic injuries and illnesses with rising temperatures. This increase was 1.95% (95% CI, 1.28-2.62% with every 1° C increase in outdoor temperature, indicating an anticipated 50% proliferation in ambulance call-outs from winter to summer in Korea.
Turner, Connell and Tong (2012) found statistically significant relationships between average temperatures and ambulance response calls in Brisbane, Australia. Acute heat effects were prevalent with a 1.17% (95% CI, 0.86% to 1.48%) rise in total ambulance calls for every one degree C increase above the threshold temperature, with an additional 18.8% increase in ambulance attendances throughout the three heatwaves in the study. Cold effects also caused increases in activity for EMS but were more delayed with a 1.30% (95% CI, 0.87% to 1.73%) increase in total ambulance attendances for every 1° C decrease below the threshold.

<p>Williams <i>et al.</i> (2012a) identified that with ambulance response call outs in relation to temperature in Adelaide, Australia, a 10° C increase (in normal maximum temperature) was related with a 4.9% rise in activity (IRR 1.049: 95% CI, 1.027-1.072).</p>
<p>Hartz, Brazel and Golden's (2013) comparative climate analysis between the cities of Phoenix (hot and arid) with Chicago (more temperate) revealed that in both cities, the number of heat related dispatches climbed quickly with progressively hot or humid situations. Phoenix had more patients who requested an ambulance attendance and treatment for heat-associated illness, than Chicago, during the four years within the study, because of the consistently high ambient temperatures. Yet Chicago, despite having a shorter hot season, was subjected to several significant peaks in temperature, away from the expected norm, resulting in much higher demand than Phoenix over smaller periods. So the increased demand was described as "persistence in Phoenix" and "sporadic intensity in Chicago".</p>
<p>Kue and Dyer (2013) identified that in Boston, data obtained over a five year period from 2006-2010 identified that there were significant increases in ambulance calls (9.7%) and transportation to ED (24.8%) on heatwave days specifically with temperatures above 32.2° C, with no significant differences for various call types apart from 'heat related' presentations. There was no noticeable difference between weekdays or weekends.</p>
<p>Turner <i>et al.</i> (2013) reported that in Brisbane, activity rose by 50.6% (95% CI, 32.3%-71.4%) for a 9.5° C increase over a reference temperature of 29° C, with significant increases in respiratory and cardiovascular conditions in those aged over 65 years.</p>
<p>Thornes <i>et al.</i> (2014) identified that in the UK heatwave of 2003, in Birmingham, UK, there was a positive linear relationship between the quantity of emergency call-outs and daily maximum temperatures. During the hottest day, where temperatures reached 33 degrees C there was a 35% increase in emergency calls. With colder temperatures and more adverse weather, it was found that in the December months of 2009 and 2010 there was a 20% increase in activity. There was also a greater lag in patient need for ambulances in winter, than there was in summer, extending the increased activity period for weeks instead of days.</p>
<p>Increased transportations to ED</p>
<p>Williams <i>et al.</i> (2012a) reported a 3.4% increase in MH related ED admissions (IRR 1.034: 95% CI 1.009-1.059).</p>
<p>Khalaj <i>et al.</i>, (2010) estimated increases in ED admissions in New South Wales, Australia, for primary diagnosis fluctuating from 7% (for MH disorders) to 590% (for heat related injuries).</p>

Increased activity extends the key performance indicator of response times. It also excessively adds to the quantity of calls and ED admissions an already overstretched and financially constrained EMS system has to deal with. (Cusack, de Crespigny and Athenasos, 2011; Kue and Dyer, 2013; Thornes *et al.*, 2014; Toloo *et al.*, 2015). Coupled with congestion at EDs due to an increased number of patients self-presenting at the hospital, this has the combined effect of longer 'hand over' times before the resource can be available for responding again. Each additional journey is adding to the vehicle emissions polluting the environment, where ambulance emission factors are estimated to be 0.40kg CO₂e per kilometre travelled (Kloot *et al.*, 2020). In Nottinghamshire, in the UK, Sheldon *et al.*, (2011) calculated that the average CO₂e emission rate for a patient who was not transported to hospital was 2.5kg CO₂e and those that were transported, 3.7kg CO₂e.

From sources identified in the SLR, the average cost per emergency incident attended by the ambulance service in the UK was estimated to be between £200 and £230 (Thornes *et al.*, 2014) and in Australia it was between \$485 and \$747 (Brown *et al.*, 2013) . The average cost of an ambulance call out in the UK is more recently estimated to be £267, around £33 for each person in England (NHS England, 2018b). When commissioned budgets stay the same or lessened due to austerity measures, but responses increase, maintaining services will be extremely fiscally challenging. Increased activity reduces the overall cost effectiveness of EMS delivery within the finite financial budgets for which they are allocated.

Advances in real time surveillance for weather and health warnings can help ambulance services to invoke contingency measures and adapt to inclement weather conditions and heat waves (Turner, Connell and Tong, 2012, Kue and Dyer, 2013; Li *et al.*, 2015; Sorensen *et al.*, 2020; Ranadive *et al.*, 2021). As morbidity occurs before mortality, the development of response plans for increased call volumes and knowing the pattern of patient presentations, could help with raising public health awareness and improve how resources are dispatched (Li *et al.*, 2015). For the UK ASTs, winter resilience actions like fitting winter tyres, increased use of 4 wheel drive vehicles and rostering additional crews, could help to avoid the effect on extended response times (Thornes *et al.*, 2014). With heatwaves, health advice and additional resource planning can mitigate the increased activity of additional call outs (Turner, Connell and Tong, 2012; 2012, Kue and Dyer, 2013). Within England, the United Kingdom Health Security Agency (UKHSA) already routinely monitors data from concurrent syndromic surveillance systems, including calls to NHS 111, emergency department attendances, GP in and out of hours (on a working weekday basis) consultations, for the impact of heat-related morbidity as part of the UK Heat-Wave Plan (UKSHA, 2022). This provides pre-alerts for heatwave readiness and cascades alerts for the prevention of the main avoidable effects on health during periods of severe heat.

Overall, there is a convincing amount of evidence that indicates climate change is having a worsening effect on morbidity and mortality. Effectively, EMS providers are not only working harder due to increased demand, but also the additional patient numbers, compromises the maintenance of response time

targets and the subsequent ambulance journeys are adding more carbon emissions to the atmosphere, which leads to a need to comprehend more about how EMS practice itself, is contributing to total CO₂e levels. This is further explored in Theme 3 (section 2.4).

2.3 Theme 2: What are the challenges with implementing sustainable practices within EMS? (Strategy)

The publications that related to strategy (n=15) combine the attempts at mapping the total energy use and CO₂e emissions of trans-global ambulance services and identifying where the majority of activity in service delivery contributes towards these totals. These can be found in the table showing publications reporting sustainability strategy or policy for EMS delivery (Appendix 4).

Brown *et al.* (2012b) outlines that greenhouse gas emissions (GHG) have traditionally been classified by their scope or tier. These are summarised in Table 2.3 below and are consistent with the definitions offered by the World Business Council for Sustainable Development (2015) outlined in Chapter one.

EMS activities are integral to the maintenance of health in the community and emergency access to wider healthcare facilities. Blanchard and Brown (2011) estimated that nearly 20 million ambulance transports occur each year in the US and Mahmood *et al.* (2017) estimated that there are more than 9 million

emergency calls per year in England (UK). Management of energy use and its concomitant carbon footprint are vital to the overall sustainability of EMS operations (Brown and Blanchard, 2015).

Table 2.3 Classification of GHG by scope or tier (Brown *et al.*, 2012b)

Tier / Scope	
1	Emissions from direct energy consumption (e.g. fuel use)
2	Emissions from indirect sources - purchased energy or utilities (e.g. electricity and travel on commercial carriers)
3	Emissions that arise from a product's 'upstream' or 'downstream' production and waste disposal processes (e.g. procurement and transportation costs of resources)
'Complete Life cycle'	Total of tiers / scopes 1; 2 and 3

Following a 2009 proof of concept study, where Blanchard and Brown evaluated the energy consumption data and calculated the carbon footprint of a convenience sample of two North American EMS systems, a much larger study involving 15 diverse EMS systems was completed in 2011 to assess tier 1 and 2 emissions (Blanchard and Brown, 2009, Blanchard and Brown, 2011).

Collectively, this larger sample had a combined annual emergency response total of 554,040, served a population of 6.3 million and had a variety of fixed station and dynamically deployed systems in place. Overall, it was calculated that during the fiscal or calendar year of 2008, emissions for the reported

energy consumption totalled 21,289 tCO₂e, with approximately 75% from diesel and gasoline use; 12.82% from electricity; 5.73% from natural gas; 6.25% from aviation fuel use (air ambulances); and air travel 0.12% (Blanchard and Brown, 2011). Blanchard and Brown (2011) state that there were only 10 of the sample which could provide complete data sets for all energy consumed for ground EMS operations. The population served by the 10 organisations was 4,921,726 with a combined response call out total of 409,446. The tier 2 carbon emissions for these systems were 13,890 tCO₂e, but gasoline and diesel still remained the primary source (71.6%) with electricity (19.5%) and natural gas (8.7%) adding to the tariff. Median emissions for each resident in this sample were 7.8 pounds (3.54kg) CO₂e per resident (4.7-11.2) and median emissions for each response was 80.7 pounds (36.6kg) CO₂e (65.1-106.5). When the calculations were applied to the whole of the US population and EMS systems, at that time, emissions were estimated to be between 660,000 – 1.6 million tCO₂e each year (Brown and Blanchard, 2012).

There were two organisations in the sample which reported aviation fuel consumption related to medical air services. Overall, 139,098 gallons was used producing 1,331 tCO₂e. This was through 1,225 transports within a population of 4.4million. In comparison to ground services, each transport emitted 2,395 pounds (1086kg) CO₂e and 0.7 pounds (3.54kg) CO₂e per resident, implying that even though they have higher emissions per response, they have low emissions per capita (Blanchard and Brown, 2011).

Brown and Blanchard (2015) continued to explore the life cycle requirements of EMS systems in the US. By analysing input-output based energy requirement multipliers for the annual budgets of a random sample of 19 metropolitan or county-wide EMS systems, they could approximate the national EMS requirements and major areas where energy was being used. Total US EMS-related energy requirements were assessed to be 30 to 60 petajoules (A petajoule is a quadrillion (one followed by 15 zeros — a million billion) annually. Scope 1 energy consumption, principally vehicle fuels as well as natural gas and heating oil, was responsible for 49% of all EMS-related energy demands. The scope 2 energy supply containing electricity use and the scope 3 energy needed to produce and dispense liquid fuels and natural gas was responsible for 18% of EMS energy needs. Scope 3 energy consumption within the resources supply chain was responsible for 33% of EMS energy needs and within this, vehicle acquisitions, leasing, upkeep, and repair were the greatest energy-intense constituents of the non-energy EMS supply chain (23%), closely shadowed by medical materials and clinical apparatus (21%). No similar research was found mapping the UK EMS energy requirement, however it does indicate that EMS systems are energy intensive and vulnerable to energy shortages and price fluctuations.

Hess and Greenberg's (2011) study to characterise the fuel usage within a large hospital centred EMS organisation in 2007-2008, showed that the mean mileage was 6.89 (95% CI, 6.71-7.08) miles per gallon (mpg) with a range of 3.7-15.0 mpg. An average of 11.5 (95% CI, 10.4-12.6) miles was travelled per call and 16.2 (95% CI, 14.8-17.6) miles per transport of patient. They, and

Linstadt *et al.*, (2020), noted that other variables could affect mileage and fuel use such as vehicle type; driver behaviour, engine idling, movement between base to post ('standby' positions) and post to post, which could introduce systematic bias that leads to mileage underestimation.

A comparable assessment was also made with Australian ambulance services using scope 1 and 2 assessments (outlined in Table 1.1). From a convenience sample of three EMS systems from four Australian states or territories, serving 58% of the national population, Brown *et al.* (2012b) reported emissions of 35kg CO₂e per ambulance response or 48kg CO₂e per patient transport and 5kg Co₂e per capita. The Australian state and territory based ground and air ambulance operations (scope 1 and 2 total) were estimated at 110,000-120,000 tCo₂e each year. The study also noted that air ambulance operation emissions were nearly 200 times greater than ground operations. When the air ambulance transportation and fuel consumption was eliminated and figures applied to ground operations only, these reduced to 22kg Co₂e per response, 30kg CO₂e per patient transport and 3kg Co₂e per capita. From these ground activities, 58% of emissions were attributed to diesel and petrol consumption, with electricity contributing 41% (Brown *et al.*, 2012b).

The Australian study showed that per response emissions are considerably lower than North American EMS operations and the contribution of tier 1 fuel use is lower than their North American counterparts. This is possibly due to inconsistencies in geographical distributions of populaces, variances in per

capita ambulance use rates, discrepancies in vehicle chassis weight and enhanced efficiencies associated with centralisation of EMS operations (Brown *et al.*, 2012b).

In a later study which estimated the 'complete life cycle' of GHG, Brown *et al.* (2012a) calculated the range of total emissions of Australian ambulance services to be from 216,369 – 546, 688 tCO₂e or 62-156 kgCO₂e for each ambulance response (averaging at 389,315 tCO₂e and 111 kg CO₂e per response). This is an estimated average of 3.2% (1.8-4.4%) of all Australian health sector emissions and highly disproportionate as a contributor. Fuel use accounted for 20% of emissions, 22% from electricity consumption and 58% from supply chain and waste disposal processes (Brown *et al.*, 2012a).

Another challenge to reducing the carbon footprint of EMS organisations is within the way in which new service models are introduced, where better patient treatment outcomes are counter balanced against fewer centres that can provide the service, thus increasing transportation distances. This was highlighted in a UK study by Zander *et al.* (2011) who estimated a change in carbon emissions with an alteration in how acute ST elevation myocardial infarctions (STEMIs) are managed. They calculated that when treating a patient under the thrombolysis model and transporting to the closest care point, average mileage was 13km. But when the primary percutaneous coronary intervention treatment model was adopted, this mileage increased to 42.2km, producing an extra 7.7kg CO₂e emissions per patient journey (Zander *et al.*,

2011). This also does not take into account extra emissions from visiting relative journeys, the patients' journey returning home or any subsequent hospital appointments. The one journey alone more than triples carbon emissions and opens a wider debate about carbon accounting and environmental impact before applying any policy change due to new interventions, centralisation or specialisation of services. These measures were also reinforced by Linstadt *et al.*, (2020), who added that better technology use could also include telemedicine, alongside a wider use of 'see and treat' strategies within the peripatetic environment.

Modernisation presents both opportunities and threats to the carbon reduction agenda. EMS organisations are vulnerable to both petroleum fuel and energy supply shifts, and whilst short term fluctuations have been manageable in the past, longer term deterioration in fuel supply will challenge operational delivery (Hess *et al.*, 2011; Brown and Blanchard, 2015; Jacobius, 2022). This highlights a need to move towards an adaptive management approach to move away from petroleum dependency and shift towards alternative fuel sources. Percival (2019) recognised this as part of YAS' ambition to shrink their vehicle fleet's emissions to zero, without affecting the provision of quality care. They are aiming to cut the fleet's current CO₂e emissions by 50% before 2030, which is an 8,000 tonne reduction in CO₂e. Percival (2019) acknowledged that this has to be achieved through more than just mileage reduction, and that alternative fuel vehicles are a necessity. Through a trial in 2016, of two hydrogen-electric fuelled vehicles within their fleet, it was estimated that four tonnes of CO₂e could be saved annually (2 tonnes CO₂e each). Further trials are ongoing with

the conversion of diesel ambulances to hydrogen, started in 2018, and these vehicles are currently being used as part of the public transport services within the fleet. Percival (2019) added that stand alone electric vehicles (EVs) are more costly to purchase, so would require longer-term business evaluations that analyses and assesses the energy use, leasing and procurement costs across their lifespan. All of these strategies are relatively new and so further consideration on the refuelling or recharging infrastructure is an associated strategic implication. One which may not yet be suitably ready for a large scale change to alternative fuels for emergency vehicles (Percival, 2019).

Bali and Flesher (2020) conducted a SLR of 40 papers (from 2914 papers identified) to establish if patient care quality could be maintained if carbon reduction strategies were implemented in EDs. They concluded that none of the relevant papers contained any data or observation of interventions made clinically or environmentally with the intention of reducing greenhouse gas emissions, nor were there any papers that explored how effective they were. A similar experience was found throughout this phase one literature review. Despite there being commentary papers on how a 'call to arms' was needed to initiate change, much further research was needed on carbon reduction interventions being empirically trialled and evaluated. Some papers, however, did capture some thoughtful insights into how strategic policy needed to target key areas, especially around waste, procurement and energy use.

Nichols and Allum (2015) and Linstadt *et al.*, (2020) have highlighted the need to tackle waste management and disposal in EMS practice, as it is costly and very often requires a need for behavioural change to ensure that waste segregation is effective and follows strategic healthcare policy (which is discussed in further detail in Theme 4 (section 2.6). Better supply chain purchasing at the point of procurement can minimise inappropriate packaging and ascertain alternative products, which reduce scope three emissions (Linstadt *et al.*, 2020). Much of the waste in EMS practice is disposed of into inappropriate waste streams, resulting in high proportions of unnecessary items being incinerated or going to landfill, which attracts a much higher cost per tonne, than domestic and recycling waste streams (Linstadt *et al.*, 2020). Kaplan *et al.*, (2012) suggests that a reduction of waste, effective segregation, reuse and recycling might create savings of approximately 40 cents (or 32 English pence) per patient day. In England and Wales (UK), through improved waste management, the NHS could cut around 42,000 tonnes of CO₂e every year, saving a huge amount of money, but also reducing emissions at the same time (SDU 2009; NHS England and NHS Improvement, 2020).

Nicholas *et al.*, (2021) emphasise that the inter-disciplinary teams that work in EMS delivery, have a role to play with the leadership for implementing sustainability changes as well as providing the constant climate related thinking within practice. They offer a teaching framework mnemonic called 'A CLIMATE', which allows clinicians and practitioners to uncover climate-related challenges within their practice, whilst still maintaining quality care provision (Figure 2.2). It

is designed to guide individuals through a care encounter through a lens of climate change and its effect on healthiness and well-being.

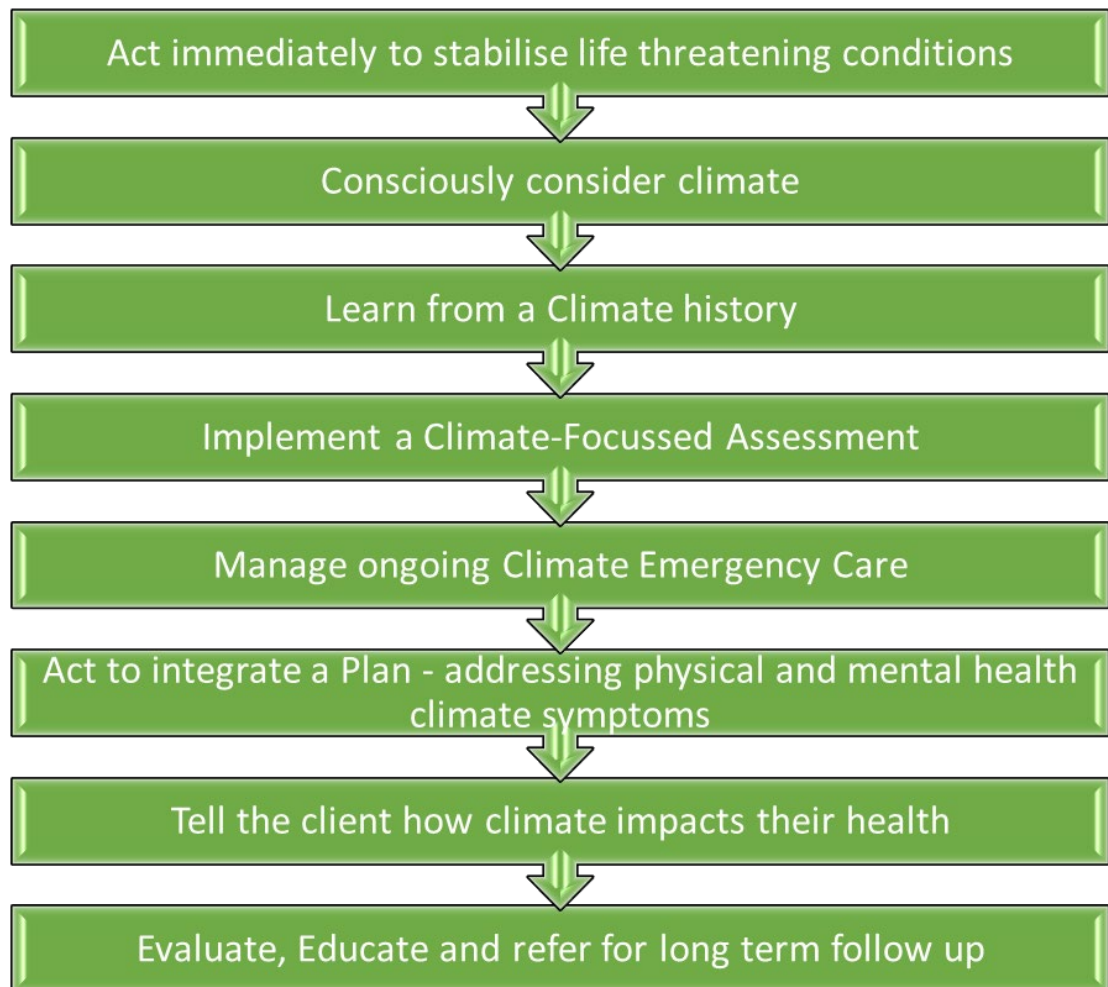


Figure 2.2 'A CLIMATE' mnemonic and teaching framework (adapted from Nicholas *et al.*, 2021, with permission from Elsevier)

A CLIMATE incorporates consideration of the health impacts of climate change within the specific geographical regions of practice, an appreciation of climate change history with its relationship to care, and an interaction between clinician and patient on how climate change may have affected their health. Strategic change involves implementing and evaluating carbon reduction initiatives, so

this leads to theme 3 (section 2.4) the theme which enables understanding, from the literature, of what actions or interventions have been applied within EMS delivery as part of controlling their carbon footprint.

2.4 Theme 3: What sustainability practice or interventions have been applied to reducing carbon footprint of EMS practice? (Actions)

The dearth of publications that related to interventions or sustainability initiatives (n=7), incorporate discussion around the use of electric or hybrid vehicles and alternative fuel sources. A table showing these publications can be found in Appendix 5.

Most EMS systems have 24-hour coverage, for 365 days of the year, which implies extensive service delivery durations (NHS England, 2018b). This requires robustness in vehicle reliability, high performing engines that can function effectively without warming, and consistency in all weathers and temperature. Over the past decade, ambulance chassis weights have been getting heavier due to the additional loading from manual handling ramps and tail lifts, along with additional paramedical equipment (Harmer and Hignett, 2018). Heavier chassis weights mean a reduced fuel efficiency and increased running costs. Often, the driving patterns during emergency responses correlate with the poorest fuel efficiency, with rapid starting and stopping, high speeds and extended idling (Hawkins, 2008). As discussed in the previous section, as fossil fuel prices rise, the logical step is to reduce consumption, adapt to alternative fuel sources for vehicles, or supplementing fuel use with recycled

energy. However, these low carbon options must become a feasible and attractive option (Baker *et al.*, 2013; Harmer and Hignett, 2018).

From the international literature, Siddique *et al.* (2013) and Tarek *et al.* (2016) discuss the use of solar powered Rickshaw ambulances in Bangladesh. As access to mains electricity is limited (around 53% of the population) and the Bangladeshi road infrastructure is mostly rural (87,316 villages), the government banned electrically assisted vehicles due to overconsumption of power from the national grid (Siddique *et al.*, 2013; Tarek *et al.*, 2016). So, the charging of electric ambulances is not yet an option for their EMS fleet. As such, they have been experimenting with renewable energy sources, with one option being solar energy. A proposal being trialled is the solar power-based Rickshaw that is non-polluting, silent and appropriate for use in both urban and rural regions, of Bangladesh, as it has a combined powered and manual application (Figures 2.3 and 2.4) (Siddique *et al.*, 2013).

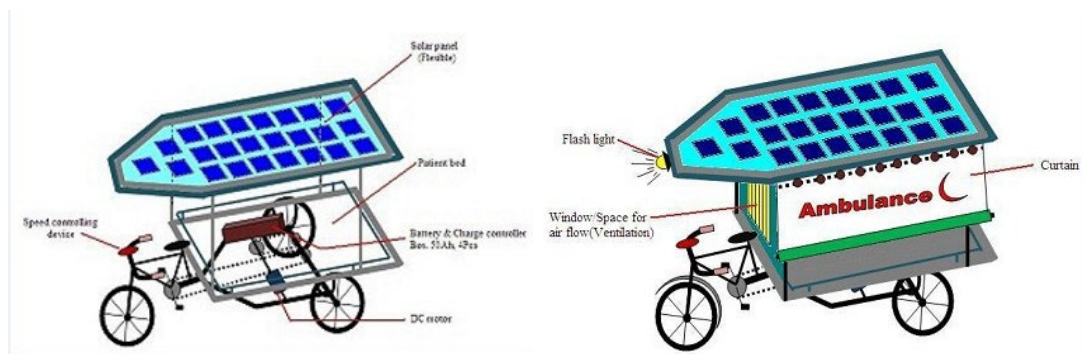


Figure 2.3 Solar based Rickshaw for rural areas in Bangladesh (Siddique *et al.*, 2013) Permission to reproduce this extract has been granted by © 2013, IEEE



Figure 2.4 Solar Electric Ambulance Van (Tarek *et al.*, 2016)
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Many of the rural areas cannot afford petroleum fuel, so rely on manually driven rickshaw ambulances. As the solar powered motor adds three to four times more speed during an emergency situation, as well as better range of travel, this bridges the gap between manually pedalled and fossil fuelled engines, which is cleaner and more cost effective (Siddique *et al.*, 2013). Whilst this initiative may be suitable for the locale of Bangladesh and similar environmental areas, the operational range and limited speed (average speed of 15-20 km/hr) are not very suitable for transferability to a wider global use, where average speeds of an ambulance need to be much higher (40-50 km/hr) (Siddique *et al.*, 2013).

The GrEAN (2012) is a collective dedicated to reducing CO₂e emissions for ASTs in the UK. It also investigated EV technology, aerodynamic advances, weights and efficiencies of vehicles and Eco-driving (Hawkins, 2008, Baker *et*

al., 2013). Countrywide, the UK AST fleet has over 5000 vehicles (3,200 ambulances and 1500 RRVs) with the average ambulance travelling around 50,000 miles annually (Lord Carter of Coles, 2018; Sheldon and Hill, 2019). Adapting driving behaviours could save up to £1.5 million, through reduced fuel use, less accidents and lower maintenance needs (Baker *et al.*, 2013; Harmer and Hignett, 2018).

Furthermore, Hawkins (2008) raised the question of whether hybrid vehicles represent the future of vehicle procurement after a 27-month trial of a Ford Escape Hybrid 4WD for EMS operations in North Carolina, US, during 2005-2007. The study utilised a medium sized SUV for providing an initial EMS response car rather than for patient transportation. The study evaluated the cargo storage; power supply for supplementary electrical needs (lights and sirens); fuel efficiency; reliability within a rugged EMS environment; and its economic viability. As it was also being used for wilderness responses, a four wheel drive was acquired (Hawkins, 2008).

The trial concluded that hybrid electric-gasoline vehicles may be suitable for EMS vehicles in some operational environments. By using a combination engine of both electric (through kinetic energy generation from braking) and diesel, fuel efficiency was calculated at 25mpg in the city and 27mpg on highways. Hawkins also commented that this type of vehicle could be 5-18% less to purchase, operated at half the annual fuel costs and emitted approximately 50% less carbon emissions. The engine was able to idle on

electric mode, which was quieter when attending an emergency, especially at night, and caused no fumes or pollution for those in the proximity of the scene. However, this needed to be balanced against less load carrying capacity; lesser towing ability and limited speeds over 40mph (which then converted to diesel use) (Hawkins, 2008). This was also the view of Blanchard and Brown (2011), Brown *et al.* (2012a) and Lord Carter of Coles (2018), who all advocated that hybrid engines were a longer-term prospect to purely diesel or petrol engines.

Baker *et al.* (2013) completed a proof of concept study to investigate the viability of introducing Future Electric Vehicles for Ambulances (FEVA). These are low carbon EVs for solo responder use in ambulance fleets. A mobile mock up vehicle was shown to five ASTs in England and commentary data was obtained from solo responders, Emergency Care Practitioners (ECPs), Paramedics, Operations Managers (OMs) and affiliates of the GrEAN committee. The concept was positively received, however there were several issues raised. Notably there was the limitation of range (distance on a single full charge) where the Nissan Leaf model upon which the study was based, had a variable performance of 70-130 miles dependent on driving patterns and environmental conditions, despite the maximum speed of 90mph. There were also concerns with the slow charging between responses (quick charge times of 10-30mins) and limited infrastructure for re-charging and the investment needed for installation of charging points at stations, hospitals and standby locations. This gave it limited capability in rural areas, but suited more to urban areas, small communities where daily distances are smaller, or to specific events, where once arrived at a destination, it remained as a static on site treatment

area. So, whilst it may not perform to the full expectations of an emergency response vehicle, it still has the potential for non-emergency use and personnel commuting (Hawkins, 2008, Baker *et al.*, 2013). Undoubtedly, the use of electric RRVs would reduce the dependency on fossil fuels and reducing carbon emissions. Both the East Midlands Ambulance Service NHS Trust (EMAS) and NAST have been involved in a trial of electric RRVs in their fleet, with the latter predicting a saving of £2.5 million for each car over a four year time span due to savings on fuel purchase and lowered maintenance costs (Sheldon and Hill, 2019).

ASTs appear to acknowledge the requirement to reduce CO₂e emissions within ambulance fleets (Percival, 2019) but there is reticence because of the purchase cost and ancillary equipment (battery technology) needed to adapt to EMS use. When the reliability, range and performance of EVs becomes analogous with current petrol or diesel engines, then there may be much stronger interest from strategic managers.

The debate on biofuels highlights a dichotomy dilemma on its practicalities. Whilst it appears attractive as an alternative to fossil fuels and conversion for a diesel engine is relatively straightforward and achievable for most EMS fleets, there are issues over its regional availability, effect on engine warranties and disproportionate land use for growing and refining fuel sources (Hawkins, 2008, Brown *et al.*, 2012a). Most commercial biofuels are made from soya beans or rapeseed and requires intensive farming. Biofuels can be available in different

concentrations from 5%-50% but in order to retain the manufacturer's warranty, only the lowest concentrations are deemed suitable (Hawkins, 2008). Trials in engines that have re-used restaurant grease have shown that it is labour intensive and voids warranties (Hawkins, 2008).

Harmer and Hignett (2018) promote the ethos of dispatching the right response to the right patient at the right time, by advocating better use of vehicles upon receipt of the patient making a 999 call. Not all patients need a vehicular response and can be managed through hear and treat services (such as the 111 service, telephone consultations or telemedicine). Some patients require a Paramedic in attendance, but not transportation to hospital (treat at scene) so a rapid response vehicle car (RRV) (Hawkins, 2008), motorcycle (Nakstad, 2009) or cycle Paramedic (Reed, 2013) can be dispatched rather than an ambulance. Those patients that do require transportation to definitive care, may not necessarily need to go to an ED, but can be taken to a more local Minor Injury Unit or primary care settings.

Following five stakeholder consultations with two AST fleet managers, a manager of a vehicle conversion company, an experienced operational Paramedic and the head of the Ultra-light Vehicle Research Group, Harmer and Hignett (2018) could make some recommendations for future fleet development. Ideal future doubled crewed ambulances (DCAs) were seen as being lighter and faster, using a complete superlight composite construction for ambulance cab conversions and the tail ramps, to lessen overall weight and improve driving

features. There were also recommendations for fast response vehicles (FRVs) (Figure 2.5) to provide more see and treat capacity, but remain small enough to cope with urban congestion and difficult access scenarios.

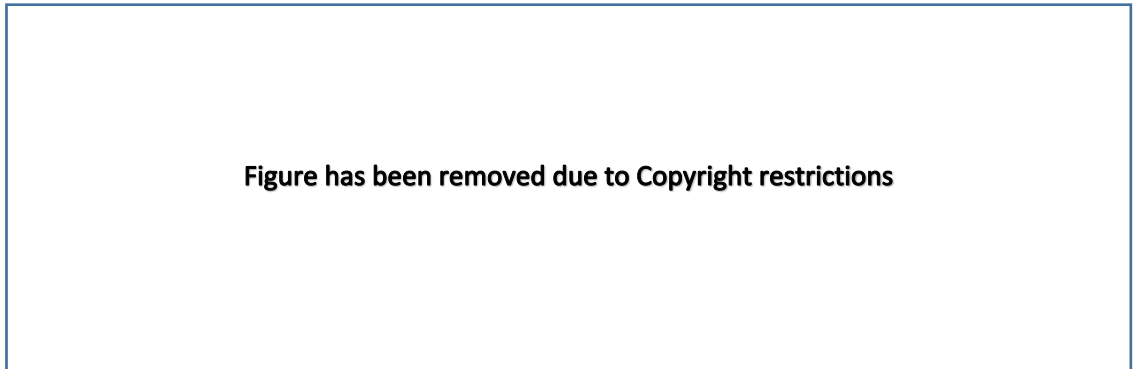


Figure 2.5 Agile Fast response Vehicle (FRV) (Harmer and Hignett, 2018)

These would be solo manned with the agility of a motorcycle and can avoid sending a DCA with a much higher fuel consumption. These could be supported with versatile RRVs to provide more options for treating at the scene, but also have the capacity to transport more mobile patients (without being supine) (Figures 2.6 and 2.7). These vehicles could also be dual manned, but be a lighter smaller version of a DCA.

Harmer and Hignett (2018) then evaluated these recommended concepts through a Likert-scale, online questionnaire sent to four UK ASTs, which was then followed up with telephone interviews for additional qualitative data. The qualitative and quantitative data were consistent in its results as were the conclusions drawn from. Despite a low interview response rate (n=8) half of the

respondents believed that the Agile FRV would be a beneficial addition to the fleet, as it would be faster in congested areas and save on fuel, concerns were raised with driving safety and comfort.

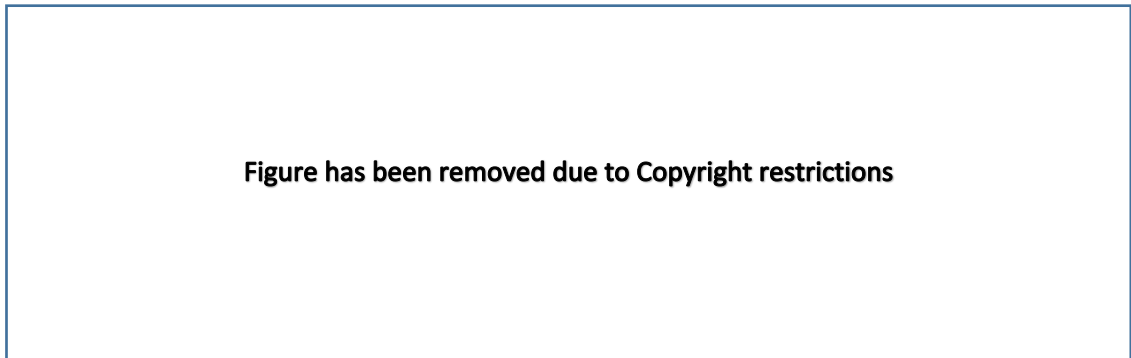


Figure 2.6 Versatile Rapid Response Vehicle (RRV) (Harmer and Hignett, 2018)

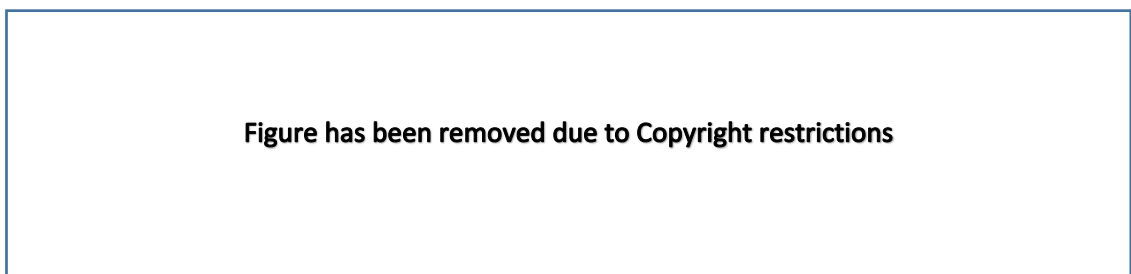


Figure 2.7 Versatile RRV, side access (Harmer and Hignett, 2018)

Clinicians were more positive with the versatile RRV, as it offered patient privacy and some ability to transport patients, but again concerns were raised with the risk of deterioration of patients during transit and the ability to manage them in a sitting position. There were also the fleet managers' concerns that the financial cost of the vehicle may not deliver the returns that a DCA van

conversion would. The respondents felt that the best concept was the superlight DCA conversion, which would offer the best flexibility with service provision and patient comfort (Harmer and Hignett, 2018).

Staff attitudes, satisfaction and willingness towards adopting new changes are an important aspect to carbon reduction strategies (NHS England and NHS Improvement, 2020), so opinions of the workforce are a key factor in determining what can work or should work. The main challenge therefore, is to design an operational vehicle that can respond as an ambulance, offer good value, diminish emissions and provides high quality (Sheldon and Hill, 2019). Respondents to Harmer and Hignett's (2018) survey had prioritised that they want more fuel efficient DCAs and alternatives to patient transportation with better promotion of see and treat services. They also advocated simpler strategies which were changes to the service delivery model (or response dispatch system) to avoid vehicles not being 'stood down' from initially triaged Category A calls and vehicle engines not being left running or idling whilst waiting at standby locations.

Sheldon and Hill (2019) scoped ambulance emissions and although their literature review only included five eligible international papers from their search strategy, it revealed that CO₂e emissions per ambulance response varies between 22kg CO₂e and 36.6kg per journey. This is due to the wide variation in makes and models, the driving style adopted, weather conditions, traffic conditions, as well as the geographical distances travelled in each country (with

the US and Australia having remote rural communities). An average of 31.3kg CO₂e per journey was calculated from all of the average data included. So even small reductions in this figure could make a large impact nationally and globally. Williamson (2011) reported that engine idling accounted for 65% of every 12-hour shift, using 0.9 litres of fuel per hour, simply to keep the auxiliary equipment fully charged. Use of interventions such as plug in points at standby locations and EDs for charging equipment batteries used in the rear of ambulances can reduce fuel use and carbon emissions. By having vehicle data monitoring systems, real time data could provide information on staff eco driving ability and fuel efficiency, reducing expenditures by up to 14% with ambulances and 22% with RRVs, along with a 20% reduction of maintenance costs (Lord Carter of Coles, 2018; Sheldon and Hill, 2019).

One other measure of note within the literature for reducing fuel consumption for ambulances, were technological trial proposals in radio-frequency automated traffic signal changes for free movement of ambulances (Shankar, Gautham and Ashvarma, 2015). By activating a green signal at traffic light controlled intersections, ambulances can move more freely through traffic, thereby reducing the idling of engines whilst in static traffic. However, there are no further reported results as to the success or feasibility with this mechanism.

The focus in this theme reveals that there has been some consideration of interventions to reduce the fuel burden on EMS organisations, through minimising fuel consumption and exploring alternative fuel sources. Change,

however, involves the human element of adopting these initiatives, so Theme 4 (section 2.5) below, explores the attitudes and behaviour of EMS personnel when they consider climate change.

2.5 Theme 4: What opportunities exist for changing attitudes and behaviours in relation to better sustainable practices in EMS delivery? (Psychological)

The publications that related to attitudes and behaviour (n=16) mostly centre on biomedical waste management and guidance for carbon reduction in healthcare. They also outline the importance of knowledge, awareness and willingness of employees in adopting strategies for change. A table showing these publications can be found in Appendix 6. Some of these 16 papers, however, may be considered as tenuously linked to EMS delivery as they either mention 'paramedical workers' (Gupta *et al.*, 2009; Sumi, 2010; Shafee, Kasturwar and Nirupama, 2010; Ahmad *et al.*, 2015; Kumar, Somrongthong and Shaikh, 2015; Singh, Sood and Bhardwaj, 2015; Kumar *et al.*, 2018; Kalia *et al.*, 2020; Alvi *et al.*, 2021) or are based in 'Non-Hospital Emergency Units' (Pereira *et al.*, 2013). In order not to eliminate these from the discussion, the definition of 'paramedical workers' have been interpreted in the same way as a UK definition of a paramedical worker and not as an ancillary member of hospital staff. Some also have reliability questions raised in their methodological approach and reporting, but do make some relevant points on behaviour and attitude to waste generation and disposal, which correlate to UK practice. These were critically appraised in the following discussion.

Negligence with biomedical waste (BMW) management contributes towards pollution, affects health and depletes natural and financial resources (Gupta *et al.*, 2009; Nichols and Allum, 2015). Healthcare workers have a duty of care for the safe working practices around patient care as well as to the environment (Gupta *et al.*, 2009). BMW generated within practice comprised of sharps; human tissue or human body parts; toxic, chemical or radiological waste; pharmaceutical products; infectious materials; or hazardous products; each with their own colour coded waste stream, according to each country's healthcare policy (WHO, 2018). The objectives of effective BMW management is to reduce the generation of waste to begin with, safe handling and collection during procedures, and appropriate disposal into the specified waste stream (Kalia *et al.*, 2020). Waste generation and decisions taken on its disposal are very much made by human choices, which in turn is driven by attitude, values and behaviour (WHO, 2018). Understanding how waste is handled, allows an insight into the motivation and behavioural actions of the healthcare workforce in adopting sustainable practice.

Sumi's audit and qualitative study published in 2010, was to ascertain whether BMW generated in a private hospital was being segregated and managed properly by staff (including its paramedical workers). They calculated that 610kg of waste was generated per day in the hospital in Delhi, India with 150kg being BMW. The study identified that staff did not always comply with instructions regarding segregation at source, labelling of bags, or maintaining records with 88% of staff having had no training in waste disposal methods. After remedial education and training, non-hazardous waste going into the hazardous waste

stream reduced to 50% after the intervention. Sumi (2010) adds that safe management of waste is more than just providing technology or facilities; it is more of a problem with attitude and ignorance. Successful waste management cannot be realised without the willingness, motivation and cooperation from all healthcare employees (Sumi, 2010). These results and findings may have to be viewed with caution though, as the data gathering methods were not fully explained, limited explanation of statistical application was provided and there was a once only check of procedures, which does have an effect on the reliability of the data and the suppositions made. Shafee, Kasturwar and Nirupama (2010) conducted a proforma-designed survey with 500 participants, during one to one interviews with healthcare staff (including paramedical workers) from 47 randomly selected healthcare centres in Karimnagar town in India. Of the 500 subjects, only 53.2% (n=266) knew about correct application of BMW disposal, however only 14.4% (n=72) had correct knowledge about various methods of disposal of BMW, despite 95.8% (n=479) of participants having knowledge of the various health problems caused by BMW. Overall, Shafee, Kasturwar and Nirupama (2010) concluded that staff lacked the required knowledge of BMW management, recommending regular staff training, monitoring and audit to improve waste habits and ensure policy is followed. This study also had issues with reliability such as an absence of information around data gathering and how its statistical testing was implemented. Also the proforma questionnaire was not available to see how the questions were devised; thus the results might again have to be considered with caution.

Gupta *et al.* (2009) applied a research method similar to Shafee, Kasturwar and Nirupama (2010) within Vivekananda Polyclinic, in India, which included paramedical workers. From their observations, interviews and consultations with the study participants, they found that the Polyclinic was managing BMW effectively and in compliance with local requirements, however this was a 'snapshot' of behaviour at one point in time. Gupta *et al.* (2009), made recommendations including that management should ensure staff have continued refresher training, data compilation for audit purposes should be improved and modern equipment for waste management practice should be acquired. Similar recommendations were drawn by Kalia *et al.*, (2021) who used a cross-sectional study design and pre-prescribed survey questionnaire, conducted through interviews, with an onsite assessment of healthcare staff (including paramedical health workers) in Chandigarh, India. They concluded that there was a gap that existed between knowledge demonstrated and actual observed practice. Again, continuous training, monitoring and audit was needed to ensure compliance with policy.

Three further studies from Pakistan, exploring the relationship of knowledge, attitude and practices of hospital workers (including paramedical staff) (Kumar, Somrongthong and Ahmed, 2016; Kumar *et al.*, 2018; Alvi *et al.*, 2021) had comparable conclusions about the need for targeted training. From a sample of 550 respondents in public hospitals in Gujranwala, Pakistan, Paramedics (n=112 of the sample group) were found to have a much poorer knowledge of hospital waste management than Doctors or Nurses and almost half (46%) of Paramedics even had a negative attitude towards undertaking the required

training on BMW (Alvi *et al.*, 2021). Both of Kumar *et al.*'s (2016) and (2018) studies in Rawalpindi, Pakistan involving a comparison of different healthcare workers and their waste knowledge and behaviours, found a converse difference with Alvi *et al.*'s (2021) results in the comparisons between Paramedics, Doctors and Nurses. They indicated that Paramedics have better knowledge and demonstrated optimal behaviour towards waste management, when compared to Doctors and Nurses.

Pereira *et al.*'s (2013) epidemiological cross-sectional study in three locations in Brazil, observing the generation of waste and waste disposal activity at three non-hospital units and analysed using descriptive statistics, identified that there were systematic failures across all operational stages. Appropriate segregation of waste proved to be the area with most errors, compromising the next stages under evaluation and snowballing the costs and risks to the organisation. Lack of a management plan, resulted in little education in what should be done by employees and a lack of facilities for enabling individuals to do the right thing (Pereira *et al.*, 2013). From the identified 208.189kg of waste per day in Pereira *et al.*'s study, only 10.7% actually represents infectious waste. However, in one week, 361.802kg of common waste (classified in the UK as general or domestic waste) was unnecessarily contaminated by being mixed with infectious or hazardous waste. Additionally, 3.8% of infectious waste and 0.6% of piercing and cutting waste was disposed of as common waste, which then contaminated all of the general waste within that container. Waste that was infectious was also found in areas where it was not traditionally generated, such as coffee rooms and administrative areas, indicating that there were breaches in infection

control recommendations (Pereira *et al.*, 2013). In one week, the three units could have forwarded 639.329kg of common waste for recycling which would not only have been reducing carbon emissions due to the minimized extraction of raw materials, it would also have generated an income (Pereira *et al.*, 2013).

Professionals working at the locations were unaware of correct procedures, chose to ignore them (willing non-compliance) or did not have the appropriate receptacles for disposal. Providing clear and transparent management systems, educating for (and monitoring) staff compliance for waste segregation at the point of generation, along with providing the appropriate facilities, are key steps to optimal waste disposal. Without them, ethical, sustainability behaviours are difficult to nurture and non-compliant attitudes difficult to change (Gupta *et al.*, 2009; Pereira *et al.*, 2013). Similar conclusions were drawn by Shafee, Kasturwar and Nirupama (2010) who found that where staff lacked the required knowledge about biomedical waste management, a positive attitude, education and sharing of good practice amongst technical and non-technical staff may improve the situation. Church, Briggs and Tran (2019) also reinforce this from their reported pilot programme to improve waste management in Australian EDs. A 24-hour audit of medical waste performed across the region's health facilities revealed that only 33-45% of waste was placed in the correct waste stream. Alongside the normal contaminated waste and sharps bins, Church, Briggs and Tran (2019) provided dedicated recycling bins for co-mingled items (rigid plastics, paper, cardboard and aluminium products); soft plastics (soft waste from packaging) and general waste (all other non-contaminated waste). Training and education were provided to staff members for correct segregation

and cleaning staff were instructed to continue the segregation through the contracted disposal service. Estimated savings to be made were in the region of Aus. \$50,000 (£28330) through the correct segregation of waste alone. However, the trial failed due to no further follow up audits and the attitude and behaviour of the staff. Adherence to the new process was impaired by a perception that waste segregation was a time consuming activity in a time-pressured environment, resulting in the belief that their actions would make no difference. In addition, both patients and visitors were confused by the various bins and their use. They were deemed as too small, inadequately labelled and were viewed as 'clutter'. The cleaners were also observed to be re-mixing waste streams to simplify collection.

Poor waste management practice was also a key theme within Hallihan *et al.*'s (2019) appraisal of how Paramedics operated within the rear of an ambulance. By evaluating 48 Canadian EMS teams within an anaphylaxis scenario being transported in a moving ambulance, they frequently observed that Paramedics were throwing waste onto the floor of the ambulance, as well as the adjacent chairs and work surfaces. From the primary seat, occupied by the Paramedic, waste was only placed in the correct receptacle 31% of the time and sharps disposal into designated containers 90% of the time. When they sat in the CPR seat on the opposite side, correct waste disposal happened only 2% of the time and sharps disposal 71% of the time when sat in the airway seat (See Figure 2.8). Some strategies used secondary receptacles such as an emesis bowl to collect waste as an interim measure, due to insufficient access to the designated bin during transit.

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Figure 2.8 The location of the Primary, Airway and CPR seats within a Canadian ambulance (Hallihan *et al.*, 2019)

Some of the behaviours demonstrated may have been affected by time pressures, but most probably due to deficient vehicle design in relation to ergonomics and the placement of the waste facilities. No mention, however, was given towards differences in waste stream facilities or waste segregation being performed. Whilst accessibility of bins and their spatial location are important considerations for vehicle design, decision making behaviours within high acuity work, tend to be driven by intrinsic and extrinsic factors of what is most appropriate within that time and context, even if that means adopting unsafe practice (Simpson *et al.*, 2017).

Overall, this suggests that changing staff attitudes, influencing their values and monitoring behaviours are key to implementing carbon reduction strategies and

sustainability engagement. Without staff investment into sustainability, which includes both the healthcare workforce and healthcare management, the provision of facilities, and regular training are likely to be ineffectual.

Richardson, Allum and Grose (2016) proved that attitudes towards sustainability and climate change can be positively influenced through education. From their pre and post survey of a sustainability teaching session involving resources utilised in EMS delivery and the possible impact of those items on the environment, it was found that undergraduate Paramedic students can be motivated to make positive changes in their practice. Although this was only a small sample size (n=44) in one UK university, so is not generalisable to all undergraduate Paramedic students, it does indicate that if sustainability education is embedded into paramedical curricula prior to qualification and registration, once Paramedics enter practice the organisational culture and sustainability habits may change for the better over time. Schwerdtle *et al.*'s (2020) literature review relating to environmental sustainability and health professional education (including Paramedics) supports this and is reflected in their '12 tips' for embedding sustainability into various curricula. Both Schwerdtle *et al.* (2020) and Anåker *et al.* (2015) conclude that by empowering our future workforce with integrated contemporary knowledge, skills and clinical case studies that provide the link between the systemic global impacts and individual behaviours, we can transition healthcare professionals into adopting the right values, which influence attitudes, which in turn affects behaviour.

Gupta *et al.* (2009) reminds us that there needs to be a balance between effective infection control measures and a sustainability ethos. It should be inherent in every healthcare professional to uphold high professional standards of hygiene, whilst at the same time lessening the impact on ecological pollution and avoiding the depletion of non-renewable assets. Incineration of waste decontaminates and reduces waste volume to 10% but can also be a major source of dioxin and furan pollution, along with metals (lead and mercury) particulates, acid gasses, carbon monoxide and nitrogen oxide (Gupta *et al.*, 2009).

Waste disposal and the RRR philosophy is but one small aspect of carbon reduction planning, but the studies here show there is an important message. Even when management plans are in place, training has been given and facilities are available, there still has to be a concerted effort to establish positive attitudes within healthcare workers towards the sustainability ethos and influence progressive behaviour. Without the cooperation of staff at operational levels, strategic plans are difficult to implement.

2.6 Discussion of findings

Climate change and temperature fluctuations are likely to have an ongoing, evolutionary and magnified effect on EMS activity due to: increased mortality; morbidity; ED presentations; ambulance responses and transportation of patients (Tham *et al.*, 2020; Kranc *et al.*, 2021). Tackling the carbon emissions

created by EMS systems is the first small step towards alleviating the impact of an ever-increasing collective of causes.

A nation's total emissions are calculated from the mass collective, which includes large organisations that are main contributors, relatively low emitting organisations as well as individual members of society. Accordingly, it is extremely important to implement multiple layered and cumulative strategies throughout all strata of society, ranging from incentivising government policy through to influencing adoptive behaviours of individuals towards the green agenda (Brown *et al.*, 2012a). Minimal changes to each ambulance service in the method that those services are managed, the way that vehicles are dispatched and the manner in which staff conduct their daily duties could produce substantial decreases in carbon emissions and reduce overall cost (Blanchard and Brown, 2011, Brown *et al.*, 2012a; 2013). Blanchard and Brown (2011) highlighted from their North American study that a modest 5% reduction in emissions from the sample group would contribute to a fall of more than 1.5 million pounds (47.63 million kg) CO₂e in the atmosphere. They advocated that ground operations should keep emissions below 106.5 pounds (2.95kg) CO₂e per response or 11.2 pounds (5.08kg) CO₂e per resident as a voluntary benchmark. A platform of actions could reduce EMS organisations' carbon emissions over the short to medium term, with further improvements becoming possible as emerging technology develops.

Currently, EMS services are heavily dependent on fossil based liquid fuels (Hess and Greenberg, 2011; Brown *et al.*, 2013; Percival, 2019). Vehicle emissions remain one of the highest contributors to the total CO₂e emissions for EMS organisations (Blanchard and Brown, 2011, Brown *et al.*, 2012a; Percival, 2019). Exhaust fumes are also associated with ill health for both the public and EMS workers. This area provides the greatest opportunity for reduction. Several strategies could be made which are summarised in Box 2.3 (Blanchard and Brown, 2011; Zander *et al.*, 2011; Brown *et al.*, 2012a; Brown *et al.*, 2013). However, more empirical research needs to be produced in order to evaluate the effectiveness of each opportunity listed above, their impact on carbon reduction and improved patient outcomes.

- Reducing unnecessary ambulance responses (using hear and treat methods such as 111 service or telemedicine);
- Revising multiple vehicle responses; altering how vehicles are deployed (flexible response time policies);
- Consideration to which type of vehicle needs to be deployed;
- Decentralisation of resources;
- Sourcing cleaner fuel sources or the use of fuel alternatives;
- Fleet procurement of electric or hybrid vehicles;
- Reduce engine idling; reducing driving speed for non-emergency journeys;
- Improving driving skills;
- Decreasing non-emergency travel for meetings (better use of web conferencing)
- Reducing the number of transported patients by treating them at home or at source (through better clinical ability and adoption of telemedicine)

Box 2.3 Strategies for reducing vehicle emissions (Blanchard and Brown, 2011; Zander *et al.*, 2011; Brown *et al.*, 2012a; Brown *et al.*, 2013).

In a report commissioned by SWASfT, (Mitchell and Norton, 2012) conducted by the Centre for Energy and the Environment at Exeter University, it was highlighted that up to 40% of the fuel consumed by the Trust's ambulances may be attributed to engine idling. The simple provision of field charging points to reduce the reliance on engine idling of emergency ambulances to maintain battery charging of on-board lifesaving equipment, provided the largest scope for emissions reduction (8% or 950 tCO₂e per year) and cost savings around £660,000. Other vehicle improvements considered were choice of vehicle size (as the chassis weight is a major factor on fuel consumption); new tyre and maintenance technologies; getting the right type of vehicle responding to the dynamics of the patient presentation (e.g. a rapid response motorcyclist to treat and discharge patients at home) and behavioural changes to driving which encourages Eco-driving (reduces fuel use by up to 10%). Speed limiters could also be used to enforce even more fuel efficient driving, which can be bypassed for emergency response (Mitchell and Norton, 2012).

Brown *et al*'s studies (2012b; 2013) also noted that air ambulance operation emissions were nearly 200 times greater than ground operations. A logical step for reducing emissions is to limit the use of air ambulances to situations that clearly provide some clinical benefit. Reliance on diesel, petrol and gasoline not only mean that EMS organisations are vulnerable to disruptions of production and procurement; they are also vulnerable to fiscal changes of supply and demand that increase expenditure (Hawkins, 2008; Blanchard and Brown, 2011; Hess and Greenberg, 2011; Brown and Blanchard, 2012). Brown *et al*. (2013) highlighted the link between fluctuations in energy prices and variations

in the resource performance and safety characteristics of Australian EMS systems. As rising fuel prices affect budgetary spending, in response as a rebound effect, the financially squeezed organisations may be prevented from filling vacancies, covering overtime to fill the shortfalls in resource planning, or deploying additional ambulances to meet failing response time targets. Ironically if any form of additional governmental 'carbon tax' was imposed on fuel purchase for EMS systems, this would have an amplified effect on prices, response times and safety. This prompts the need to revise and move away from the way in which EMS systems are performance measured by response times and utilise other key performance indicators that encompass quality of care rather than speed to the patient (Brown *et al.*, 2013).

Reductions in scope 2 energy and utility use can also lower EMS environmental impact. Despite the majority of EMS activity providing predominantly peripatetic and mobile delivery, there are static positions of real estate for administrative offices and also main base stations for housing vehicles and ambulance staff. This provides a significant opportunity to implement approaches that monitor and reduce baseload energy consumption. 'Greener' electricity sources could be procured (Brown *et al.*, 2012a) and energy efficient behaviours could be adopted in organisational buildings and offices (Mitchell and Norton, 2012). Technology for rapid 'kill switches' also exist, which turns off all unnecessary appliances and lights, while still maintaining essential items for charging, when exiting a station on an emergency activation. These could be used effectively without disrupting response times. Upgrades to building fabric and services,

with on site-renewable energy generation can yield savings in the longer term (Mitchell and Norton, 2012).

Supply chain emissions also need to be considered when procuring and disposing of resources needed for EMS delivery. This includes consideration of distance travelled for the supply; the lifetime and expiry for resources; elimination of superfluous packaging which generates waste; and greater emphasis on the re-use, reduce, recycle ethos and provision of facilities to enable this (Brown *et al.*, 2012a).

Accurate reporting systems will be essential for monitoring trends and reductions from mitigating strategies. This includes evaluating mileage and fuel consumption for each form of emergency /non-emergency journeys and vehicle types; vehicle telematics to monitor driving behaviour; 24/7 monitoring of utility and energy use on static sites through live measurement information systems; and appraising waste disposal compliance to ensure effective, legal and sustainable practice is in place.

2.7 Conclusion of findings

The onus for a concerted action on reducing the exacerbation of global warming and reducing contributory occupational carbon emissions is now upon our generation. Climate change is continuing and global health appears to be deteriorating, causing increased morbidity and mortality. EMS organisations will

need to deal with this ill health, but EMS are also major contributors to climate change.

Whilst there are numerous evidence sources to indicate how EMS services will be affected by global climate change, a much lesser, published empirical evidence base, evaluates meaningful interventions and approaches. Several gaps in the literature are noted. Firstly, there has not been any identification of qualitative research, especially involving either SACRM managers' experiences of implementing sustainability policy and initiatives, notably from the UK ASTs. Gaining an understanding from their perspectives, offers crucial insight into the challenges they have, in reducing carbon emissions and therefore meeting NHS and UK carbon reduction targets. Secondly, there has been little research into the behaviours of the EMS workforce in adopting sustainability change. Further observational research into sustainable behaviours and a qualitative insight into their attitudes and values that underpin their behaviours, offers insight into how effective EMS sustainability policy is being adopted. This thesis investigates both of these areas, and therefore makes a valuable contribution to SACRM understanding.

To conclude, this SLR suggests there are gaps in the research evidence base, where further empirical studies are needed around the implementation of sustainability initiatives and their efficacy within EMS and in particular UK ASTs. By understanding what intervention strategies are being introduced, how effective they are perceived to be and how operational staff are adopting well

them, it is possible to identify where change is needed. Ultimately, this will promote an effectual and cost effective ethos in EMS delivery. This led to the formulation of a research question, which was developed in Chapter three.

Chapter Three: PHASE TWO – Philosophical Positioning, Methodological Selection and Formulation of the Research Question

3.0 Introduction

This chapter presents the formulation and justification of the research question (for Phase two) gleaned from the findings of the SLR, in Chapter two, especially with the intention to explore the identified gaps in the evidence base. Various philosophical approaches are discussed, in order to choose the most relevant for the research question proposed (Section 3.2.7). This then guides the selection of the methodological paradigm adopted (Section 3.3) and the research methods that were chosen within the design (Chapter four).

Evidence gained from the SLR in the previous chapter, suggests there is a dearth of empirical or interpretive studies around the implementation of sustainability initiatives within EMS delivery, particularly within UK ASTs. As outlined in Chapter two, section 2.7, the overall intention of phase two of this thesis was to explore the intervention approaches being specifically instigated within UK ASTs' corporate strategies, and provide an understanding of the tactics, perceptions, viewpoints and feelings of those managers that are implementing them.

3.1 Considerations made before the Phase Two Research question, aims and objectives

Any research design should have consideration towards a research paradigm, which is generally described as being either quantitative, qualitative, or an amalgamation of the two as mixed methods (Hewitt-Taylor, 2011: p.13).

Research processes are heavily influenced by the philosophical paradigms; so they were considered before the formulation of the research question. Zaidi and Larsen (2018) describe the philosophical paradigms as beliefs or worldviews that effect how researchers perceive the world. Quantitative research traditionally uses a scientific analysis of data through numbers and statistics, whereas qualitative research engages words, instead of numbers, and is more 'naturalist' and 'interpretivist' (Sullivan, 2019). The choice for following a particular paradigm, however, is influenced by the beliefs or philosophical assumptions about the nature of reality (ontology), ideas about knowledge (epistemology) and the values which reinforce research (axiology) (Hewitt-Taylor, 2011; Biedenbach and Jacobsson, 2016).

Deliberating the philosophical approach to this phase of study was essential, in order to ensure that it investigated what was intentional, with a process that was consistent with the study's design, thereby affirming the global validity and reliability (Sullivan, 2019; O'Meara and O'Meara, 2022). There are many traditions in planning a research project. When deciding upon a research approach, there are three main levels within the order of consideration; firstly the paradigm, secondly the methodology and thirdly the method (Lindsay,

2007). Each level of decision-making is dependent on the one that precedes it, eventually fashioning a unique combination of choices within the project itself (Merriam and Tisdell, 2016). Each paradigm is dependent on its own ontological and epistemological assumptions.

3.2 The Philosophical Consideration (Theoretical Positioning)

All research is ingrained with philosophical beliefs concerning values, concepts and the nature of knowledge (Killam, 2013). Philosophical deliberation is a key concept that enables the foundation of rigour in quality research (Howell, 2012; Gray, 2017) as it represents what researchers 'silently think' about it (Scott and Usher, 1999:10; Johns, 2017). Moon and Blackman (2017) advise that philosophical viewpoints expose the assumptions that researchers have about their own research, leading to decisions made in their design. This positioning highly influences the chosen methodology, methods, research questions and potential outcomes as well as providing a map for the research (Lederman & Lederman, 2015). Understanding theoretical positioning or 'worldview' also supports the justification of the methodological approaches and methods selected (Crotty, 1998; Johns, 2017).

A theoretical framework, or philosophical stance, originally promoted by Crotty in 1998, but still endorsed within contemporary literature (Rees, Crampton and Monrouxe, 2019; Al-Ababneh, 2020), suggests that the researcher should begin with determining their philosophical perceptions of what is real in the world (ontological stance) and subsequent perceptions of how knowledge is gained

(epistemological stance). This then underlies the entire research process and determine the particular theoretical perspective selected. Subsequently, this then defines the methodology, which in turn guides the choice of research methods (Al-Ababneh, 2020).

Each represent distinct hierarchical levels that are inter-related and guide the research design process (Figure 3.1). These components are the basis for determining a research paradigm, where each is explained and the relationships between them are explored (Scotland, 2012; Bergman *et al.*, 2012; Killam, 2013).

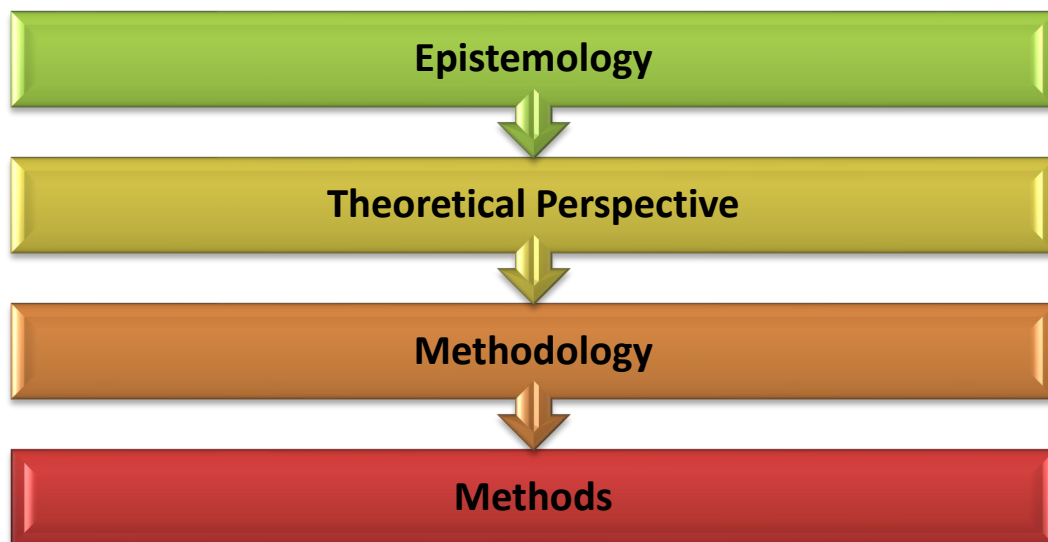


Figure 3.1 The Basic Elements of a Research Process (Crotty, 1998: p.4)

There is a further addition of axiology, which is a study of the values and beliefs that researchers have (Cohen, Manion and Morrison, 2017). A combination of

ontological, epistemological and axiological beliefs, offers philosophical insight into how the world is viewed, how understanding is gained and what is deemed valuable. It is important to differentiate the philosophical perspectives through the ontological, epistemological and axiological positioning, as they shape the research philosophy and the eventual selection of the methods used and how they are conducted (Whitehead, 2004; Biedenbach and Jacobsson, 2016; Al-Ababneh, 2020).

3.2.1 Ontology (Realism and Relativism)

Ontology is the study of 'being' or 'existence' and the nature of reality (Crotty, 1998: p.10; Scotland, 2012; Barbour, 2014; Al-Ababneh, 2020). Therefore, researchers should decide on a viewpoint that encompasses their perceptions of what exists, how things exist and how things really work. Braun and Clarke (2013a) further elaborate that ontology answers the question of what is the reality of 'being' and what shapes the reality. Ontology therefore contrasts the variation between realist and relativist views on reality (Levers, 2013).

Realism

Realists believe that one single truth exists, that is independent of the human mind and that truth does not change (Niiniluoto, 2002). Realism is the stance arguing that entities have an existence independent of the 'knower' and leads to certain ways of generating knowledge, through scientific approaches that test and make objective measurements in order to make inferences, which can then

be generalised (Cohen, Manion and Morrison, 2007; Scotland, 2012; Braun and Clarke, 2013a). Hence, the researcher and the objects of research are two independent units, implying that meaning is uniquely inherent in objects and not in the conscience of the researcher, thus the goal of the researcher is to attain that significance (Scotland, 2012). Realism is the ontological view that underpins most quantitative research, and is closely associated with the epistemological perspective of positivism (discussed further in section 3.2.2) (Braun and Clarke, 2013a).

Relativism

Conversely, relativists believe there are multiple realities which are shaped by situational context and that we can only understand these realities by interpreting the meaning from the experiences of others and ourselves (Levers, 2013). Relativist ontology is the credence that reality is a finite subjective understanding and does not exist externally to our thoughts (Denzin and Lincoln, 2005). Unlike realism, realities differ across time and context, evolving and changing, depending on the involvements. Therefore, because reality is contextually bound, it cannot be generalised, it can only be transferred to other comparable situations. Relativism is the ontological view that underpins most qualitative research and is closely associated with the epistemological perspective of constructionism, constructivism and social constructivism (discussed further in section 3.2.5) (Braun and Clarke, 2013a). Gray (2017) interprets this dichotomy between realism and relativism as 'being' and 'becoming'. 'Being' stems from the notion of a perpetual unchanging reality,

concentrating on factual evidence, while 'becoming' is rooted in the concept of a changing and emerging world, through the cognition and interaction of people. Levers (2013:2) explains that many different interpretations of experience result in multiple realities; therefore, a relativist ontological position recognises the subjective perspective of reality, which therefore implies multifarious truths (Levers, 2013).

As this Phase two research aim was to explore individuals' perceptions and experiences within their workplace, it therefore indicated that multiple realities would exist, and not just one universal or 'mind-independent' truth. Thus, a relativist ontological stance was adopted. This was congruent with the concept that what is 'real' and 'true' can vary across time and context for each individual (Braun and Clarke, 2013a:27; Merlo and Pravato, 2020).

3.2.2 Epistemology

Ontological beliefs shape our epistemological beliefs and vice versa (Crotty, 1998; Killam, 2013). Killam (2013) further suggests that epistemology examines the relationship between the researcher and knowledge, during its discovery. Epistemological belief is therefore based on 'how we know what we know' incorporating the nature, forms, limits and scope of knowledge (Denzin and Lincoln, 2005; Willig, 2018), or alternatively, as a means of observing our world and making sense of it (Crotty, 1998). It incorporates the concepts of how knowledge can be obtained, shaped, acquired and communicated.

Realists believe that knowledge is gained from an objective, etic approach, where the researcher has no effect on the data being gathered (Levers, 2013). Whereas relativists believe that knowledge is gained through a subjective approach through the interaction of other multiple sources, gaining in depth understandings of what is happening (Denzin and Lincoln, 2005). Otherwise known as an emic approach (Cohen, Manion, and Morrison, 2017). This is also where the potential for research influence by the researcher is acknowledged, sometimes avoided or sometimes embraced.

Crotty (1998) advocated three epistemological divergences: (i) objectivism (ii) constructionism and (iii) subjectivism. Each stance has a profound difference in how research is conducted and how it is reported. Building upon Crotty's work, the evolution of mixed methods designs has introduced a fourth epistemological stance, which is pragmatism (Morgan, 2014) also described by McMillan (2015) as criticalism. This is where reality may be objective or subjective, but truth is repeatedly challenged by opposing sides.

3.2.3 Objectivism (positivism)

Objectivist epistemology involves the realist view that knowledge already exists as meaningful units, independent of consciousness and experience, and waits to be unearthed by scientific research (Crotty, 1998). McMillan (2015) summarises this into the philosophical 'worldview' of positivism where the epistemological assumptions are that the researcher and the entity being researched are both independent items and it is possible to study something

without the researcher affecting it. If what is then found is replicable, it is true. By using a deductive approach, a hypothesis may be tested in a formal, scientific way, which is objective, free from culture, personal beliefs and assumptions (Whitley and Siriwardena, 2022: 5). However, positivism can be criticised, as there are contentions that the researcher and the object being investigated do not always have true independence, thus implying that truth cannot be established with absolute certainty and objectivity (Crotty, 1998: Howell, 2013; McMillan, 2015). This contributed to the 'worldview' of 'post-positivism', where the approach is more flexible, accepting that the observer and the observed are not entirely independent (Howell, 2013; Moon and Blackman, 2017). This epistemological belief is based more on critical realism and modified objectivism, where conclusions are formed on the basis of incomplete information (Whitley and Siriwardena, 2022: p.5). Although there may be some resonance with qualitative methods, post-positivism mostly aligns with quantitative methods and mixed methods research (Whitley and Siriwardena, 2022: p.6).

3.2.4 Subjectivism

Subjectivist epistemology holds the opposite viewpoint of objectivism; taking the view that meaning is placed on the object by the subject through individual human reflection and interpretation (Levers, 2016; Al-Ababneh, 2020). The reality that is attributed to an object comes from an individual's conscious perspective and can be derived from people interpreting meaning in a way that makes sense to them (Moon and Blackman, 2017). It is the theory that one's

own perception or internal consciousness is the only reality and is dependent on the individual's subjective awareness of it.

Phenomena that are perceived subjectively are experienced in unique and different ways by individuals, depending on who is experiencing them and under what conditions they are perceived, such as being in a happy or sad mood, or within one particular cultural context opposed to another (Trivedi, 2020).

Therefore, it is the belief that an understanding of the world is subjective and social reality only exists when an individual experiences it and gives it meaning.

Qualitative research involves people's viewpoints; however, a criticism of applying a subjectivist epistemology is that there can be opposing or differing realities from two different individuals (Green and Thorogood, 2018). Just as the perceived taste or flavour of a food item can be experienced as pleasant or unpleasant by two different people, so can their interpretations of what is the 'truth' of whether that food is tasty or not, resulting in many variant positions or opinions, all of which can be deemed as true reality by each individual.

3.2.5 Constructionism, Constructivism and Social Constructivism

Constructionist epistemology similarly holds the opposite viewpoint of objectivism, as it supports the belief that meaning comes into being through our continued, interactive engagement with our own world, through our minds and contact with other people (Rees, Crampton and Monrouxe, 2019). Crotty (1998) contends that constructionism focuses on the social dimension of meaning, interlocking with culture and building knowledge from 'parts'. This implies that

subject and object evolve as co-partners in engendering meaning (Al-Ababneh, 2020) and that meaning is constructed and not discovered. This also assumes that different people construct different meanings in different ways, through a partnership between subject and object. The significance of constructionist exploration is in creating contextual knowledge of a distinct subject or issue (Moon and Blackman, 2017).

Burr (2015) and Rees, Crampton and Monrouxe (2019) differentiate constructionism from constructivism. They explain that constructionism contains elements from four identifying assumptions. These are criticism of accepted ways of understanding; understandings being shaped by time and place; knowledge constructed through social interaction, such as language; and different constructions of the world producing dissimilar behaviours. Whereas constructivism is more aligned to how people identify and generate their own interpretations from their experiences (Talja, Tuominen and Savolainen, 2005). So, whilst it is a viewpoint that an individual's mind constructs reality in a humanistic relationship to the world, Gergen (1999) further reinforces the position of social constructivism as a cognitive process that is informed by influences received from societal conventions and interactions with others.

3.2.6 Axiology

The consideration of how values influence a research process are outlined in an axiological paradigm (Zaidi and Larsen, 2018). Biedenbach and Jacobsson (2016) suggest that axiology is connected to research questions that are

associated with 'what' is valued and considered to be desirable or 'good' for individuals and their cultural society. Deane (2018) also adds that axiological considerations include what is considered as a worthwhile research project as well as the values and qualities of a good researcher, which has further links to the concept of reflexivity (discussed further in section 3.3.3). Qualitative research relies on subjective human interpretation and is therefore 'value-bound'. Klenke (2016) advises that a researcher's beliefs and values should be made clear, so that the context, in which the research took place, is known and has been exposed to critical examination as an element of the research design. Therefore, reflexivity was an important aspect to include within the context of the Phase two research, it was important to understand the values of the research participants, without the pre-conceptions of the researcher influencing the data.

3.2.7 Theoretical Perspective (Justification of the Research Philosophy Adopted)

A theoretical perspective was considered within the Phase two research design, showing how the research question was determined (Cleland, 2015). The research terms 'quantitative' and 'qualitative' are widely employed in healthcare research and they act as 'signposts' to the character of the research being undertaken. There is, however, a distinct dichotomy between the two terms, which can hinder the construction of methodological designs from their questions (Denscombe, 2010). The traditional leaning, within social and behavioural healthcare research, tends to be more towards quantitative

methods, reflecting the positivist paradigm (Mack *et al.*, 2005; Bowling, 2009; Denscombe, 2010; Holloway and Wheeler, 2010). O'Leary (2004:99) suggests that quantitative research is often depicted as a large scale, objective pursuit for one singular truth and depends upon hypotheses and variables. Whereas qualitative research is wrongly described as subjective with emphasis on value, biased and improvised, involving a small sample size of participants. While quantitative research and its associated statistical analysis of data is often perceived as offering greater reliability, it can also be criticised for not providing a 'true' snapshot of reality. Whereas, qualitative research concentrates on the manner in which individuals make sense of their experiences, by seeking to understand how things happen, rather than prove that things happen. As the Phase two research would be exploring SACRM managers as participants, they are the experts on their own experiences and are perfectly placed to offer explanations about their experiences of a specific phenomenon (Darlington and Scott, 2002). The sample size and choice of participants was also likely to be limited, as SACRM managers had a specific role within a narrow number of ASTs. So a qualitative design was best suited.

The qualitative research paradigm is a means of obtaining understanding of the emotions, perceptions, experiences and actions of individuals. It is a person-centred approach, which enables interpretation of the meanings, expressions and values that individuals have (Holloway and Galvin, 2017). It contrasts with a quantitative research paradigm in that it is more interpretive, 'humanistic' or 'naturalistic' as opposed to the positivist, objectivist or 'empirical-analytical' approaches upon which quantitative research rests (Barbour, 2014).

Quantitative researchers are said to be attentive with defining, counting and analysing variables; examining the relationship between cause and effect and causal relationships; and describing them in terms of observation statements, verification and prediction. Whereas, qualitative research involves the interpretation of human descriptions and explanations, through expressions of social meaning, actions and behaviours, under real world conditions (Rapport, 2004; Braun and Clarke 2013a). Whilst there still remains a viewpoint that qualitative research is unscientific, difficult to replicate and is considered, by some, as little more than anecdotal or conjectural, there is increasing acceptance in clinical and social science arenas of its value (Merriam and Tisdell, 2016). Qualitative research can validate quantitative research or provide an alternative perspective on the same social phenomena (Pope and Mays, 2006; Yin, 2011; Klenke, 2016). Therefore, with the intention of conducting an in-depth exploration, specifically involving SACRM managers from English ASTs, this Phase two research design adopted a qualitative design which adds greater detail to the existing empirical data, obtained from the SLR in Chapter two.

Qualitative research is embedded within the subjectivist-constructivist philosophical paradigm, which assumes that people look for an understanding of their social context and where multiple realities exist (Hewitt-Taylor, 2011). This perspective suits the research design for Phase two as the intention is to research the lived experience of the participants. However, Caelli *et al.* (2003:5) and Denzin (2009) posit that there are multiple and contrasting epistemological perspectives within the qualitative research community.

Furthermore both Caelli *et al.* (2003:5) and Denzin (2009) suggest that despite the argument that postmodernity has changed the way that qualitative research has evolved, with a greater move toward a more generic approach, qualitative researchers need to honour the philosophical and methodological roots, rather than upending them in order to aim for credibility. This view is further reinforced by Braun and Clarke (2013a) who add that greater integrity and quality in research leads to greater opportunities for meeting research funding criteria.

Saunders, Lewis and Thornhill (2009) outline four types of research philosophy, demarcating them as positivism, realism, interpretivism, and pragmatism. As mentioned earlier, positivism is defined by Al-Ababneh (2020) as a stance of the natural scientist, based on objectivist and direct experience or observation and not speculation. It follows the understanding that only factual knowledge, gained through observation is reliable. Sullivan (2019) argues that positivists view people as inherent with their own biases and pre-conceptions and so cannot produce objective knowledge. So positivism must adopt a deductive or hypothesis testing approach and a robust methodology, measureable observations and statistical analysis (Dudovskiy, 2022a). In general, the positivist approach tends to adopt a realist ontology and an objectivist epistemology, so was ruled out. (Hewitt-Taylor, 2011).

Realism also relates to scientific enquiry and is similar to positivism, where there is a credence that reality exists independent of a person's thoughts and beliefs (Al-Ababneh (2020). It can be divided into two groups: direct realism and

critical realism. Both Al-Ababneh (2020) and Dudovskiy (2022b) explain that direct realism (or naïve realism) is where the researcher sees the real world truthfully, through human senses on one level. Whereas critical realism is where the researcher sees the world as sensations, not the real things directly, implying images of the real world can be deceptive and require multiple layered study (Saunders, Lewis and Thornhill, 2009; Barbour, 2014).

While positivism and interpretivism are two dichotomous paradigms, in its ontological and epistemological positioning, pragmatism uses both objective and subjective criteria and sits between a positivist and interpretivist research philosophy (Al-Ababneh (2020). Researchers can adopt more than one philosophy, as they can all be appropriate, adopting both a deductive and inductive approach (Dudovskiy, 2022d). Saunders, Lewis and Thornhill (2009) argue that it is possible to also have variations in both ontology and epistemology in addition to conducting research using multiple or mixed methodologies.

As this Phase two research was to explore the phenomena of sustainability within ASTs, through gaining an understanding of individuals' perspectives within their own contextual environments and their social interactions with others, objectivism was discounted. An objectivist approach would be more aligned to scientific deduction, which is creating a hypothesis and then testing it, rather than induction, where theory can be naturalistically generated from the data using regularities and patterns (Green and Thorogood, 2018: 23). Klenke

(2016) also adds that quantitative designs following the positivist paradigm, often fail to obtain an understanding of the deeper structures of the phenomena under study, because they are not context dependent and thus strip away social interaction and the meaning derived from it.

An in-depth critical exploration of an individual's perspective and how they interpret their experiences involves subjectivity, as it is not independent from consciousness or how an individual constructs their world (Merriam and Tisdell, 2016:16). So a more naturalistic philosophical paradigm was adopted, in this Phase two study design, which was more affiliated to the qualitative and interpretive aspects of research and conducted in natural settings.

Whilst qualitative research is known to be subjectivist, where perceived opinions from individuals are sought as part of exploring opinion, a more inter-subjective perspective was desired as an approach, where contextualised meaning could be interpreted holistically and from a collaborative reconstruction where multiple realities exist (Levers, 2013). Bergman, *et al.* (2012) refer to this as 'radical subjectivism' where knowledge is made from the construction that arises from an interaction between researcher and participants. Merriam and Tisdell (2016) add that interpretivism incorporates an appreciation of the differences between people and an interpretation of multiple realities, assuming that a reality is socially constructed out of consciousness and that there is no one singular observable reality. They further outline that constructivism is often used interchangeably with interpretivism, which is similar to Creswell's (2013)

viewpoint that individuals seek understanding of the world through subjective denotations obtained from their complex experiences and their interactions with others. As such, it involves approaches such as social constructivism, phenomenology and hermeneutics, allowing a more naturalistic approach to data gathering (Dudovskiy, 2022c).

In general, the interpretivist approach adopts a relativist ontology and a constructionist, social constructivist or subjectivist epistemology, as humans cannot be separated from their knowledge, or how they interpret their world. Whilst the benefits of interpretivism allow a deep and rich understanding of human perspectives, it is often hindered by its subjective approach and the increased opportunity for researcher bias. The outcome of this infers that any data generated cannot be generalised to a wider population. This can be overcome with the adoption of validity measures to make the research design have rigour, trustworthiness and transparency (Braun and Clarke, 2013a; Dudovskiy, 2022c). Therefore, this Phase two research adopted the philosophical positioning of a relativist ontological perspective, incorporating an interpretivist social constructivist epistemological paradigm. This can be seen in Figure 3.2.

Ontological positioning

- Relativism - the worldview that reality exists through social and interactive experiences, where multiple realities exist, change and sometimes conflict through contextual influences (Bergman, *et al.*, 2012)

Epistemological positioning

- Interpretism / Social Constructivism - Knowledge is gained from mental constructions, through a person's lived experience and intersubjectivity is fostered and valued (Klenke, 2016; Whitley and Siriwardena, 2022)

Figure 3.2 – The Philosophical positioning of the Phase two research.

3.3 Methodological Consideration (Context and Approach)

The exploration of sustainability experiences, behaviours, attitudes, and knowledge, logically incorporates the study of human reactions in a social context and therefore implies building explanatory theory about people and their behaviour (Punch, 2006). This phase of study aims to contribute insights into existing or emerging concepts of sustainability within ambulance services through the contextual perspectives of SACRM managers employed within NHS ASTs in England. Thus, when studying human behaviour, a qualitative design, involving a naturalism orientation through an interpretive, social constructivist approach has been applied, to explore each participant's explanation of their 'real' world. Denzin (1971, in Green and Thorogood, 2018: 13) advises that social research should be diligently linked to the routine lives of the individuals researched, with the aim of understanding their perspective and then provide a

data-rich interpretation of the experiences and thoughts from them. This should reflect the 'real life' context rather than the 'ideal' situations and should overtly reflect on how the research setting itself, has an impact on behaviour. A quantitative methodology would not have been suitable for this phase, as that approach measures concepts or variables objectively and examines numerical or statistical relationships (Parahoo, 2014). A quantitative methodology would not have been flexible enough to let the participants articulate their values, opinions or feelings or to help acquire a deeper, fuller and greater understanding of the phenomenon being investigated. These are difficult to measure by statistics and it would not have provided detailed insight into what perceptions the participants have about implementing sustainability within ASTs. Accordingly, instead of seeking to confirm a hypothesis about a particular phenomenon, the purpose of this phase of research was to explore, discuss and explain the expressive relationships and culturally salient experiences of SACRM managers (Todres and Holloway, 2004; Kumar, 2014). Mack *et al.* (2005:6) also emphasise that qualitative methodology is the most appropriate approach within a relativist, interpretive design adding that the valuable role of qualitative research is the explicit cultural and contextually rich data it creates. It is effective in gaining illuminating data about values, opinions and behaviours, amongst a social perspective of specific populations.

3.3.1 Methodological Design

The challenge of selecting suitable methodological designs for each phase of study, within the thesis, is to select approaches that are relevant to the

researcher's question, their ontological and epistemological positioning and the context of the research (Hewitt-Taylor, 2011). There is a plethora of methodological options and alternatives, available from the research literature, all of which have the ability to create the evidence and data needed for credible results and discussion. Nevertheless, each methodological approach has the potential to formulate answers from very different perspectives, highlighting that each approach has a discrete set of advantages and disadvantages (Burns and Grove, 2011; Parahoo, 2014). The final choice of research strategy for this Phase two research was made on the basis that it addressed the research question; enabled a reasonable and explicit justification for the chosen route; had relevance and feasibility; was ethical; and obtained the best possible outcome from the research resources available (Denscombe, 2010; Holloway and Wheeler, 2010; Hewitt-Taylor, 2011).

When embarking on any form of research, methodology must be clearly distinguished from method (Grix, 2001; Caelli, *et al.*, 2003; Braun and Clarke, 2013a; Willig, 2013). Methodology embodies theoretical frameworks that guide how research should be conducted and it is the philosophical foundation on which researchers are theoretically positioned and should base their procedures and strategies, whereas, methods are more demarcated as the tools, techniques and tactics used to gather the evidence (Denscombe, 2010). Methodological principles direct the researcher into appropriate designs and methods (Sim and Wright, 2000:7, in Rapport, 2004:1). A shortfall of explicit methodological clarity can lead to speculation about the research approach. Nonetheless, it is important to be mindful of 'methodolatry' which is an

overweighed prominence of reporting and defending methodology to the detriment or expense of the reporting and interpretation of substantive findings, because of space or word count limitations (Chamberlain, 2000; Caelli *et al.*, 2003; Holloway and Wheeler, 2010; Finlay, 2011; Chamberlain, 2012; Green and Thorogood, 2018).

3.3.2 The Case for Phenomenology

Embracing a phenomenological paradigm, from the qualitative tradition, can allow knowledge of how an individual experiences their world (Finlay, 2011). The sole aim of phenomenology is to comprehend the commonplace, participant experience. As a research approach, it can be described as a theoretical perspective that uses relatively unstructured, yet flexible approaches with data collection, with an emphasis on inductive logic (Denscombe, 2010; Finlay, 2011).

Gray (2008) endorses that this methodology is suitable for gaining an understanding of the subjective (or lived) 'essence' of an experience. Phenomenological philosophy has influenced the progress of empirical research, through the writings of Husserl, Heidegger and Giorgi (Todres and Holloway, 2004; Neubauer, Witkop and Varpio, 2019). Phenomenology involves research that is potentially transformative for both the researcher and the participant. Spiegelberg (1975:57, in Streubert-Speziale and Carpenter, 2007) defines descriptive phenomenology as encapsulating an undeviating exploration, analysis and description of a specific phenomenon, untainted by

researcher biases and assumptions, aiming for a maximum natural presentation of the data.

Phenomenology enables a 'snapshot' of a witnessed experience for a participant and 'gives voice' to what they are going through (Finlay, 2011).

Todres and Holloway (2004:83) offer four essential stages adopted by phenomenological research (Box 3.1).

1. Articulating an experiential phenomenon of interest for study.
2. Gathering descriptions of others' experiences that are concrete occasions of the phenomenon.
3. Intuiting and 'testing' the meanings of the experiences.
4. Writing a 'digested' understanding that cares for different readers and purposes.

Box 3.1 Four essential stages of empirical phenomenological research
(Todres and Holloway, 2004:83)

Firstly, a phenomenological researcher acknowledges that the natural world motivates the generation of 'burning' personal questions which leads to the formulation of a research question. Secondly, open ended and exploratory questions should be asked, which allow the researcher to stand back from their own interests and engagements in order to elicit 'experience-near' descriptions from the participants of what they have personally lived through. Thirdly, the phenomena experienced by the participants have some generalisable properties, leading to transferable insights, meanings and thematic pattern

common to several experiential examples. The voices of the individuals serve as a 'window' for a form of analysis that moves beyond the words and expressions of the participants. Finally, there needs to be a structure which describes how the features of a phenomenon function as a whole and how there is an interconnection forming a union of the complete experience (Todres and Holloway, 2004; Streubert-Speziale and Carpenter, 2007; Finlay, 2011).

There is a rich range of phenomenological approaches, which have arisen out of the diverse philosophical traditions, offering a multitude of choice. Finlay (2011) describes these in two classifications as descriptive and hermeneutic that align the philosophical traditions of Husserl and Heidegger, respectively. McConnell-Henry, Chapman and Francis (2009) elaborates on this, by advising that it is important to determine which of the two frameworks are to be adopted; either Husserl's transcendental phenomenology (bracketing) or Heidegger's hermeneutic phenomenology (presupposition). When using the Husserlian framework, researchers are required to 'bracket' pre-conceived ideas, knowledge and experience (Rapport and Wainwright, 2006). This approach would have identified descriptions of the SACRM Managers' experiences; however it would not have allowed derivation and interpretation of meaning during the interview. Heidegger's approach allows prior understanding, or 'fore-structure', which amplifies the researcher's interpretation by also 'being-in-the-world' of the participant and therefore 'co-creating' interaction between them (McConnell-Henry, Chapman and Francis, 2009; Finlay, 2011). Despite Heidegger's approach being challenged due to the potential for researcher influences within the data affecting validity, it is still advocated for legitimate

use, as it would be difficult for the healthcare researcher to preserve a bracketed stance (McConnell-Henry, Chapman and Francis, 2009; Holloway and Wheeler, 2010; Finlay, 2011).

Finlay (2011) offers four alternative classifications or supplementary traditions of conducting phenomenological exploration, which also sit slightly outside of the descriptive-hermeneutic dichotomy. These are first person accounts; reflexive-relational approaches; interpretative phenomenological analysis (IPA); and lifeworld approaches). Each has their own strengths and limitations.

First Person Accounts (FPA)

The aim of FPA is to gather a rich description of a lived experience from introspection and personal reflection, often using autobiographical or autoethnographic narratives, reflexive writing, photography, poetry or even painting (Finlay, 2011). Although this methodology can add an empowering voice of an individual's expression, it can also be prone to accounts being self-absorbed and self-indulgent (Finlay, 2011).

Reflexive – Relational Approaches (RRA)

An RRA to research is where data emerges from a researcher and co-researcher (participant) association and co-created through interactive discourse and combine dialogic, heuristic and relational centred methodologies

(Finlay, 2011:160). RRA can be transformational in their application, as it combines both the researcher's and participant's experiences within the dialogue, however critics do challenge its scientific status due to its subjective nature and capacity for influencing bias (Finlay, 2011).

Interpretive Phenomenological Analysis (IPA)

IPA is a fairly novel hermeneutic approach which focusses on idiographic accounts of participants' viewpoints and opinions and how they make sense of their experiences (Finlay, 2011:140). It assumes that each participant is 'sense-making' and able to reflect on life decisions and choices, seeking the meanings behind their experiences (Finlay, 2011). Whilst this approach would have allowed a more personal perspective from individuals, Willig (2013) highlights numerous limitations such as the role of language, the relevance of accounts and explanation contrasted with description; therefore, this methodology is dependent on the articulation abilities of the participants being researched.

Lifeworld Approach

For Phase two of this thesis, the lifeworld or 'Lebenswelt' approach was adopted. Finlay (2011: 125) describes this as understanding phenomena through the world in which individuals live and the daily activities, which they are accustomed to. King, Horrocks and Brooks (2019:33) add that lifeworld is the concrete experience as it is lived by people and allows individuals to offer meaning to the world or context within which they live.

Lifeworld embraces both the Husserlian and Heideggerian ethos, but also draws on the works of Satre, Merleau-Ponty, Schutz and van den Berg, with Dahlberg, Ashworth and Seamon being modern protagonists of lifeworld-led methodology (Finlay, 2011; Kaufer and Chemero, 2015). Lifeworld allows an open, slow paced, 'bridled' attitude to the subject as the researcher interprets the crux through dynamic reflection. The purpose of Dahlberg's 'Reflective Lifeworld Research' is to "...seek to know how the implicit and tacit becomes explicit and can be heard, and how the assumed becomes problematised and reflected upon" (Dahlberg, Dahlberg and Nystrom, 2008:37).

A descriptive and hermeneutic design can reveal the lived experience and requires a researcher's incorporation of candidness and readiness to let the data 'talk for itself' (Braun and Clarke, 2013a). Instead of the researcher's prior knowledge and beliefs being bracketed, they are 'bridled' which means that the researcher needs to have an 'active passivity' where the experiences are revealed at their own pace, in their own way (Finlay, 2011). Open questions are asked and the researcher elicits further responses through an active, sensitive, yet flexibly spontaneous manner. It allows searching for the nuances, instead of any fixed ideas of what the researchers hope to uncover. Utilising this methodology, helps to formulate the methods of how data can be gathered (Barbour, 2014), which is discussed in Chapter four.

King, Horrocks and Brooks (2019) advise that several considerations should be made, in designing a research question that is suitable to a qualitative study.

These are the type of question, the scope of the question, the need to avoid presuppositions and the extent that a research question itself might change during the study. They add that the type of question needs to elicit relevant meaning from participants, focus on a specific scope of experience within the sample selected, avoid leading words which introduce bias and avoid overly broad interpretation which enables a shifting away from the original relevance of the study. A similar approach is used by Barbour (2014) who also places emphasis on having a strong justification for the study and consideration to whom should be included in the sampling.

3.3.3 The Need for Reflexivity

Qualitative methodology accepts that it is a subjective process and that a researcher can influence a research design and process (Willig, 2013:25). Reflexivity is defined as the researcher's ability to establish, critically reflect and make nuanced judgments upon the aspects in which they may be implicated; through their own knowledge, the research procedure and its findings (Braun and Clarke, 2013a; Willig, 2013; King, Horrocks and Brooks, 2019; Olmos-Vega *et al.*, 2022). The integrity of qualitative research not only relies on the explicit explanation of biases, dispositions and assumptions regarding the research process, but also allows a better understanding of how a researcher has interpreted the data (Merriam and Tisdell, 2016). Reflexivity allows the researcher to become a visible part of the research process and acts as a quality control (Probst, 2015; Green and Thorogood, 2018: 37). Olmos-Vega *et al.* (2022) add that the influence of subjectivity is neutralised by acknowledging

it, explaining it, or even capitalising on it. In the transcendental bracketing approach, it can assist on removing the researcher's perspective in order to eliminate the influence on the research process through a '*tabula rasa*' approach (Olmos-Vega *et al.*, 2022:2). They argue that by taking a '*blank slate*' approach, a phenomenon can be studied objectively from a fresh distance. However, as this Phase two research followed the constructivist paradigm, reactivity of the researcher is not seen as problematic, but rather it is essential in the co-creation of knowledge (Lynch, 2000; Barbour, 2014; Probst, 2015). Therefore, it used the 'bridled' reflexive approach, where the researcher's knowledge and identity was acknowledged and used to assist within the dialogue and discussion with the participants. It followed the four overlying and interactive components of the reflexive process proposed by Walsh (2003) which are personal, interpersonal, methodological and contextual.

Personal reflexivity

Personal reflexivity requires the examination and acknowledgement of our own unique perspectives that influence the research (Walsh, 2003). Whilst life experience can play a key role, there was a need to examine how a personal level of involvement could affect the research and its outcomes (Probst, 2015). For this Phase two, it was important to acknowledge that the researcher has a background in paramedical work as well as an interest in the promotion of sustainability in EMS delivery and how this may positively or negatively impact on the decisions taken throughout the study (Finlay, 2002; Olmos-Vega *et al.*, 2022). This encompassed a personal review of preconceptions, biases and

opinions that may have an impact on how the research journey may be influenced from the conception to outputs. A central step in this element was to reflect upon personal assumptions about how sustainability was currently being managed in ASTs.

Interpersonal reflexivity

Interpersonal reflexivity denotes how relationships, within the research method, impact upon the setting, the participants and the findings (Walsh, 2003).

Predominantly, this study embraced a considered recognition of the participants' unique knowledge and perspectives, letting the data 'speak for itself' (Olmos-Vega *et al.*, 2022). One important aspect considered within this, was the power dynamic that the researcher may have had over the participants, either through identity or as an arbiter of what was determined as 'valid' and as such, overlaps interpersonal reflexivity with contextual reflexivity (Finlay, 2002).

Methodological reflexivity

This is where consideration was made towards the paradigmatic orientations (Walsh, 2003; Green and Thorogood, 2018:277; Olmos-Vega *et al.*, 2022). The researcher's worldview (discussed in Section 3.2) and the methodological choices made, meant that the conceptual and theoretical framework was to be followed. As a result, methodological reflexivity throughout this Phase two research, focussed on the significance of those decisions, safeguarding that

they were ethically rigorous and paradigmatically aligned (Green and Thorogood, 2018:277; Olmos-Vega *et al.*, 2022)

Contextual reflexivity

This aspect referred to how features of context influenced research and the people involved through understanding the distinctive setting of the study and the dynamics of the participants' working environment (Walsh, 2003; Olmos-Vega *et al.*, 2022). Each of the ASTs have unique operational arrangements and each of the potential participants had differing titles and roles within them. So careful consideration was made towards strategic demands and contemporary institutional factors which may have altered attitude and perception (Walsh, 2003; Green and Thorogood, 2018:277). Throughout the study, reflective writing and collaborative reflection were used to document these four aspects by using memos, field notes, written and sometimes audio recorded thoughts (Walsh, 2003; Olmos-Vega *et al.*, 2022).

Both Finlay (2002) and Olmos-Vega *et al.* (2022) argue that reflexivity is not without its drawbacks, in that there can be overindulgence in self-reflection and the participant's voice is lost within the discussion of the findings. Good practice requires a balance between being reflexively aware, without being narcissistic, in order to strengthen the validity and the rigour. Lynch (2000) describes the potential for overdoing reflexivity as likened to being stuck in a 'hall of mirrors' and is a never ending process that can be extremely time consuming and Pillow (2003) cautions against excessive reflexivity.

A realistic balance was sought between several elements. These included the research question, the theoretical conceptual alignment and justified choices, an explicit depiction of the research setting in the methods segment, and a balance between the participant and the researcher voices within the findings; all of which convey reflexivity and therefore transparency (Lynch, 2000; Braun and Clarke, 2013a:303; Probst, 2015; Olmos-Vega *et al.*, 2022). Overall, the benefits of reflexivity to the study enabled a framework for accountability, trustworthiness, ethical consideration, and a richness and clarity in participant engagement (Probst, 2015; Green and Thorogood, 2018:277). An example of reflective reflexivity can be seen in Box 3.2 with a narrative contextualising the choices made when determining the Phase Two methodological route.

Reflective Reflexivity

A narrative of personal reflexivity contextualising the choices made when determining the Phase Two methodological route

Within the initial planning phases for the PhD research journey and the intended direction of travel for achieving the thesis aims, I felt it was important to remain open-minded about the range of research paradigms and methodologies available. I considered that a researcher should always remain flexible and adopt a methodology which best answers the research question, meets the aims of the research and have a design which is the best way to gather information.

This thesis started gathering information from a very broad international perspective, within the Phase One SLR, gaining awareness about the global perspective of EMS research. From the literature review over the 2008-2015 period, holistic knowledge was gained through understanding how climate change was impacting on service delivery, how EMS services were contributing towards CO₂e emissions, interventions that had been identified to reduce the EMS carbon footprint, and the behavioural changes needed to adopt sustainability behaviours. Using a 'funnelling' technique and responding to the identified gaps in the literature (a dearth of UK based SACRM research, a distinct lack of qualitative designs for data rich understanding of viewpoints and perspectives, a scarcity of interventional studies, and a dearth of behavioural research in EMS SACRM studies), the next logical step was felt to be an exploration of UK ASTs. By narrowing the 'funnel' from the global perspective, focussing more on the national SACRM perspective of English

ASTs, knowledge could be gained from the strategists who were responsible for implementing the corporate 'Green Plans'. This led to the deliberation of the best design for Phase two.

As there were only ten ASTs in England, and a likelihood that there was only one appointed person with managerial accountability for SACRM within each Trust, it indicated a very limited sample group size. Also, given that the selection of participants would require a non-probability, purposive sampling for their expertise under investigation, the sample size would be unlikely to reach any generalisability within a quantitative paradigm. Because of the small sample group, it made logical sense to adopt a qualitative paradigm and aim for maximum variation sampling but make it data rich through an in-depth exploration. This also offered the opportunity to explore AST SACRM managers' life experiences, of not just what was being done, but also how they were doing it and the opinions that they held. It provided that really, personal perspective on how they considered the best way to implement SACRM policy.

The choice for using phenomenology, rather than a generic qualitative approach discussed by authors such as Caelli, Ray and Mill (2003), or Kahlke (2014), where generic methodology and generic thematic analysis refuse allegiance to any single methodology, was made through further exploration of the various phenomenological frameworks. The overall aim was to explore the life experiences of these AST SACRM managers, so when determining the various forms of phenomenology, the framework that really seemed to suit, out of all of them, was Lebenswelt. This embraced a mixture between the Husserlian and Heideggerian approaches and its use of 'bridling' rather than 'bracketing' which enabled use of my own paramedical experience and my newly gained knowledge in SACRM, to navigate the complexities of drawing out that life experience from the participants. It was a choice that was made because I had read extensively read around the subject of phenomenology and it just felt to be the right methodological process for that stage. Lebenswelt embraced the richness of the participant interaction of how AST SACRM managers were actually 'living it' and how they expressed their values, opinions and feelings to contextualise the choices made within their personal insight.

Box 3.2 Reflective Reflexivity - A narrative of personal reflexivity contextualising the choices made when determining the Phase Two methodological route

3.4 Determining the Phase two research question, aims and objectives

After considering the various ontological, epistemological and methodological options, it was possible to formulate a research question, aim and key objectives that would draw upon the experiences of SACRM managers from a range of English ASTs. By studying experiences from within ASTs, by the individuals that implemented sustainability, there was an appropriate setting and context for the study, with suitable characteristics of the participants, which could then allow findings to be transferred to other similar situations (Hewitt-Taylor, 2011; Barbour, 2014). The philosophical positioning discussed in this chapter, outlines the choices made for the research approach. This phase of research adopted a qualitative paradigm, followed the philosophical assumption of a relativist ontology, with an interpretist, constructivist epistemology and used a phenomenological methodology (Figure 3.3).

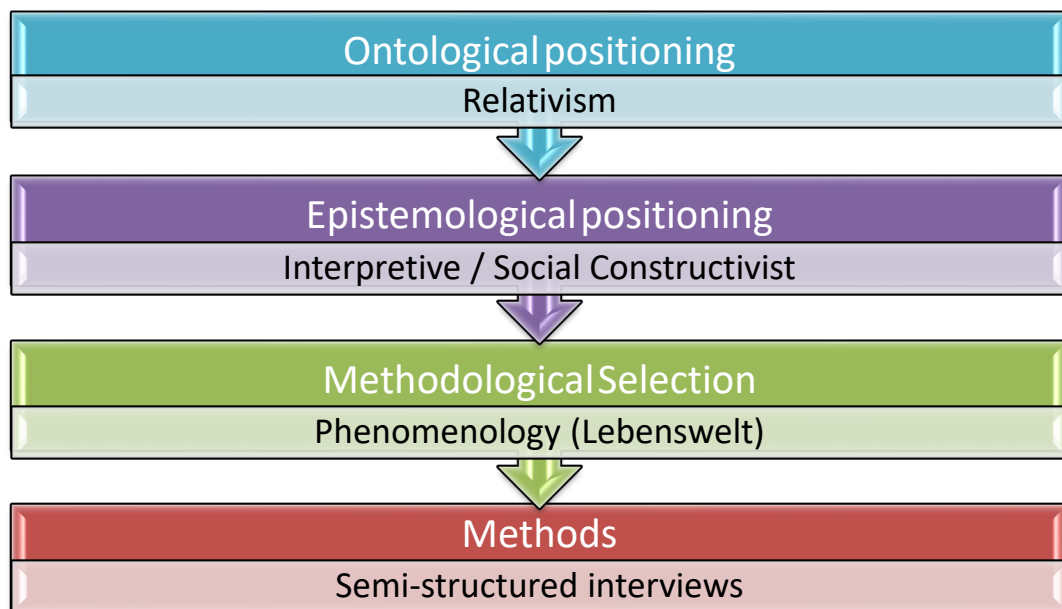


Figure 3.3 The Phase two methodological selection from the philosophical positioning

3.4.1 Research Question for Phase Two

What are the experiences of Sustainability Development Managers of NHS Ambulance Trusts in England, when implementing carbon reduction strategies?

This research question focusses on an exploration of what is happening in ASTs, looking for fresh insights that offer a more in-depth understanding of the nature of the subject being researched (Al-Ababneh, 2020). Qualitative research is inductive and interpretive in its approach (Barbour, 2014; Merriam and Tisdell, 2016; Green and Thorogood, 2018; Sundler *et al.*, 2019), so this phase of research design encompasses the ontological position of relativism, as there are multiple constructed realities, differing across time and context (Braun and Clarke, 2013a). Understanding of a lived experience aligns to the notion of intentionality of consciousness and how that experience is given meaning (Sundler *et al.*, 2019). The epistemological stance of how knowledge is created, is aligned to social constructivism, as the researcher interacts with those being researched and will be seeking participants' subjective and intersubjective meanings as they interact with the world around them (Al-Ababneh, 2020).

3.4.2 Research Aim for Phase Two

To explore the contemporaneous experiences, perceptions, attitudes, behaviour and knowledge of strategic managers in the ten NHS ambulance trusts located in England (the research sites) in their approach to sustainability.

3.4.3 Key Objectives within the Phase two study are;

- To explore how proactive each organisation is with the promotion of 'sustainability' and their own contribution to reducing the overall carbon footprint.
- To identify the nature of sustainability initiatives being employed by each Sustainability Manager within NHS ASTs in England to meet sustainability and carbon emission reduction targets.
- To understand how Sustainability Managers view the level of other employee engagement with strategic objectives within their Green Plans (from a strategic viewpoint).
- To explore the perceived challenges and opportunities that Sustainability Managers have with the implementation of their initiatives, in order to understand their views on effectiveness.
- To explore what Sustainability Managers' personal, longer-term priorities, aspirations, values and strategic impetuses are, towards meeting sustainability and carbon reduction targets.

The research aim and objectives then led to the development of the research design methods adopted. These include the considerations for sample selection, data gathering and data analysis, which are outlined in detail within Chapter four.

Chapter Four: (PHASE TWO) Methods

4.0 Introduction

This chapter presents the rationale for the methods adopted in the Phase two research design and builds the case for the data gathering approach most relevant to the research question. A diverse range of data collection approaches is offered for qualitative research; however, Finlay (2011) emphasises that the selected method must be consistent with the research design, aims and methodology. Some of the most commonly reported processes for data collection in phenomenological research are focus groups, interviews, participant observation and written accounts (Finlay, 2011; O'Meara and O'Meara, 2022:146) and each has a set of guidelines or quality criteria that must be followed for the research to be considered rigorous (Gibson and Riley, 2019:100)

When capturing the spirit of phenomenology, data are often considered to be generated from an interactive research environment, where denotations surface from the co-created discussion (Finlay, 2011:197). The method of data collection chosen, however, needs to deliver a rich, in-depth description of the phenomena as concretely as possible, both emotionally, cognitively and bodily from the perspective of the participant's own life and experiences (Finlay, 2011:197).

4.1 Research Design (a case for interviews)

The selected method of data generation for this Phase two research involved the use of semi structured qualitative interviews. Every interview was conducted on a one-to-one basis with a representative strategic manager (one from each AST in England) responsible for SACRM in their organisation. The choice to use interviews was based upon the epistemological and ontological premise that knowledge and reality can only be obtained from those who have experienced it (Crotty, 1998; Elmir, *et al.*, 2011; Merriam and Tisdell, 2016; King, Horrocks and Brooks, 2019). Indeed, Merriam and Tisdell (2016) firmly advocate that the interview is the principal method of phenomenological data gathering and is utilised to elicit the rich essence or meaning of an experience.

Focus groups were initially considered, as they can generate lively debate and discussion, in a supportive environment, through group interaction (Braun and Clarke, 2013a; Barbour, 2014), and can encompass a wide range of views and perspectives. They were, however, discounted. Phenomenology fundamentally seeks to elicit what participants truly feel and so the sensitivity of that personal data may not be forthcoming in a public setting as it would in the privacy of a one-to-one in depth interview. Discussing individuals' experiences, which may have involved being highly critical of other individuals or organisations, in a group context, may not have been conducive due to the lack of anonymity in such a small purposive sample group available (Braun and Clarke, 2013a). The confidentiality of disclosure was an important consideration and some participants could have been reluctant to express themselves fully, due to either

argumentative group dynamics or through social acquiescence to a group consensus (King, Horrocks and Brooks, 2019).

Interviews are considered as the 'gold standard' of qualitative research and ideally suited to explore perception and experience-type research questions (Braun and Clarke, 2013:81; Barbour 2014). Interview designs can range from structured to the unstructured, and whilst all interviews have some form of structure, what varies is the flexibility of the participants in how they can respond (King, Horrocks and Brooks, 2019). Structured interview designs are questionnaire driven, have pre-determined questions, are researcher-led and tend to be the commonest type of interview in quantitative work, as they offer standardised or closed questions (Braun and Clarke, 2013; Merriam and Tisdell, 2016). A distinct disadvantage of using this in qualitative research is that any response elicited is based on the supposition that questions posed are interpreted in the same way by all participants and does not offer further exploration of perspectives or understanding of their world (Merriam and Tisdell, 2016). Alternatively, unstructured interviews are when the researcher begins with a broad list of subject areas to discuss, but the conversation is highly participant-led offering flexibility or open ended responses, determined by what is important to participants (Braun and Clarke, 2013a). This allows individuals to define their views in their own unique way (Merriam and Tisdell, 2016).

Semi-structured interviews are commonly used in healthcare and sit between the two ends of the continuum (Pope and Mays, 2006; Braun and Clarke,

2013a; King and Hugh-Jones, 2019:121). They allow the respondents the autonomy and opportunity to elaborate on their feelings and experiences and allow the interviewer to reflexively clarify interesting and relevant topics (Merriam and Tisdell, 2016). Semi-structured interviews also give the interviewer spontaneous openings to explore and investigate complex, emotive and thought-provoking topics (Pope and Mays, 2006; Barbour, 2014). They allow the investigator to obtain a deeper, fuller and greater understanding of the phenomena being investigated, which is what this phase of research intended to achieve. Consequently, semi structured one-to-one interviews were deemed as the best method for data collection within this phase. To enhance this method of data collection, a set of questions was used, within an interview guide, as prompts for the interviews (Appendix 7). These were open-ended questions, which allowed participants to frame their answers using their own words and allowed the researcher to probe and clarify interesting areas (Burns and Grove, 2011).

The interviews were scheduled between December 2015 and August 2016. Each participant was offered the option of a face-to-face interview, in private locations within the participants' own AST, or via a telephone or web based interview. Each interview was set for a pre-arranged date and time, which was mutually agreeable to both researcher and participant. Details of the participants' choices can be seen in Chapter five, Table 5.1. All interviews were audio recorded in accordance with ethical principles outlined in the ethical approval applications (see Section 4.3), transcriptions of the recordings were made and the interview data analysed using a thematic analysis (TA) model,

promoted by both Braun and Clark (2013b) and Green and Thorogood (2018:259). This is a common approach used in qualitative research and is suitable for the methodological approach (King Horrocks and Brooks, 2019).

The raw data were reduced, categorised and coded, with the researcher identifying patterns or themes that emerged in comparable phrasing, associations between variables, divergence in subgroups and shared expressions. By identifying and separating these themes, further information and direction was explored during subsequent interviews (Braun and Clarke, 2013a; Miles and Huberman, 2013). From the emergent patterns, the data were then interpreted and conclusions drawn. Confirmability was established to assist with validity, through achieving credibility, transferability, and dependability (Nowell *et al.*, 2017). The preferred method for complete coding was to use manual methods, from hard copy data, which was then transferred to word, and excel documents. Specialised computer software was not used, due to the limitations with cost and the time that would take in familiarising with an alternative system (Braun and Clarke, 2013a:219).

For rigour, additional notes were added during each of the interviews and these were referred to during the data analysis. This enabled a reflexive understanding of the researcher role in interpreting the study findings (Green and Thorogood, 2018). Following the transcription, and before coding and development of any themes, member checking was carried out for credibility, where the participants were offered the opportunity to review the contents of the

transcript (Porter, 2008; Nowell *et al.*, 2017). An independent researcher (Director of Studies / Supervisor) was also used to analyse the interview transcripts to compare with the Chief Investigator (interviewer). Any agreed differences in the accuracies of the transcribing were amended, following a discussion. Following analysis of the data, the emergent themes were also discussed amongst the research team, then agreed and adjusted accordingly. This delivered cross validation to the analysis (Reid, Flowers and Larkin, 2005).

4.2 Sampling Strategy and Recruitment of Participants

Initial recruitment was conducted by using a typical purposive sample by contacting the ten NHS ASTs in England and identifying key individuals that met the inclusion criteria. Purposive (also known as judgement) sampling is a common method of participant recruitment in phenomenological studies, as it selects individuals which are 'data rich' from their characteristics; attributes which are relevant to the enquiry and particular knowledge of the area of inquiry (Streubert-Speziale and Carpenter, 2007:94; Barbour, 2014; Merriam and Tisdell, 2016; Moule, 2018). The criterion for inclusion was that each participant must be a strategic manager involved with the writing, implementing, monitoring and evaluation of their Trust' Green Plan. The overall purpose was to obtain a deeper and fuller understanding of the experiences, attitudes and beliefs of strategic managers, when implementing sustainability initiatives throughout NHS ASTs in England.

Although there may be some limitations regarding this sampling technique due to the potential for researcher bias in selection judgement (Moule, 2018), incorporating a wide range of sample site selection and criteria for participant inclusion, along with being guided by the research aim, helps to mitigate this. The purposive selection from all NHS ASTs in England enabled analysis of sustainability cultures and potential paradigms in attitudes towards sustainability. The differences in location of these Trusts throughout England helped to illustrate the socio/political context and facilitate understanding of any regional variations (Bowling and Ebrahim, 2005). In essence, ASTs were selected to provide as wide a range of experiences as possible within England and this ensures that variation is managed to avoid distortion towards one perspective, thus enhancing validity (Silverman 2010; Miles & Huberman 2013; Barbour, 2014). Importantly, this primary selection method reflects candidates who were appropriate participants by being 'information rich' and appropriate to the research question. The number selected was not necessarily aimed at reaching saturation of data, but encompassed a cross representation of the ASTs in England and was proportionate to what was achievable within the study time-scales.

Each potential candidate was identified through initial enquiry with the AST (either through email to the Director responsible for the Green Plan or through the Research and Audit Department of the Trust). The potential recruit was then contacted via telephone or email and was sent a document entitled Participant Information Pages (PIPs) (Appendix 8) to then consider continued participation. The PIPs addressed the purpose of the research; the proposed aims and

objectives of the research; the data collection techniques; confidentiality issues; how the information was going to be used; and what would happen to the information once the study had been completed. There was ample opportunity for all potential participants to ask further questions about the study and discuss any concerns with the Chief Investigator prior to interview. Each participant then completed a consent sheet, before the interview took place (Appendix 9) and key points were reiterated through the introductory talk at the beginning of each interview (Appendix 10).

4.3 Ethical considerations

Phenomenology elicits and extracts information that is of a highly personal nature, which King and Hugh-Jones (2019:127) describe as obtaining the 'first person conscious experience'. This methodology and thus its methods involve human interaction and so exploring all ethical considerations within this design was of paramount importance and an expected obligation (Hewitt-Taylor, 2011; King, 2019:36; Langlois, Armstrong and Siriwardena, 2022:29). It was imperative to keep a good professional standing with the participants, throughout the whole interview process as well as how the findings are presented. It was also essential for them to feel valued for their contribution towards the advancement of professional practice (Punch, 2006). Valid consent in qualitative studies differs from quantitative studies as there is no way of anticipating what might be discussed in the interview and there needs to be awareness of the researcher-participant power dynamic when presenting the findings (Streubert-Speziale and Carpenter, 2007:95; Finlay, 2011).

Ethical approval for the Phase 2 design was sought from both the author's Higher Educational Institution (HEI) Faculty Research Ethics Committee and also from each individual NHS Ambulance Trust's Research and Development (R&D) department (Kaura, 2013) (Appendix 11). The documentation was initially produced through the Integrated Research Application System (IRAS), which generated the necessary requirements for NHS/ HSC R&D submissions. Full NHS Research Ethics Committee approval was not required at the time of application, as this research phase only involved NHS staff and not patients, vulnerable persons or minors. Each NHS AST's R&D department manager was then contacted by telephone to initially discuss the proposal and then the researcher submitted an individual trust application for review.

The research was carried out in adherence with the HCPC Standards of conduct, performance and ethics (HCPC, 2016; 2019c). In addition, the investigation respected individual participant's autonomy, and was carried out with beneficence and non-maleficence within legal limitations (Beauchamp and Childress, 2009). HCPC standards of conduct have transferable responsibilities for a registrant who is also acting as a healthcare researcher and can be seen in Box 4.1.

Several ethical issues were considered. Valid participant consent from each person was obtained, ensuring that each participant had capacity, consent was offered without coercion or personal incentive and full disclosure of information was offered prior to each interview (Hewitt-Taylor, 2011; Kaura, 2013).

1. promote and protect the interests of service users and carers;
2. communicate appropriately and effectively;
3. work within the limits of their knowledge and skills;
4. delegate appropriately;
5. respect confidentiality;
6. manage risk;
7. report concerns about safety;
8. be open when things go wrong;
9. be honest and trustworthy; and
10. keep records of their work.

Box 4.1 - HCPC Standards of conduct, performance and ethics (HCPC, 2016)

Valid consent involved providing sufficient information, so that the participants understand what the study's purpose was; what was required of them; what (if any) were the risks and potential benefits to them; how it would be recorded (audio recorded); and how the results were to be used (Hewitt-Taylor, 2011).

Both the participant and researcher signed the consent sheet. They used either electronic signatures (and sent via email), or they physically signed and returned copies via postal mail, or they signed in person when face-to-face. There was particular emphasis, both verbally and in the documentation, that outlined reversible participant withdrawal from the study, if they so decided.

For confidentiality, standard five (Box 4.2) of the HCPC Standards of Conduct Performance and Ethics (2016; 2019c) were applied. The conditions of any relevant data protection laws were preserved and adherence to the legal expectations for handling confidential information was maintained.

5. Respect confidentiality

Using information

5.1 You must treat information about service users as confidential

A registrant must respect the confidentiality of service users and must treat information about service users as confidential; using it only for purposes that it has been provided for.

Disclosing information

5.2 You must only disclose confidential information if;

- you have permission
- The law allows this
- it is in the service user's best interests, or
- it is in the public interest such as if it is necessary to protect public safety or prevent harm to other people.

A registrant-researcher must not knowingly release any personal or confidential information to others who are not entitled to it. They should also check that people who ask for information are entitled to it, even though the participant has given the researcher specific permission to use the information.

Box 4.2 Standard 5 (Respect Confidentiality) (HCPC, 2016; 2019c)

The participants were made aware of the usage of the data and who owns it. A full explanation of this was outlined in the PIPs given to the participants.

The University of Plymouth (UoP) policy, as well as good practice, dictated that any raw data (including digital audio recordings, transcripts and copies) collected were secured within a password protected hard drive on a university computer (UoP, 2018b). Any back up files were stored on a password protected

external hard drive which was secured in a lockable filing cabinet within a locked office. Any printed transcripts from the audio recordings were secured (when not in use) in a lockable filing cabinet within a locked office. The only persons with access to the personal data during the study were the researchers involved. This included the Primary Researcher and the supervision team. The research data will be stored until the end of the thesis study period (or after 10 years). Upon which it will be destroyed.

All reported data within the transcripts have been anonymised or pseudonymised as advocated by the Data Protection Act and NHS Codes of Practice (Lindsay, 2007). Identities of individuals and organisations were kept confidential and anonymised within the transcripts through redaction, so that they could not be linked to data provided or publicly divulged (Polit and Beck, 2006; Hewitt-Taylor, 2011). Anything said during the interview was treated in confidence, and measures were taken to preserve anonymity, to avoid identification. The participants were also informed of how the analysis was going to be reported. This will primarily be for the purpose of the PhD thesis, but may also be used in subsequent journal articles.

Another risk considered in this study involved the potential for the participants to discuss an area of sensitivity affecting either the legality of their practice or a breach of their professionalism, where a participant disclosed an illegal act or a breach of their organisational code of conduct (Lindsay, 2007). To pre-empt this problem, the PIPs contained a paragraph emphasising that the study was

discussing sustainability only. It stated that any explicit disclosure of unethical or unlawful behaviour which has or may put others at serious risk, may result in the interviewer informing the interviewee of a termination of the interview as well as a researcher obligation to report it to relevant authorities. This was also emphasised prior to commencement of the interview. As a result, no unethical or unlawful disclosures were made during any of the interviews conducted.

The subject area may also have provoked feelings of insecurity and self-doubt in the participants, through the discussion of difficult decisions that they have had to make, or discussion of contentious issues within the strategic management of the employing organisation (Lindsay, 2007; Elmir *et al.*, 2011). Therefore, an informal holistic assessment of participants' psychological stress was made during each interview by the interviewer, with strategies of debriefing and counselling for their well-being considered. The researcher could also have possibly have been exposed to sensitive, embarrassing or upsetting anecdotes from the participants, which Elmir, *et al.* (2011:15) describes as having the potential for 'vicarious traumatisation'. Both the researcher and participants had access to a contracted counselling service throughout the study.

4.4 Procedures

Interviews were either conducted face-to-face, by telephone conversation, or by video conferencing. This was dependent on participant availability or economic distance of travel (King, Horrocks and Brooks, 2019). Where possible, each interview was conducted from a neutral environment and away from the normal

workplace to ensure there were no external distractions (Braun and Clarke 2013a:91). A potential burden for the participants was the fact that they were volunteering in their time, outside of normal working hours, so timings for interviews had to be built around times that were convenient to the participant. Face-to-face interviews were arranged close enough to an interviewee's home to ensure their accessibility when attending. Where interviews were conducted in person, the UoP lone working policy was adopted as part of the risk assessment (UoP, 2018b).

An interview guide was pre-prepared (Appendix 7), with a list of open-ended questions for stimulating the dialogue, encouraging expressive thought from the participants and to guide and 'funnel' the interview by producing explicit pieces of information (King, Horrocks and Brooks, 2019). There was also space between questions to encourage time for the participants to respond and for the researcher to take notes and write responses to the participant's comments. This was used to good effect, as a key skill of the interviewer is to be reflexive to the data obtained and probe further, deeper or wider than the original issues (Pope and Mays, 2006; Elmir *et al.*, 2011; Finlay, 2011; King, Horrocks and Brooks, 2019). The first early interview raised issues that were not expected from the initial literature review, so these newly surfacing topics provided stimuli for subsequent interviews, hence enabling emergent themes as well as expected themes (Ziebland and McPherson, 2006). Finlay (2011) considers this as being consistent with the methodological approach as the fluidity and spontaneity of unexpected directions within data rich conversations allow a wider exploration of the phenomenon.

Face-to-face interviewing is considered by some to be the best way of exchanging information by human interaction and the 'gold standard' for qualitative research (McCoyd and Kerson, 2006; Elmir *et al.*, 2011; Lechuga, 2012; Janghorban, Latifnejad and Taghipour, 2014). However, when considering the economic and sustainability or environmental impact of the transportation mileage needed to travel around England to visit participant Trusts, other forms of oral communication, through remote interviewing, were considered and agreed with the participants. Face-to-face, telephone interviews or web-based video conferencing were used, although each has their strengths and limitations (King, Horrocks and Brooks, 2019).

Telephone interviews can be seen as 'faceless' and 'body-less' (Isen, 2009, in Elmir *et al.*, 2011); however, as long as the participant-researcher relationship develops and a rapport is built, other oral led methods can be as effective as 'real' face-to-face interviewing. They are judged as equally rich, vivid, in depth and high quality (Novick, 2008; East *et al.*, 2010, in Elmir *et al.*, 2011; Lechuga, 2012; King, Horrocks and Brooks, 2019). In effect, telephone techniques provided participants with an opportunity to divulge personal information without feeling uncomfortable (Sturges and Hanrahan, 2004; King, Horrocks and Brooks, 2019). This is corroborated by both King, Horrocks and Brooks (2019) and Novick (2008) who concluded that there is little evidence suggesting that telephone interviews yield inferior data and that any bias against this method is counter balanced by a growing interest in electronic or alternative oral methods. Despite the lack of visual cues and a forfeiture of nonverbal and situational data, telephone conversations allow the respondent to feel more comfortable

and much more willing to reveal deeper, explanatory information. Furthermore, both Smith (2005) and King, Horrocks and Brooks (2019) advised that the physical appearance of either the researcher or the participant has a minor importance during a telephone interview; as such, both may feel more relaxed and attentive. The technique also allows the researcher to decrease cost and carbon footprint; broaden the geographical 'net' to reach dispersed respondents; decrease logistical space requirements; and lessen participant fatigue, as well as promote enhanced interviewer safety (Novick, 2008; Lechuga, 2012; King, Horrocks and Brooks, 2019).

Other disadvantages of telephone and web based video conferencing include limited coverage, poor connectivity and occasional distortion of voice clarity. Rapport can be affected as it is more challenging for creating a "good interview ambience" (Opdenakker, 2006:13, in Novick, 2008). This was found to be the case when conducting this phase of study. When using a web based video conference, where one participant's internet connectivity speed was slow, there was a delay or pauses in conversational exchange, and consequently difficulty with the clarity upon transcription of the audio recording. As a result, where this happened, the researcher and participant reverted to audio conversation, without the video feed.

Web based interviewing is accepted as a qualitative technique and is seen as a valid tool for obtaining data, challenging traditional methodological boundaries and modalities (Mann and Stewart, 2003; Fontana and Frey, 2005; Beck, 2005;

Meho, 2006; Hamilton and Bowers, 2006; Egan, Chenoweth and McAuliffe, 2006; Novick, 2008; Janghorban, Latifnejad and Taghipour, 2014; Oates, 2015; King, Horrocks and Brooks, 2019). It has an added advantage over telephone interviews as it allows the visualisation of nonverbal cues and nuances such as thoughtful or defensive silent pauses and can help to avoid non-verbal or contextual data distortion (Novick, 2008; Lechuga, 2012).

Provided consent was granted, all interviews were audio voice recorded to capture the discussion in the participants own words. The interviews were conducted in a respectful, polite and neutral style; avoiding leading, biased or double negative questions; with the researcher listening attentively to the dialogue, objective referents and subjectivity of the participants' words (Pope and Mays, 2006:13). Measures to address social desirability bias from the participants included, building a rapport to elicit honest answers and reassurance of their anonymity (Larson, 2018). Any doubt over the participant's meanings, acronyms or phrases were checked during the interview, to avoid any reliance on assumptions.

Transcription of the audio recordings into word processed documents was initiated and completed by the researcher as soon after each interview as possible, to allow for immersion with the data, and identification of further reflexive possibilities that could be explored. It also allowed reflection on the interview questioning techniques and to develop accordingly to improve researcher quality and objectiveness (Pope and Mays, 2006:16; Finlay, 2011).

4.5 Methods of Data Analysis

Thematic analysis (TA) is a widespread process used for qualitative data analysis (Howitt and Cramer, 2010; Finlay, 2011; Huxley, Clarke and Halliwell, 2011; Braun and Clarke, 2013a; Freeman and Sullivan, 2019) and was adopted as the method for analysing this Phase two of study data. TA is extensively used for generating themes and identifying patterns of meaning from the data gathered, in relation to the research question. Although acknowledged by some qualitative researchers to lack the substance of other 'branded' and theoretically driven methods such as IPA or Grounded Theory, a major strength of the TA method is its flexibility and that it can be employed in virtually any form of qualitative question or data (Braun and Clarke, 2020). Its ease of use enables researchers with little or no qualitative research experience to quickly grasp the concepts of categorising and coding (Braun and Clarke, 2013b; Freeman and Sullivan, 2019).

The process advocated by Braun and Clarke (2013a) is a seven-step process, which is described in Box 4.3 below. This was adopted as the framework for this study's TA as this was believed to be one of the most rigorous and yet flexible approaches currently developed (Braun and Clarke, 2013a) and incorporates other similar but less detailed approaches (Barbour, 2014; Green and Thorogood, 2018). Braun and Clarke's (2013a) seven-step process of TA offers a robust and systematic framework for the coding and categorisation of obtained data, and for finding patterns within the dataset (Braun and Clarke, 2013a; 2013b).

1. Transcription
2. Reading and familiarisation; taking note of items of potential interest
3. Coding; completed across entire dataset.
4. Searching for themes
5. Reviewing themes: producing a map of the provisional themes and subthemes and the relationships between them – also known as the ‘thematic map’
6. Defining and naming themes
7. Writing – finalising the analysis

Box 4.3 Seven-Step Process of Thematic Analysis (Braun and Clarke, 2013a:202)

Following the data preparation through transcription (step one), there was an ongoing evolution of selecting, converging, streamlining, conceptualising and transforming the information from the interviews. Miles and Huberman (2013) refer to this as ‘data reduction’. For step two, there was an ‘immersion’ or ‘dwelling’ in the data by the Primary Researcher, with the aim of become intimately conversant with the content and begin to make links with the research question. This was a process of reading and re-reading and repeated listening to the data (Finlay, 2011; Braun and Clarke, 2013a).

Within this step, there was the noticing of recurrent issues which could be causal and observational, recorded as notes on the transcription (Green and Thorogood, 2018). Then there followed complete coding (step three), which was a systematic process, seeking portions of data that addressed the research question and objectives. Coding needed to be precise and indicated what it was about that section of data that was of interest (Barbour, 2014). Emergent

themes were then identified (step four), which allowed an index of conceptual categories to be constructed (Barbour, 2014; Freeman and Sullivan, 2019:162). A system which facilitated this was to note the categories in the margins of the raw material (Bowling, 2009). From that, a data-matrix of themes and sub-themes was devised (step five), arranged within a thematic map and the coded data was then imported to an excel spreadsheet, to simplify extrapolation of data. Chunks of data were coded in paragraphs and some items coded in more than one category (Braun and Clarke, 2013a). An interpretive analysis was then carried out (step six) by re-reading the data set definitions and interpreting their relevance, connecting themes and theorising from the results (Bowling, 2009; Finlay, 2011; Braun and Clarke, 2013a). The finalising stage (step seven) was the presentation of the analysis by writing the story that could be told with the data, which Ziebland and McPherson (2006:409) advises us "...is not always the same as finding the story that you would like to be able to tell."

4.6 Rigour

In order to maintain trustworthiness and integrity with this phase of study, Lincoln and Guba's (1985) framework of quality criteria for qualitative research was adopted. These include the areas of credibility, dependability, transferability, confirmability and authenticity (Polit and Beck, 2013).

Credibility denotes the confidence in the truth value of the research, through believability of the findings and to demonstrate credibility to external readers (Merriam and Tisdell, 2016: 242). Credibility in this study has been enhanced by

comprehensive field notes, audiotaping and verbatim transcription; inter-coder checks; peer review and debriefing; and documenting researcher credentials. Finlay (2011) and Porter (2008) also endorse member checking, where the participants are sent the interview transcripts and research report so that they can corroborate with or recommend amendment to the researcher's original findings. All participants in this study were offered member checking. Only one participant asked to review the transcription and made minor amendments of terminology clarification, without altering any of the actual data, agreeing that this was an accurate reflection of the interview.

Dependability denotes the reliability of the data over time and over conditions (Polit and Beck, 2013). By maintaining and documenting an accurate process trail and journey of this research, the methods of data collection and decisions about the research can be available for external scrutiny (Finlay, 2011).

Transferability denotes the extent to which the findings can be applied in other settings, groups or situations. The research should provide a sufficient amount of descriptive data so that other readers are able to evaluate the applicability of the findings to other situations (Finlay, 2011; Polit and Beck, 2013). This has been addressed by providing the research design, procedures and sampling criteria outlined in this chapter.

Confirmability refers to objectivity or agreement between two or more independent researchers concerning the accuracy of the data, relevance and significance (Polit and Beck, 2013). Transcriptions and TA were shared and reviewed by both supervisors for collaboration and confirmability.

Authenticity takes into account how much the researchers have faithfully presented a variety of realities from the data and invites the reader into a vicarious familiarity of the participants' experiences being disclosed (Polit and Beck, 2013). This has been considered in the writing up of the findings.

4.7 Resources

Financial outlay for this phase of study was minimal due to using existing resources owned by the researcher or facilities made available from the HEI. The only true costs were occasional travelling expenses, paid for by the researcher's own personal finance.

4.8 Chapter four summary

This Chapter has discussed the rationale for the methods adopted in the Phase two research, which embraces the phenomenological design and answers the research question posed in Chapter three. It has justified the use of interviews for the data gathering approach, the purposive sampling strategy and the procedures for recruitment. There were a number of ethical considerations

adopted to ensure that the procedures were protecting both the participants and the researcher and all were embedded into the process for protocol design, data gathering and thematic data analysis. Finally, rigour for the chosen methodology was deliberated, with credibility, dependability, transferability, confirmability and authenticity elements interweaved throughout the methods selected to maintain the research trustworthiness. Following the granting of ethical approvals. Data gathering commenced in December 2015 and the findings are presented and discussed in Chapter five.

Chapter Five: (PHASE TWO) Findings and Discussion

5.0 Introduction

This chapter presents and interprets qualitative data, gleaned from the experience of managers working within English ASTs, each of whom have a responsibility for SACRM within their role. The total sample that contributed towards the data set was six participants. There were four Trusts which did not participate. One AST would not grant local R&D approval due to being unable to support educational studies from outside the trust and the other three ASTs could either not provide a key name for a person responsible for sustainability, or could not find a willing candidate to contribute towards the research sample.

The participating interviews took place between December 2015 and August 2016. The choices of discussion format, location and duration of each interview can be seen in Table 5.1. There was a total of 7 hours 34 minutes of audiotaped and transcribed data. Complete coding of the data was conducted across each dataset and patterns were then actively identified (Braun and Clarke, 2013b).

Six broad areas of enquiry were explored. These included the participants' areas of focus for sustainability and carbon reduction initiatives; their views and perceptions on what strategies are most effective; their experiences of their relationships when working with the Senior Management Team (SMT) on sustainability issues; their experiences of engaging operational staff in the adoption and execution of the Green Plan; and to gauge how proactive they

perceived ambulance organisations to be, with reducing the overall carbon footprint.

Table 5.1 Choices of discussion format, location and duration of each interview

Participant	Date conducted	Discussion format chosen	Location of Participant	Interview Duration
1	17/12/16	Telephone	At work	65 minutes
2	17/12/15	Web based video conferencing	At home	44 minutes
3	04/02/16	Face to Face	At work	68 minutes
4	05/02/16	Face to Face	At work	117 minutes
5	16/08/16	Face to Face	Visit to UoP	78 minutes
6	30/08/16	Face to Face	At work	82 minutes

Candidate themes were identified and after a period of reviewing and revising the transcripts (Braun and Clarke, 2013a). Four main themes were identified, each of which had a central organising concept. These themes are shown in Figure 5.1 and defined below. Each theme is supported with direct quotations from the participants, but due to word count limitations, additional quotations have been placed in Appendix 12, that reinforce the point of discussion.



Figure 5.1 Identified themes within Phase two findings

1. **Essential Leadership Contribution** - the perceived leadership and experience needed for implementing and maintaining sustainability and carbon reduction strategies within an ambulance organisation
2. **Willingness of the Workforce** – how an ambulance organisation enables or restricts the adoption of sustainable practices and a carbon reduction ethos.
3. **Targeted Successes** - The range, nature and impact of implemented sustainable and carbon reduction initiatives
4. **Future Ambitions**–Longer term objectives and ambitions for further sustainability and carbon reduction strategies

5.1 Theme 1: The Essential Leadership Contribution for Sustainability Change

Leadership and the ability to lead sustainability change management was a strong feature captured within the data. Several subthemes emerged from this (Figure 5.2), which outlined the importance of having a qualified, experienced and motivated manager at the helm, in order to implement and oversee strategic aims in SACRM.

5.1.1 Taking Charge

Within the last decade, implementing and managing SACRM strategies was a relatively fresh concept for EMS organisations (Pinzone *et al.*, 2016).

Subsequently, English NHS ASTs have created new, specially titled managerial roles to specifically innovate, implement and oversee strategy, which reduces carbon emissions as well as financial savings.

Length of time in the role

All participants had been in post for less than ten years, with the majority of them in post for the past two to four years. These appointments indicate that ASTs appear to be making a firmer commitment towards meeting their statutory duties by tackling their overall carbon emissions.

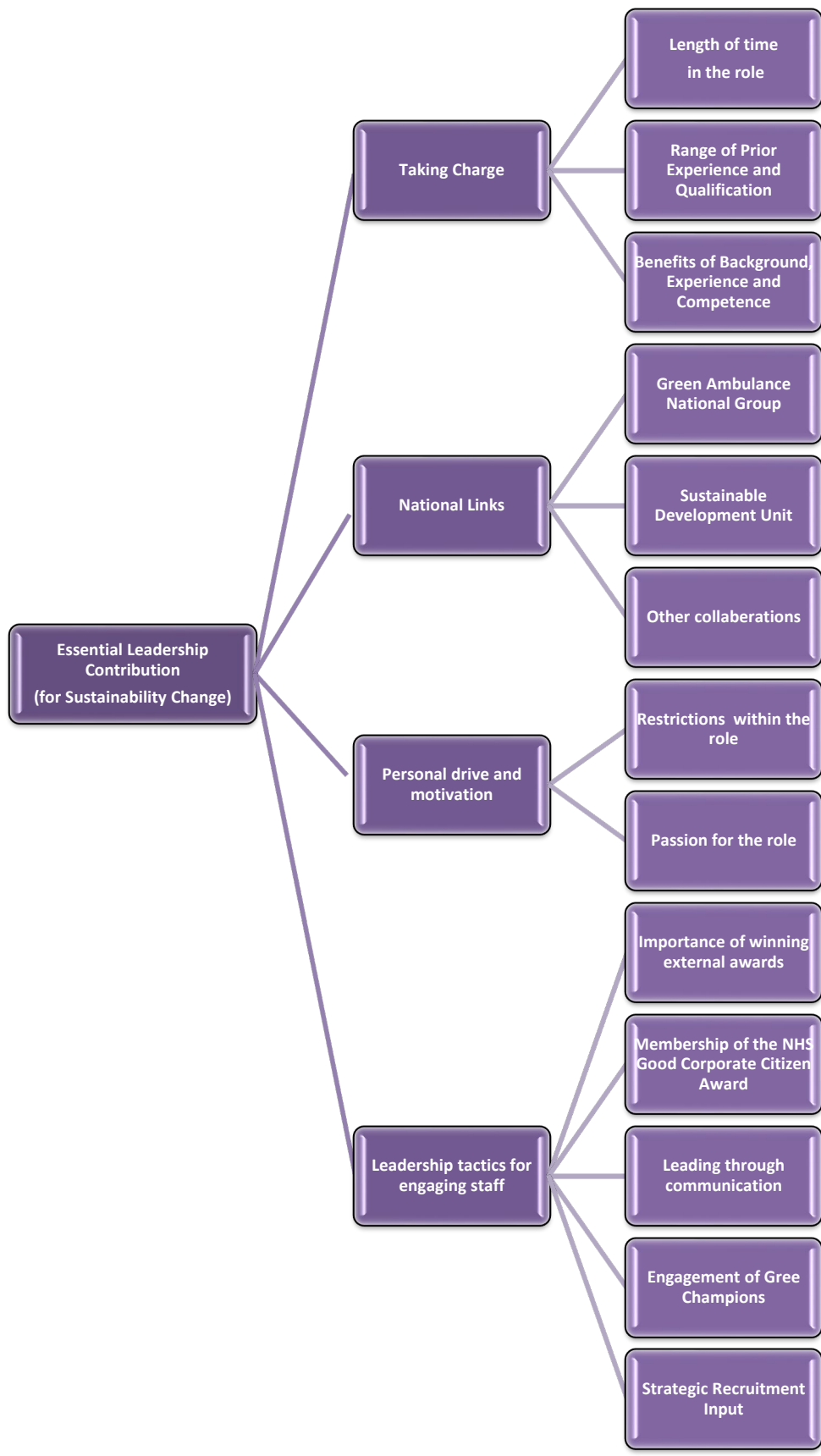


Figure 5.2: The Essential Leadership Contribution - needed for implementing and maintaining sustainability and carbon strategies

Some participants felt that they had been selected for their prior, higher level qualifications relevant to SACRM, whilst others believed that personal experience and proven successes with other organisations were the main drivers for their appointment. Previous experience can shape a better understanding of leadership style and adoption of the best approach to engage followers, or staff members (Barr and Dowding, 2019:28). These elements are crucial to a successful ‘taking charge’ process on appointment; qualities that are strongly advocated by The King’s Fund Commission (2011; 2018) and NHS Improvement (2019) on Leadership and Management in the NHS.

Range of Previous Experience and Qualification

The creation of SACRM Managers roles within English NHS ASTs has attracted individuals from a variety of experiential backgrounds. Only one of the participants had come from clinical (operational) experience, which had evolved into a managerial role due to their passion, drive and commitment towards creating a more environmentally aware Trust. By their own admission, this participant’s knowledge of SACRM may not have been as extensive as other trust appointments, or as qualified, but had been developed and self-taught by personal research.

“What I had, as far as tools to work with...when I started...was zero. I had no training in sustainability...or what I needed to know internally from a non-managership position. I had no autonomy in any Department and yet every Department comes in contact with sustainability or environmental issues. They didn’t know it at the time but that’s how it was.” (6)

Other participants had previously spent time as sustainability managers, environmental managers or consultants in largescale global organisations, ranging from the public sector (Local Authorities, Emergency Services, and Defence) to the private sector (Free-lance Consultancy and Charities), incorporating SACRM into business practices. Most had relevant associated HEI qualifications within environmentally subject related areas, ranging from undergraduate Degrees to post graduate Master's Degrees and Doctorates. Managerial titles of the new appointments were, however, noted to be inconsistent and varied across the ASTs. Additionally, not all of the participants appreciated the full extent of the remit implied by the job description of the titled position being offered, causing some ambiguity with their expectations within the role.

“Um, I’m not quite sure of what they wanted. They had spent a lot of time developing the job description and had all sorts of different Departments involved in putting it together. My expectation was that it would be similar to what I did before....to go and put in place sustainability programmes in line with Trust Strategy.” (5)

Some participants felt that there was a need for flexibility within the role to adapt to the organisational and cultural nuances of ASTs. Wankhade and Brinkman (2012) describe this as the need to consider ‘organisational reality’ with respect for cultural sensitivities, before embarking on change within an organisation.

Some of the participants were appointed to a particular department, such as Estates or Fleet and had primary responsibilities within that department with SACRM as a secondary ‘bolt on’ role, which was seen by some as a distractor

from their primary function of employment. This is further discussed in section 5.1.3, as it was also perceived as a demotivation.

Benefits of Background, Experience and Competence

Relevant qualification, experience and competence in this area was considered by the participants as essential to meeting the needs of their new NHS employers. The responsibility and accountability offered by the titled posts enabled the participants to exercise leadership and motivation, facilitating progress in expediting strategic priorities.

“Most people who’ve come into the NHS end up in quite a civil service mind set. The guy who’d been in beforehand, who had been doing the full Carbon Trust Programme....he took eight months to not assemble anything at all. He’d written nothing of a report. I came in [at] the beginning of December, had to have the report finished by the beginning of January. In the space of a month, I’d done the sort of thing which he hadn’t managed to do in a year. The consultancy background that had helped me on that front.” (4)

The experience of knowing what works effectively, was felt to have paid dividends within meeting organisational aims.

“When I came in...we started to review the carbon footprint...find out what our baseline was...and I suggested we went through the Carbon Trust’s Carbon Management Programme, which I had done previously with the [previous employer].....and was really successful.” (1)

Building on and augmenting others’ previous SACRM was also viewed as a primary focus by several of the sample group on initial appointment.

“There had been some sort of Environmental Group beforehand...but as I say...it was a completely new role. It’s to go and cover all areas of environment sustainability within the organisation...so that covers energy, travel, and procurements, waste and a few extra bits and pieces...[and] it’s supporting other departments on certain areas.(5)

However, some decided that due to inadequate reporting mechanisms, unproven calculations and naivety in previously set objectives, it was best to disregard prior work and implement well-proven processes, used with their previous employers.

“There was no sort of base line in place and there was limited structure. There was this...sort of a Sustainability Strategy, which was added into the Estate Strategy but no definitive strategy for a sustainability environment in the organisation. I scrapped everything...to go and start again.” (5)

For one participant, the role was also seen as spanning the divide between the SMT and the workforce, providing a conduit to operationalising corporate intent.

“Nothing had been done apart from designating a person on the Board as the contact for environmental issues and sustainability with other Trusts. It was from a high-level board position that they were talking to each other. I was that bridge and [the CEO] could see that I was keen to do that...so I’ve made that that bridge between the top and the bottom” (6)

Most of the participants perceived that their roles and job descriptions (as SACRM managers) had been developed by their current employers, with an element of blind faith. As with any new role created, there can be huge benefits of prior experience being brought into organisations, that encompasses a diverse range of expertise in subject knowledge, adeptness in project management and willingness to be the vanguard for SACRM change

(Anandaciva *et al.*, 2018; NHS Improvement, 2019). However, what is equally as important is the retention of these sustainability managers within the role.

5.1.2 National Links

An aspect of the SACRM role is to be a pivotal link point within other local, regional and national agendas. The sharing of documentation, opinion and future ambitions for SACRM was viewed as,

“...absolutely imperative really. Without collaborating with others, I don’t think that you’ll get really far. You know...for finding out what works and what doesn’t.” (1)

Inter-agency and multidisciplinary working appears to enable more than just information exchange. Being a leading role for SACRM within an organisation can be isolating, especially as the role was a new concept and was perceived with some scepticism.

“You’re sticking together and promoting good ideas...because I think a lot of [managers] out there...they’re on their own fighting a losing battle.” (3)

There were a variety of interprofessional networking opportunities highlighted by the participants, that were either EMS specific, health related or locality related (with other emergency services, local authorities and large corporations).

Notably the GrEAN and the SDU.

Green Environmental Ambulance Network

GrEAN was founded in May 2011 as a UK forum for AST representatives responsible for SACRM and promotes sustainable practices through carbon reduction programmes (Health Business, 2017; Greenfleet, 2020). The participants acknowledged that ASTs within the UK are very different to other NHS Trusts and because ASTs are principally fleet-based, they face many different and unique challenges in relation to SACRM. This was a viewpoint echoed in the international literature (Blanchard and Brown, 2011; Hess and Greenberg, 2011; Brown *et al.*, 2013; Harmer and Hignett, 2018; Percival, 2019). The participants felt that one of the main aims of the forum was the promotion of good practice, in order to reduce the carbon footprint nationally. GrEAN has unified ASTs in sharing information on trials and different technologies, ensuring that vital information was effectively disseminated around the country.

“It’s more of a networking platform for people to sit and share success...as well as share challenges...it’s a good networking platform.”
(2)

Some of the output examples are the publication of a ‘Green Passport’, a guide for all AST workforces to promote carbon literacy (GrEAN, 2011) and the first national carbon footprint assessment of UK ASTs to classify variances in the carbon emissions of each service. Participants viewed GrEAN as vital; adding that when funding opportunities or trials of products became available and required a speedy response in the submission of application documents, communication was rapid, open and inclusive of all members. This feeling of

cohesiveness amongst the members enhanced the morale of each of the participants:

“I found having that networking with other ambulance services, with people doing similar job roles, really helps to benefit you and keep you motivated, because it can be a very lonely job being a sustainability person.....because you don’t have anybody else. You’re in a Trust that the core interest is not about green stuff.” (4)

This unity and has led to a voice on larger, influential bodies, such as the AACE (2019). This gives the Chairperson of GrEAN a route to influencing national strategic direction, which was described by one participant (4) as a “*back door route*” to getting agreement when an initiative has been ignored within their own organisation. Access to AACE allows a direct voice to the decision-making managers of all UK ASTs, which collectively can create peer pressure into the adoption of ideas, as when one CEO stalls, another is ready to accelerate the initiative and take the kudos.

Participants highlighted that the personal qualities of the Chairperson of the GrEAN forum is a recognised driving force behind the group’s longevity, success and effectiveness.

“I think that [the chairperson] just directs and pushes us. Yeah and that does sort of encourage you.” (3)

However, there were challenges in keeping the GrEAN forum running. There was good representation from most ASTs; however, some of the participants noted that the commitment from some Trusts was waning.

“We’ve got most of them [ASTs]...even if we have a representative who isn’t quite the environmental manager, they are normally quite close to an environmental angle. Some people just don’t come to the meetings....and it’s always difficult to get a meeting location convenient to everyone.” (1)

The participants also related this to difficulties in finding mutually convenient dates for meeting, in a very busy workload of responsibilities.

“We don’t meet as often as we should because we’re scattered right across the country...it’s difficult with not getting the time for things” (3)

Participants highlighted that the lack of attendance to the forum, from some ASTs, may be due to competing priorities in a busy workload agenda. It was also suggested that it was indicative of a wider issue in that, in some of the absent ASTs, SACRM was not considered essential.

The Sustainable Development Unit (SDU)

Some of the participants had been working on interagency joint projects with the SDU. This was a national organisation, funded by NHS England and Public Health England to encourage sustainable health and care systems in England (SDU, 2017a). Since 2019, the work from the SDU has been absorbed into the new Greener NHS National programme (NHS England and NHS Improvement, 2019). The collaborative work with NHS Trusts enables the tracking of national and regional progress within the health and care system's ability to meet sustainable targets and provide promotion of further initiatives. The benefits of working at this higher strategic level, for those in SACRM roles, include raising

the profile of initiatives within EMS organisations and the distinctive challenges that they face at governmental level.

“I’ve worked with lots of different agencies to look at how we kind of respond to things like that ...and how that gets reported back to Government.” (4)

Often, this involves writing national policy for all ASTs, streamlining the rollout of universal strategic advantages and benefiting from economies of scale. Other involvements include participation at SDU conferences, where information dissemination keeps the participants informed of contemporary transformational change as well as ensuring that issues associated with ASTs are kept on the wider NHS’ agenda. This was felt as extremely important as very often ASTs are often overlooked in the family of NHS Trusts.

Other collaborations

The value of collaboration amongst interagency networks, such as Local Resilience Fora (LRFs) and local NHS partnerships were deemed crucial to furthering the promotion of EMS initiatives and gaining creative inspiration for future enterprises. Ideas from comparable organisations can be synthesised and applied to AST delivery. It also provides a ‘strength in numbers’ voice to lobby higher authorities.

“There’s also another Sustainability Working Group...up in [local area] all made up of NHS organisations. Another one has involved other local authorities and public sector organisations...and that is a big help because we all get together and discuss what our issues are.” (5)

5.1.3 Personal Drive and Motivation

Being a leading protagonist of SACRM within an organisation requires a personal drive and enthusiasm for the principles inherent within that role (Anåker *et al.*, 2015; Mitchell and Boyle, 2019). Two subthemes emerged that identified what participants felt were restrictions on their effectiveness at leading sustainability change. They also expressed how their passion and belief in what they were working towards, helped them to overcome those limitations.

Restrictions

Some participants felt that their ability to fully engage with SACRM enterprises was hampered by the fact that it was deemed a secondary responsibility, in their job description, to the primary managerial role within which they were appointed. Even though some participants were assigned a department, it was perceived that those in a 'titled' sustainability role, that were independent of other remits and worked across departments within a centralised headquarters, were more effective. However, even when employed specifically within a SACRM role, competing demands of the Trust often meant that they were also tasked projects not involving sustainability.

"It is a bit of a struggle as well...because you could easily be pulled off path. For example, I do have to work on other items as well [such as] the cleaning tender. I've been pulled on to do other work as well." (5)

This has been reported as a usual paradigm within NHS trusts. Role conflict can lead to emotional exhaustion, depersonalisation and fewer individual

accomplishments (Ghorpade, Lackritz and Singh, 2011). With the participants mostly coming from specialisms outside of the ambulance service domain, many found the organisational culture and the bureaucracy of the NHS a hindrance to accomplishing objectives in a timely fashion.

“I actually think how the NHS is set up...it could be extremely confusing when you're walking into it. It's very different to the private sector where everything made sense.” (5)

It was felt that the policies of austerity and the underfunding of NHS Trusts to provide services has made an impact on what could realistically be achieved, when taking into account the scope of the objectives that need to be accomplished and the added responsibility of working within dual roles.

“It's a financial issue...I mean our department is cut to the bone. They can't reduce us any further than they have done to be honest with you. It's annoying that when you look around...and in other organisations you've got one specific role of sustainability management as a separate role. Well I'm doing two roles. I'd like to champion [sustainability] more, but I just haven't had the time.” (3)

There was also frustration at not having an assigned budget or a high enough level of authority to autonomously act, without having to go through a line of accountability. Often, this was expressed as projects that sometimes stalled due to the time that this process took, thus missing deadlines for submission, or that the decision-makers involved were not sympathetic to the sustainability ethos and readily dismissed ideas as they were not congruent with their own priorities.

“Previously I had my own budget. That was very nice because you could obviously work out what you were doing for the coming year and say, put in, what money you needed. But here...you don't have any budget at all now. [You] either apply through a Department...and take it from their

budget ...or to go and put a business case together [for the SMT]. That's probably one of the biggest challenges I think.” (5)

This is further explored in Theme 2.

Passion for the Role

Despite the consternation that has been experienced when undertaking a SACRM role, the enthusiasm and depth of feeling for promoting a green agenda was highly evident amongst the participants, especially when they could see that their own AST had the potential to be a vanguard and role model for other organisations.

“I’m self-motivated because I’ve worked hard at what I believe is the right thing to do within [my Trust] and promote sustainability...because I feel so strongly about it. I believe the Ambulance Service has a lot to offer, but they don’t realise it at the moment,” (6)

Many saw themselves not as the ‘traditional’ or ‘activist’ environmentalist, but just a strategist who cared about making small organisational changes that could make a bigger difference to the global effort of carbon reduction; often adopting a pragmatic approach as a SACRM leader;

“When you think about it...I’m quite passionate about the environment. I’m not a ‘tree-hugger’, but I’m passionate about what we’re doing to our environment and we should all be taking more responsibility. Sustainability is just a new word for good housekeeping....if you invest well and correctly...you can save a lot of emissions... it’s just logical stuff.” (6)

Mitchell and Boyle (2019) identified that a leader's capacity to influence change and innovation is dependent on their ability to facilitate an encouraging environment. A passion for change can be a highly valuable tool when influencing the uptake of strategies with SACRM. However, passion may not be all that is required to embed a green agenda. One participant, when considering the genesis of conceptual ideas and the resistance that could be encountered when promoting strategies for adoption, offered a sage message.

“Well sustainability...it's about efficiencies...it's about being responsible. So it's a key aspect in our organisation to undertake. However, sustainability has to be a likeable priority...because I've seen sustainability [initiatives] fail.” (2)

So, it appears that there must be more than just energetic motivation when considering engagement with staff. Delivering effective task related results and accomplishment of objectives are equally as important within EMS organisations (Brophy, 2010:8; Foster *et al.*, 2013).

5.1.4 Leadership tactics employed for engaging staff

The participants had developed a unique toolkit of manoeuvres to augment the SACRM agenda into the organisational culture and encourage the engagement of the Trust's entire workforce. These strategies are an accumulation of what has worked in their previously employed posts, what has been gleaned from successful experimentation in other organisations (obtained from networking) or from naturalistic evolution of ideas since employment within their AST.

Importance of winning external awards

The kudos of winning high profile, external awards for sustainability initiatives was considered a huge driver for future engagement of the Trust CEO and the SMT.

“[Winning awards] is very important...Well we’ve won one or two prestigious awards and actually even the CEO is thrilled to bits. That’s the impact I wanted to get. It worked because our CEO now says sustainability is high on our agenda. That’s what I was after...even if I stop now I’ve actually woken people up...and that’s what it’s about.” (6)

Winning awards can influence the perception that strategic accomplishments were firstly needed and had value; secondly that they were led successfully to fruition, through independent scrutiny; thirdly, carries a huge degree of positive publicity to influence an organisation both internally and externally; and finally, they are an opportunity to promote good practice (Harrison and Jepson, 2015; Zadah, 2015; Lasrado, 2017; Bruni *et al.*, 2019). Awards can also indicate quality and value achieved through expertise which can give confidence in strategic performance (English, 2005; Surlemont and Johnson, 2005; Frey and Neckerman, 2009; Bruni *et al.*, 2019).

Organisational Membership of the NHS Good Corporate Citizen (GCC)

Model

One important accolade, which featured high in priority amongst the participants to attain, is the DH’s GCC Award for NHS organisations making a contribution to sustainable development (SDU, 2017b). It follows the broad framework model of six themes, which Trusts could register for, and measure themselves

against benchmark targets in transport; procurement; facilities management; employment and skills; community engagement; and buildings.

“My main goal...is to get the GCC Tool underway. I think some of those objectives within the GCC will really help us go forward....and I think that’s really where we need to go.” (1)

This award, launched in 2008, has since been superseded by the new Sustainable Development Assessment Tool (SDAT), which is a self-assessment system more aligned to the UN sustainable development goals (Hewitt *et al.*, 2019). Both tools, however, enable a focus on understanding sustainable development, development of Green Plans, and the annual measurement of corporate progress against recognised benchmarks.

Leading through communication

Effectively communicating sustainability messages to the Trust workforce and to the wider community was a topic frequently discussed. Some participants emphasised that timely and well-worded media messages were a significant way of keeping ‘green’ issues in the forefront of discussion. It was felt that regularity of press releases and poster campaigns improved information dissemination, advertising what was being done and why. Staff newsletters and monthly bulletins were a popular choice for dissemination.

“I will always try and make sure that actually whatever we are doing...it is re-iterated through communications to the workforce of why we are doing it and what the benefit is.” (1)

Strategy such as this also helps to evidence current SACRM activity to the SMT and bids for further funding of projects. The choice of wording and language code of the press statements was an important consideration; with a preference towards simpler, concise, explanatory and less corporate-like soundbites.

“I make sure that all our initiatives are advertised in layman’s terms in our weekly newsletter that is emailed around the whole of the organisation...and I have a regular column in the [Trust] magazine...and I try and round up what I’ve been doing, and why we have been doing it.”
(1)

One preferred method of emphasising how sustainability could be better understood was to offer visual and contextual advice on how individuals could contribute and the differences that one person could make, thus cementing the relationship between solo behaviour and the collective whole; not just in a work environment, but also in a socio-domestic setting.

“We report general information on how to save energy...not just at work but would help people at home.” (3)

Thoughtfully crafted messages were also used for influencing behaviour through choice architecture and ‘nudging’ individuals. One example given by a participant was how it was useful to be ‘shaming’ the workforce with documented figures on how much they waste. This helps to reinforce positive behaviour through a libertarian paternalistic approach.

“...we’ve kind of shamed people into doing it [disposing of waste] the right way. That was partly a cost issue....I just don’t think they even had a clue as to how much it cost to get rid of clinical waste...and when you told them...they looked in absolute horror....So that really hammered the point home, I think.” (1)

Hertwig and Ryall (2020) describe libertarian paternalism through the notion of ‘nudge’ policies, which involve non-regulatory and non-fiscal interventions that influence people’s behaviour into a preferred direction. These interventions can be both educative (through reminders or publicised results) and non-educative (which involves influencing a person’s cognitive biases or motivational deficits, such as loss aversion or desire to be seen as professionally adept (Hertwig and Ryall, 2020:1387).

Participants also elaborated on the importance of having representation at all of the key Trust subgroup meetings to ensure that SACRM was kept active on each agenda. Having a specific input into the terms and conditions of each subgroup and continual dialogue within the minutes, keeps all participants mindful of integrating greener policies or initiatives. Linstadt *et al.* (2020) has highlighted the difficulty in implementing initiatives in isolation without engaging the wider organisation, so having a coordinated and integrated approach within the whole organisation was deemed more constructive than in single departments. Participants indicated that where this worked successfully and the various subgroups engaged with a SACRM ethos, it was important to ensure that the sustainability managers communicated this to the wider Trust and the Trust Directors, so that they were given support, recognition and the credit; especially where further funding was dependant on positive actions:

“Our Estates Team is very shy and retiring and they do an awful lot of stuff. Our FLEET team...they don’t blow their own trumpet either...so I make sure that it gets reported...so the board can actually see it.” (4)

However, some agreed that the communication and dissemination efforts could have been better. Specific Trust Public Relations teams appeared not to have always been as proactive with SACRM media requests as desired. This often resulted in a need for the sustainability manager to either have the patience to keep pushing the issue to get results, or even to have the courage to bypass the paradigm organisational process, and initiate press releases of their own. It was felt that the 'red tape' of the communications department meant that often the message intended was 'out of date' by the time of dissemination.

"I didn't get my comms people to do it. They had enough on their plate, because otherwise by the time they did my green issue request, it would be out of date. So it was another thing I had to do." (5)

This is particularly important on the issue of the promotion of the Trust's corporate Green Plan to the wider workforce, leaving a question over having to use alternative means, such as social media, rather than the traditional internal newsletters and public relations releases.

"The [Green Plan] that's adopted by the Board and, at present, the only way that staff see this is when I put it on our intranet. So therefore, not many people are [able] to see it...only the Board and the Managers know about it. The only other way the staff are getting involved in sustainability issues is through the 'Green Champions' and that's it ...there's no other avenue." (5)

There was difficulty expressed in hosting meetings with operational staff due to the 24/7 shift rotas and the frequency of call outs when on duty. This meant that individual station visits and personal canvassing were necessary to get the sustainability messages out to the Paramedics and Emergency Care Assistants

(ECAs), but this was also highly impractical. The engagement of 'Green Champions' were one method of communication that was felt to bridge the gap.

Engagement of Green Champions (GCs)

Several participants expressed their desire to recruit volunteer 'GCs' or 'carbon champions' within the wider Trust workforce as it was seen to be an effective way of establishing communication throughout all of the employment hierarchy. These GCs were considered an active conduit for raising sustainability discussion across the wide geographical multiplicity of ambulance stations. Most importantly, it was felt that GCs could run SACRM promotions and foster discussions at local level with their peers, to inspire sustainability behaviours in others, through positive encouragement.

Some participants believed that their own AST had well established networks of GCs with two Trust sustainability managers reporting between 70-75 green ambassadors amongst their stations. Other participants still considered this 'network army' as a future ambition. Recruitment of GCs within ambulance staff was experienced as challenging though. One Trust manager (3) described as having some people with "*eyes on the ground*" but with "*take up being variable*"; because it was purely voluntary, desired numbers were never reached. It was also felt that peer pressure from colleagues opposed to green initiatives was a negative influence when it came to recruitment.

GCs can be influential in their promotion of mindfulness and wellbeing amongst ambulance station communities.

“...a few years ago I had a planting programme of putting fruit trees across the Trust...so I’ve got a 150 apples, pears and cherry trees across the entire Trust...my GCs helped me plant that. They begged for them to be on their station.” (4)

Simple acts of environmental enhancement can lead to health benefits at local level (NHS England and NHS Improvement, 2020). Humanising work environments can help individuals reconnect with their personal feeling of contentment and help alleviate anxieties and stress.

“...and it motivates staff to think differently about their work location. With all the issues that we have in the NHS... the mental health and wellbeing aspect.... it really benefits it. It’s something which makes them want to come to work.” (4)

There was a financial benefit observed with some stations, turning large areas of grass lawns into wildflower meadows. This eliminated the cost of landscape gardeners to regularly cut the grass, thus saving on estate expenditure.

The network of GCs does need constant review and supervision to keep the momentum and enthusiasm going.

“... you need to make sure that you’re talking to them and recruiting yearly because life doesn’t stay the same...they move on...so you need to keep recruiting...you need to keep getting the message across.” (6)

Champions are needed amongst OMs and SMT too.

“I brought on board managers as GCs because I’ve found out that they are attuned to what I believe we should do.” (4)

This is important for gaining support from the strategic management in implementing and embedding sustainability practice into the corporate agenda. This is further reported in Section 5.2.1.

Strategic recruitment input for green thinking protagonists

Currently, none of the participants had input into recruitment processes to identify suitable ‘green minded’ employees. Some have engineered a sustainability angle into employees’ job descriptions, but it was not exploited through questioning applicants at interview stage.

“I believe it’s actually in all staff job descriptions it’s just I can’t remember which section it’s in, but it’s just to say that this is something you need to be aware of and how we like to operate.” (5)

All participants agreed that this was an area for improvement. The recruitment, retention and embedding of GCs throughout organisational hierarchies, was seen as a positive and necessary step in the communication of sustainability issues. Actions and leadership promoted by these individuals can nurture a sustainability culture and positive peer pressure can influence a transformation in behaviours of the workforce. The network created can build critical staff ‘buy-in’ for initiatives (Linstadt *et al.*, 2020). However, the participants also suggest that recruitment of GCs can be problematic, with little evidence as to the true effectiveness, indicating a potential area for further research into the behaviours and attitudes of the operational workforce.

5.2 Theme 2: The willingness of the workforce in creating and adopting sustainable practices with a carbon reduction ethos.

When discussing the participants' experiences of interaction with the wider AST workforce, two main areas emerged: the inter-relationship with the Senior Management Team (SMT) and the Operational Staff. These were analysed and grouped into sub themes, outlined in Figure 5.3.

5.2.1 The Senior Management Team (SMT)

The SMT were seen as pivotal in the vision, planning, implementation and sustenance of SACRM strategies. The SMT have corporate responsibilities and targets under wider NHS policies and have opportunities to initiate savings in overall expenditure. All participants viewed the engagement of the CEO as essential, along with important allies within the Board of Directors. There were three topics within this subtheme; willingness to engage with sustainability; resistance to conform to the 'green' agenda; and considerations with contingency and succession management of managerial appointments that can alter the dynamic of SMT group commitment.

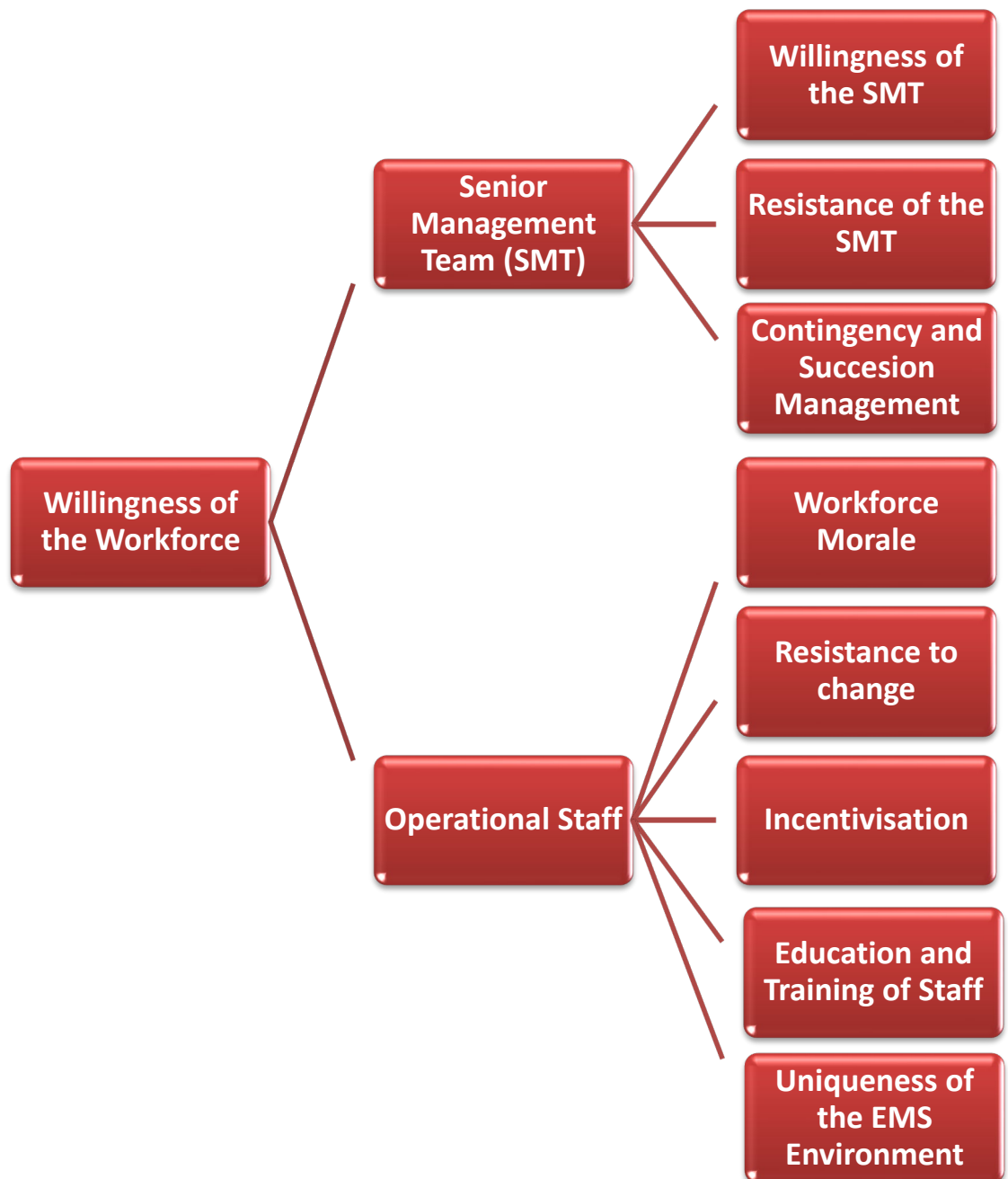


Figure 5.3: The willingness of the workforce in creating and adopting sustainable practices with a carbon reduction ethos

Willingness of the SMT to engage in the ‘green’ ethos

When exploring the participants’ experiences with the SMTs’ overall engagement with SACRM, it was identified that initially the process was difficult, due to them having a new role in the organisation and the challenges with

changing long held traditions of paradigm management. Getting access to meetings and membership of committees was challenging. Having constant access to SMT directorate meetings was a way in which the participants' viewpoints and proposals could be consistently heard.

Placing regular agenda items that were recorded in various types of directorate business documentation, allowed a more direct approach to promote 'green' issues and remind managers of SACRM.

"[the SMT] are definitely opening up now...because they begin to realise that we have targets to meet and we've actually got to meet these targets. They're being forced to actually make a change which is not a bad thing. I'd like to say that I've raised the flag and made them aware. I've now gained the knowledge that they need to make sure that they are where they should be at this point in time." (6)

Some participants discussed the effectiveness of having a standalone environmental management group, which benefitted from having at least one senior director within the membership. Other participants found that a personalised approach to individual managers gave opportunity to gauge a true interest in sustainability.

"There are a lot of people within any organisation that has similar views to you. You just need to embrace those views no matter what level they are and then build a team. The team can help you get your message across." (6)

This was beneficial for one participant, as the networking allies gained at middle management level, were eventually promoted into senior management, director

or CEO roles, thus expanding the positive circle of influence with proactive sustainability supporters.

Once the participants' voices were being heard at SMT level, there was a general movement towards a managerial 'buy in' as arguments for making organisational 'green' changes indicated potentially huge benefits to the Trusts. Financial savings were the prevalent incentives that drew managers to adopt sustainability initiatives. Once a reputation for enabling financial savings had been established, most participants believed that they were then engaged more willingly within directorate planning and were actively sought out to add more creative initiatives.

"...they are now starting to understand that things that I've been knocking on doors about for years are now starting to happen and I'm feeling really good about it," (6)

The experience of gaining support amongst the SMT members was felt to be a priority amongst the participants, but once achieved, positive strategic progress was eventually made. Even though the motivational emphasis may have been towards financial savings, rather than a reduction of carbon emissions, there was a great benefit in gaining mutual agreement within the SMT for implementing the aims of the Green Plan. These participants' experiences were believed to have helped embed SACRM into the corporate agenda ahead of the NHS commitment to a net zero health service, and the requirement to have an accountable, board level lead for leading the broader, greener NHS agenda (NHS England and NHS Improvement, 2020; Care Quality Commission, 2016;

2022). Despite the positive perception of progress, towards influencing SMT managers, it had its challenges with resistors.

Resistance of the SMT to conform to the 'green' ethos

Initial opposition to SACRM strategies, from senior Trust managers, was a widely reported experience amongst the majority of participants, with some participants reporting continued resistance from particular individuals over a prolonged period. Preliminary exploration of carbon reduction initiatives by the sustainability managers had met with antagonism, mostly over competing financial demands in a period of budget cuts and austerity, along with meeting other governance targets, such as meeting response times and performance measures.

"I've had financial constraints...so delivering stuff that I want to do has always been an issue...because I've never been given a pot of money. Green issues aren't high up on the agenda when you've got patient care to gun for." (4)

Some sustainability managers could see very 'quick wins' for saving money in certain departments, which additionally brought reductions in CO₂e. This was found to be a suitable tactic for encouraging early adopters and transforming resistors and laggards (Barr and Dowding, 2019), enabling participants to embed creative sustainable thinking into strategic plans and start the catalyst for some longer term investment. Investment that would require greater sums than initial rewards in the short term, but would be of enormous financial and environmental benefit in the future.

“If saving carbon doesn’t motivate people...then saving money should.” (3)

One participant postulated that,

“...finance really is the main sticking point. It might be a good idea if the NHS would actually ring fence funding.” (3)

Others added that greater incorporation into the Trust’s organisational culture would involve all managers to have responsibility within the green agenda and not just one.

“Sustainability is something we should all work together at...because it’s an encompassing title. You can’t just have one Department like IT switching off the printer when we’re going paperless and then another Department is creating two more times of CO2 through ignorance. It can’t be right...you have to do it together.” (6)

This is a viewpoint that is also advocated within NHS plans, where sustainable development is needed across the entire workforce and everyone has a role with embedding sustainability into everyday actions (NHS Improvement, 2019; NHS England and NHS Improvement, 2020). The advantage of having a proactive CEO, or senior Directors, within a Trust can initiate a top down mandate for other senior managers that are reluctant to engage. This is seen as vital to making a Green Plan work in practice as well as in principle. CEOs have an influential role on their SMT and the organisational culture. Fostering the value of the employee voice and the promotion of upward as well as downward communication, builds trust and open communication in healthcare (Adelman, 2012).

Considerations with contingency and succession management of managerial appointments

Once the cohesiveness of the organisational management was set and engagement in a green ethos was fostered, sustainability objectives could be expedited. However, a sudden change in that team dynamic can affect the overall esprit de corps (Trainer *et al.*, 2020).

“Unfortunately...our Head of Fleet is leaving. He has been really engaged with this and has worked with me by thinking of ‘hare-brained’ ideas...and what we can do to tackle it...and I think things might fall by the wayside. There is going to be a time lag in getting a new Head of Fleet in...so my biggest worry is that the good work that we have been doing might stall somewhat. But hopefully the next person we get will be kind of a visionary with the strategic element of it...because there is a lot of work to do.” (1)

Trainer *et al.* (2020) argue that disruptive change events with team membership can change the team-working dynamic and have a negative effect on productivity. They also add that disruption can be minimised by succession planning tactics, having a new member who is proactive, knowledgeable on the current team’s needs and aligns with the team’s thinking. Having some sort of sustainability competency, or conditional responsibility towards reducing carbon emissions, embedded into job description criteria for senior managers would indicate a Trust’s commitment to maintaining this momentum in a green agenda. None of the participants were influential enough with Human Resource Directorates or invited to interview panels to explore this when recruiting new managers.

“I have asked...[to be involved with recruitment]...because one of the criteria, on the Corporate Citizenship, is that every job description has sustainability running through it. I’ve asked for that a couple of times but

I've been unsuccessful up to now to get that in. It could even be part of the Manager training.” (3)

Contingency planning and succession management not only applies to the SMT, but also the role of the SACRM managers. When asked if they were to leave their AST, how confident were they that the network and the momentum that's carried through that strategic development period would carry on, some responded by cautionary feelings that;

“...it would take somebody with a lot of contacts to kind of fill my shoes. It would continue...but the problem is, it's not core business...it's not core integration, into the Trust. How they monitor it and how they kind of influence it...post me leaving...I don't know.” (4)

Persistent resistance to change can threaten progress on a manager's strategic direction (Lumbers, 2018; Barr and Dowding, 2019). Most of the participants had experienced initial opposition to sustainability change, but gradually they had used various approaches to gain SMT allies in order to implement and embed carbon reduction strategies within their Trust. Whilst SMT is one crucial aspect within the leadership of sustainability, change, however, does require the cooperation of all staff within an organisation, including the operational workforce (NHS England and NHS Improvement, 2020).

5.2.2 The Operational Staff

Not all of the participants reported that the SMT were the biggest challenge to the adoption of a green agenda, intimating that,

“... actually I don't think it's the board that are necessarily the issue...I think it's the wider workforce...and how our workforce are geographically distributed....and quite difficult to communicate with.” (1)

Understanding the participants' viewpoints on how operational staff reacted, actioned, or challenged the tenets of a strategic Green Plan was seen as paramount to the successes of the objectives within it. Topics affecting 'green' attitudes and sustainability behaviours explored within this theme included staff morale; resistance to change; incentivisation; education and training of staff; and uniqueness of the EMS environment. Each having an impact on how the participants' perceived the operational workforce engagement with SACRM initiatives.

Staff Morale

At the time of data gathering, a consensus of participants reflected that, morale amongst operational staff was low, due to a variety of historical and cultural pressures involving, low staff pay, extended working hours and constant pressure of meeting organisational targets. This can have a 'knock on' impact to peer pressure within station culture, where a negative attitude towards SMT sustainability initiatives can filter down to the more proactive newer recruits, thus creating enmity to change behaviours. Another participant highlighted that operational staff can be willing to adopt sustainability practice and generate ideas for creating a better working environment but a local station manager would be opposed to it, further deepening the low morale.

“The problem is they’ll be a Manager who goes “no” and instantly he’s goaded nearly 40 people who want to get involved in this, on station.” (4)

Low staff morale affects engagement with organisational objectives, job satisfaction and productivity (Wilkinson, 2015; Raihan, 2021). This is particularly pertinent since the COVID 19 pandemic, where burnout in the NHS due to excessive workload is at its highest in decades (Beldon and Garside, 2021; House of Commons Health and Social Care Committee, 2021). An employee’s journey involves perceptions of their experiences and social interactions, which shapes their attitude and behaviours, subsequently influencing their culture (Raihan, 2021). This led to exploring why staff were thought to be resistant to adopting SACRM changes.

Staff Resistance to adopt sustainability change

Some participants expressed that they have experienced a positive optimism towards operational staff embracing the spirit of the Trust Green Plan despite initial reluctance.

“They [staff] were extremely resistant at first.... but I think we’re making inroads.” (3)

However, participants have also experienced large pockets of disinclination. This was expressed in terms of a perceived antipathy between operational staff involved in care delivery and their SMT, dogmatism to retain traditional practice or simple ignorance in how to adopt good’ housekeeping’ behaviours on station.

“I think it’s just tradition...they like doing what they’ve always done. Nobody likes change...plus it’s not their money and it’s not their energy. I think it’s just a bit of ignorance on some people’s part...and a lack of willingness to conform and change.” (3)

One participant also related how staff were disincentivised by poor organisational management with contractors, when stations were complying with Green Plan good practices, such as the separation and recycling of their generated waste.

“...they [the staff] were meant to be recycling. A lot of the contractors that we had in place were saying that the stations were recycling...but when the [recycling] wagon turned up...both bins [general waste and recycled waste] would get chucked onto the same lorry. People would become quite despondent that they were bothering to save waste and then it would be just chucked onto one lorry.” (1)

Where resistance was encountered amongst the operational staff, the participants advocated more direct measures for implementation, as a management tactic, especially when it came to promoting better utility or fuel management within ambulance environments. This included initiatives such as installation of motion sensors for lighting and control of station heating by remote means, or modifications to the vehicular fleet.

“If I can’t change the mind-set of something you’re actually physically doing...we have to change the actual physical thing. So, with Estates...if you can’t get people to turn the lights off, you have a motion sensor. With driving, if you can’t get them to do Eco-driving we have to look at redesigning the vehicle. It’s a little extreme but that’s what we’re doing.” (4)

However, some participants perceived that their interventions also caused hostility, such as where a new heating system had been installed at some

ambulance stations, which automatically maintained station environments at consistent ambient temperatures, according to weather conditions. Because the operational staff could not control the temperature locally themselves, they characterised subtle antagonism through opening windows when it seemed hot (and left them open following a call out), or brought in additional electrical heaters to add additional warmth when cold. Both of which directly affected the thermostatic control of the main system, making it hotter or colder than it actually needed to be. Interestingly, some participants also highlighted that staff resistance to such measures met with acts of overt hostility.

“I’ve got ambulance stations being heated to 25 degrees, that’s tropical. We did have people sabotaging the units at one point.” (3)

“I know that other Trusts, they’ve actually put in place secure boxes over their heating controls...then staff have actually taken them off the wall by brute force. They’ve [then] put re-enforced boxes on them and that seems to work.” (5)

Cooperating staff members are extremely important to the adoption of the green agenda (NHS England and NHS Improvement, 2020). Persuading them to change behavioural habits and employ energy efficiencies, better waste management and reduction in non-essential fuel use is paramount to the success of a Green Plan. The study participants identified that a crucial aspect to this was the ‘what’s in it for me?’ mentality and how incentivisation softens the resistance.

“The staff are not interested in reducing the carbon footprint...it’s just all about saving money. That’s the impression that staff have I think. But it’s not about that. With Senior Managers...they can see the direct cost benefits...but from a staff point of view, it’s about “if we are saving money....where does that money go?” (1)

Incentivisation to adopt Green Plan strategies

It has previously been discussed in section 5.1.4 that recruitment of 'GCs' within operational stations are an integral tactic for the promotion and maintenance of sustainability objectives, but some participants expressed difficulty in recruitment of suitable candidates. Partly due to few incentives that could be offered to the individual or the station fraternity.

“So we advertised about a year ago for GCs...so that training will be given...and that it would be great if people who were interested would put themselves forward. But it is actually really difficult to create incentives, other than “you will have a really nice warm feeling if you help your trust”. I was really quite surprised by the lack of response” (1)

Effective communication between the SMT and operational staff was seen as fundamental to the success of adopting sustainability stratagems. That communication needed to be two way process of implementing strategic objectives and listening to feedback from staff on their experiences. Obtaining feedback from the workforce also involved good representation of operational staff, either within or being able to contribute towards the Trust's Environmental Groups. Where SACRM Managers have visited ambulance staff in their own working locale, they suggested that it helps to show a genuine desire to understand the conditions and viewpoints of those operationalising the Green Plan.

“The Environmental Group were mainly HQ Centric. There wasn't very much relationship with the rest of the Trust, so within my new structure, we're going to have representatives [from] different hubs around the Trust” (5)

This has been further enhanced by some participants producing 'sustainability programme packs', where the corporate language of the Green Plan has been translated into a generic and simple plan for OMs to follow. This has helped to focus stations on the essential tactics to make sustainability initiatives visible, manageable, measurable and most importantly, achievable. Prior to any staff engagement stratagems, leadership within the organisational hierarchy should adopt feedback routes to better understand what employees actually want most, and managers should provide an encouraging, sustainable culture (Beldon and Garside, 2021; House of Commons Health and Social Care Committee, 2021; Raihan, 2021). Although staff motivation cannot be commanded, it can certainly be encouraged.

Being able to offer incentives at local level, where significant savings could be made, may also influence the behavioural change needed for total adoption of a Trust's sustainability objectives. Decentralisation of budgets and therefore return of any savings was seen as giving autonomy to each station, which, in turn, individualises sustainability activities into visible clusters. When explored with the participants, none of them had yet employed any feedback or reporting mechanism to individual stations on their sustainability performance. Some could report at operational division level (a collection of stations under one manager), because each division was accountable to a budget (and its budget cuts), but could not identify any stronger or weaker stations within that mix. Some participants identified that by feeding back performance and equating that to station savings in financial terms, would not only incentivise staff, but could

also promote competition amongst stations to perform even better, adding a culture of creativity in new sustainability ideas.

Reinvestment of efficiency savings at local level was seen as a positive incentivisation for staff. When operational staff can see direct benefits for their efforts, they are more likely to maintain and enhance sustainability behaviour (Gunaratnasingam, 2021; Miller, 2022). Benefits such as how many extra pieces of equipment could be purchased, or how many extra resources can be bought for that saving, or for individual return (money allocated to the station individuals for CPD or welfare activities).

One participant did not view it in this way however, adding that sustainability was an organisational aim and so staff should be adopting sustainability as a mandatory objective in their working and as a moral condition. Reporting on performance was the only incentive that should be offered.

“It’s not appropriate for a public sector organisation to be given financial incentive to start doing what we should be doing in the first place. I did agree with them [the SMT] when they said they can’t introduce any financial incentive apart from the fact that Divisions know that they’re doing well in their very site” (2)

Having all staff employed with sustainability behaviour within their job descriptions and subsequent Performance Development Reviews was viewed as a good way to link measured action against individuals’ annual performance, which could then foster promotions or salary enhancements.

The Education and Training of operational staff in sustainability and carbon reduction management.

Education was discussed as an indispensable medium for dissemination of SACRM. There were varying differences in the amount of time dedicated to direct educational sessions for staff, with some ASTs having only a minimal slot on corporate induction events for all staff and some Trusts providing sustainability updates during SME days for clinical staff. All agreed that they would like to see much more time dedicated to the education of staff in sustainability issues. Some participants equated the time allocated to each of the educational sessions to the level of commitment to the green agenda by the SMT and where they place it in their hierarchy of importance. This was a cause of huge consternation amongst some.

“How do you get it across to your Training Department that sustainability needs to be discussed at an introduction level? We’ve got one and a half days to do induction...but sustainability doesn’t come into it. I’m becoming disheartened with that side of it.” (6)

There are a lot of professed benefits in having dedicated and regular educational sessions on sustainability for staff. Benefits such as giving context and background to Green Plan initiatives, opportunities to ask further questions or offer constructive feedback and influence sustainability attitudes, which in turn can alter sustainability behaviour. Participants viewed that SACRM should be embedded into EMS education as learning outcomes within curricula. The learning outcomes would need to make operational staff think about how they undertake their working activities, in ways in which they have not considered

before, such as the cost of resources, how they are used and how they are disposed of.

“It’s kind of the wider stuff that they don’t think about day to day...because you don’t have time to think about it as a Paramedic...but it kind of puts it into context. I just don’t think it hits home what the costs to the organisation are, away from the clinical side...and what it does cost to keep the organisation going.” (1)

None of the participants knew if sustainability education was being incorporated into HEI based curricula for Paramedics.

“I haven’t done anything directly with [HEIs] but I’ve had the CoP come to me and say “can you please provide me with some information?” It’s something I should do more of because then it would be ingrained before they even come here wouldn’t it.” (4)

Educating the workforce in sustainability literacy and competency is critical to the success of an EMS organisation’s Green Plan (Anåker *et al.*, 2015; Richardson, Allum and Grose, 2016; NURSUS, 2019; NHS England and NHS Improvement, 2020; Schwerdtle *et al.*, 2020). Unless staff comprehend and acknowledge the challenges faced by climate change, they will not be fully able to make a difference in the workplace. In the Delivering a ‘Net Zero’ NHS document, proposals have included nationally mandated training for all NHS staff, from induction through to widespread embedding in vocational and professional curricula (NHS England and NHS Improvement, 2020). Training and education in SACRM are perceived by the participants as almost non-existent within their ASTs, but Richardson, Allum and Grose (2016) advocate that sustainability knowledge can be improved through education and more positive attitudes towards sustainability can be achieved. This suggests that

there is a potential gap in the research about understanding the knowledge, perceptions, attitudes and behaviours of the workforce towards sustainability education.

The uniqueness of the EMS environment

Participants perceived that working in a time and space starved, peripatetic environment can be a challenge when adopting SACRM behaviours.

Participants reported that performance targets were increasingly difficult to maintain, especially after austerity cuts in overall budgets and resource allocation, creating a domino effect on frequency of call outs, staff stress levels and thus an individual's attitude towards the priority of sustainable behaviour.

Especially concerning waste management on the scene of an ambulance response, or in the rear of an ambulance vehicle.

"...the battle has been getting the mind-set changed on the way we get Paramedics to think about where they're putting things... and it's very difficult when your front line staff, driving out on the road and you've got somebody bleeding all over the place do you say "oh I'm going to have to slip this glove off". You're going to put it in the same location... you're not going to say "I'm going to put it in this bin, and this bin, and this bin." (4)

Interestingly, some viewed this increased activity as an even greater need to push the sustainability agenda, as more responses required more vehicles, which used more fuel and emitted more CO₂e gasses into the environment.

"...if people are ill...you've got to send vehicles out. People are living longer...so we need more vehicles...so they make more calls. We've got targets to make. It's a bit of a fighting battle really...we were trying to reduce emissions but the more vehicles we put on the road, the more they're going up." (3)

It was clearly felt by the participants that EMS environments present unique challenges, which have not been experienced in their previous roles for other businesses or industrial sectors. Church, Briggs and Tran (2019) found that staff compliance was affected by their perception that sustainability involved complex and time-consuming processes during stressful and high pressured situations. When coupled with Hallihan *et al.*'s (2019) observations that small or badly designed ergonomic working spaces in EMS vehicles, has an impact on how waste is managed, it may indicate that currently, operational staff do not work in the optimal conditions to enable sustainability. Whilst certain standard initiatives could be implemented within static buildings such as ambulance stations and headquarters, the ever changing, peripatetic context of providing a mobile healthcare service demands lateral and diverse problem solving. These are further explored in Theme 3.

5.3 Theme 3 Targeted Successes

Gaining an insight into what the participants had achieved in their post was important to understand what they believed were priorities, but also how they managed to achieve them. This theme encompasses the participants' experiences of what they have achieved within their Green Plan implementation. These interventions were analysed and grouped into sub themes, which include reduction in energy consumption; reduction in fleet fuel use; procurement and waste disposal; and confidence in the measurement of these issues. The themes are outlined in Figure 5.4.

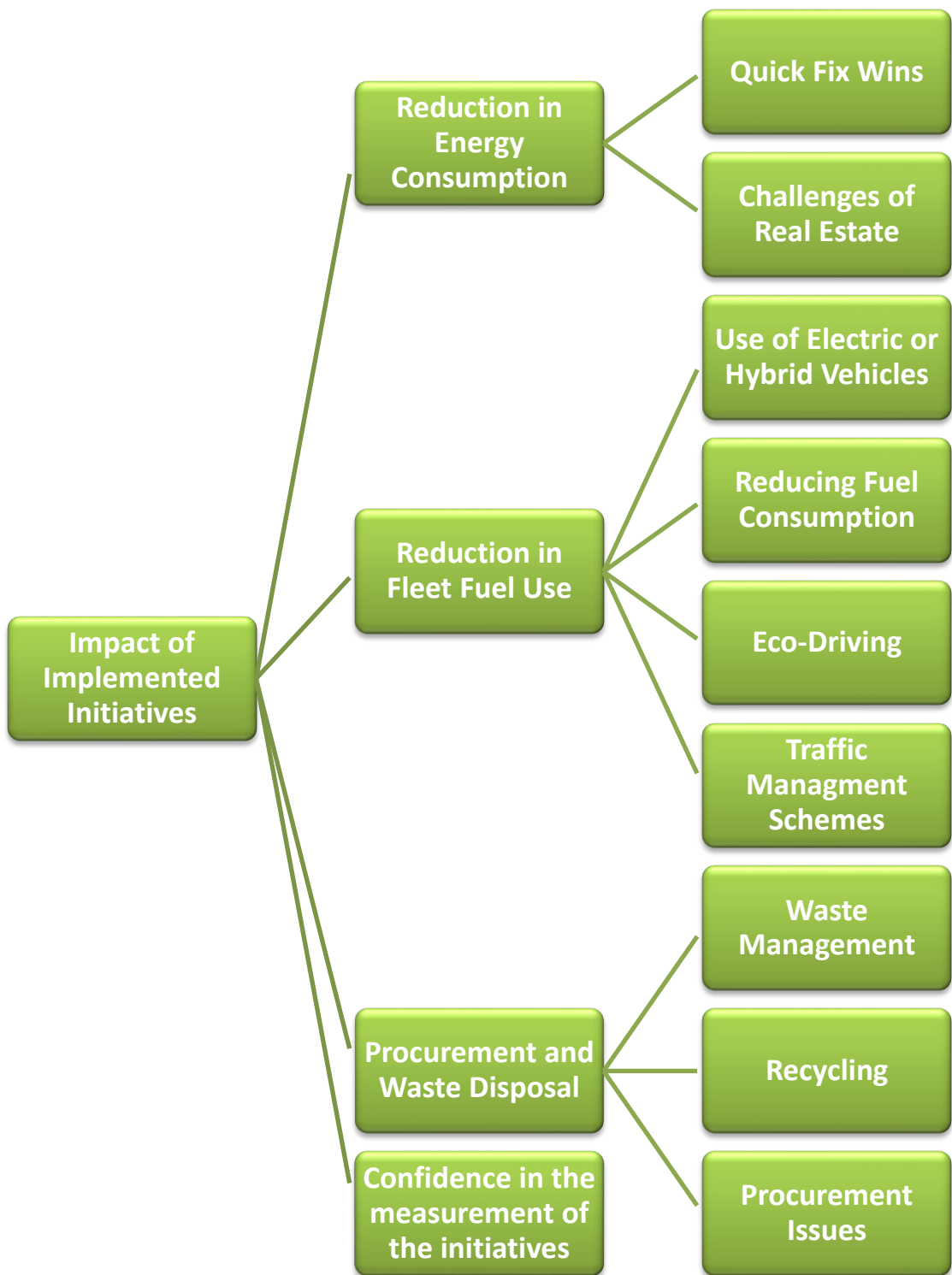


Figure 5.4: Targeted Successes - the range, nature and impact of implemented sustainable and carbon reduction initiatives

5.3.1 Reduction in energy consumption

The financial challenges of ever-increasing energy prices and the vulnerability to rising fuel costs of the transportational fleet can adversely affect both operational budgets and EMS system performance. Part of the drive for carbon reduction on static sites and real estate involves a reduction, or more efficient use of energy and utilities (Brown *et al.*, 2013; NHS England and NHS Improvement, 2020). There were a number of interventions implemented that some of the participants felt were immediate actions to take, in order to achieve quick and overt results. AST buildings and estates can be split into three main functional areas: operational (ambulance stations); control (Clinical hubs or dispatch centres); and corporate sites (e.g. Headquarters, or Training facilities) (NHS England, 2018b).

Quick fix wins

Early identification of carbon inefficient infrastructure was seen as a priority for some, which then provided a programme of works. The heating of real estate, including ambulance stations was felt to be a big source of both gas and electricity energy consumption by many of the participants. In one particular AST, it was noted that antiquated heating systems were being left on, even when the staff were not on station.

“You go into an ambulance station at 2 o’clock in the afternoon and no one would be there. The heating would be on at 26 degrees and the windows would be open. You wouldn’t do it at home....so why would you do it at work?” (1)

Part of the issue was that older heating systems could not easily be regulated for uniform and comfortable temperature.

“We were constantly getting complaints. People would be coming in at night and it would be too cold...people were coming in during the day and it would be too warm. They’d open the windows and the cycle would just go on and on.” (1)

This links back to the unpredictability of EMS demand and the balance between providing a comfortable base station for breaks and the likelihood of staff being away from the locale for prolonged durations. Garages and workshop areas were a particular frustration with unnecessary heating being used where it need not be.

“We’ve turned all the heating off in our garage areas...because we were heating garages and it was ridiculous...as there was no one ever in them...except when they got out of the vehicle into the accommodation area. That was a huge saving.” (1)

The heating of some stations was moved towards a Building Management System (BMS), which is an automated, computerised, intelligent system that heats or cools buildings according to a given set of parameters in relation to outside temperatures (Global Smart Energy and Controls, 2020). This not only removes the need for manual operation by workers at the site, but can also relay online data back to a central hub for analysis.

“We have an online BMS in 3 of our stations...where essentially we can go online and if they are a bit cold, we can turn it up a degree. In the winter we just knock it right back down...and it can save 25% in those stations on the gas bill. So essentially we have been taking the control of the heating off our staff.” (1)

The change to BMS was not always well received by the staff at the location. They were initially antagonistic towards the system, either through not understanding how it worked, or were displeased with the lack of autonomy in determining control settings.

“At first we had lots of issues with people saying it was wrong....and that they should be able to do what they like with the heating. In an ideal world that’s great but unfortunately you just can’t please everyone.” (1)

Once staff had gained knowledge in how the system operated and the benefits of an automated temperature control, cost savings were felt to be significant.

“So over the last 2 years, our gas has gone down by about 40% and we’ve had a 15% reduction in electricity across the trust. So those quick wins...and yes we’ve had to invest...they weren’t free...most of them were low cost or no cost.” (1)

Tackling electricity consumption was proving more difficult. Some participants outlined their immediate sourcing of ‘green energy’ electricity produced from more sustainable and renewable methods of generation, such as solar energy, wind turbine, and hydroelectric generation. Sourcing the providers of ‘green energy’ was felt to reduce the dependency on fossil fuel generated electricity.

Staff habits were felt to be a contributing factor to the electricity spend.

Participants expressed frustration with lighting and electrical items being left on, even whilst there was no one on site.

“I have a massive issue with TVs being left on. If we could have lights and TVs and radios and microwaves that were on standby that could go off when people aren’t there...that would be amazing.” (1)

Lighting replacement programmes were initiated by some participants, with the conversion to energy saving LED bulbs. Savings were felt to be made through additional automated lighting systems, which switch on when sensors detect movement and then switch off after a certain period. These were believed to be most effective in corridors, changing rooms, sluice rooms and toilet areas.

Energy efficiency was also felt by some participants to be dramatically reduced by going 'paperless' as a Trust. The cost from the purchase of paper, actual printing and then the storage of hard copies was recognised as excessive.

Paper use encompasses activities ranging from administrative through to Patient Clinical Records (PCRs).

"We are [Moving towards] electronic pay slips...the electronic time sheets...electronic expense sheets. No more printing. Paper storage is costing a fortune for us in square meterage of building space and outside in external storage units." (6)

The NHS had previously set a target of being a completely paperless service by 2020, and in 2014, there was a financial commitment from the DH for £1.8bn to improve the uptake of new information technologies (IT) (NHS England, 2014). Macaulay (2016) argues that this was a hard target to realistically achieve. This was partially due to slow uptake of training new staff in IT technical systems as well as convincing staff that electronic data use was a more convenient alternative. While a paperless NHS has the potential for making working lives easier, enabling financial savings and reducing carbon emissions, complicating factors again were the attitudes and behaviours of the workforce in adopting change.

In managing change, obtaining short-term wins is undeniably a successful influencing strategy, with unambiguous results, making it highly visible within the organisation as to what else can be achieved (Kotter, 2012; NHS Elect, 2022). By creating short-term targets and undertaking a swift programme of works, each win can further motivate staff. However, as resistance to some change was experienced by some participants, how the need for that change is communicated, is equally important (Kotter, 2012).

Challenges of real estate

Some participants expressed concern with how old the inherited real estate and assets were within their Trusts. Whilst this presented them with a disadvantage of additional cost for changing to more energy efficient systems, some also saw it as a timely advantage to invest, update and modernise the antiquated buildings, 'piggy-backing' sustainable alternatives onto already planned modernisation programmes.

"It's just that we've got a really aged stock...it's terribly inefficient. It made sense to target that...getting rid of what we can that's old and inefficient through leasing or building something newer. Investing more in greener technology." (3)

It was also the view of one participant that archaic building and systems meant a lack of effective monitoring and audit of energy and water consumption.

"I would like to go and install some automatic meter readers. We do have some half hourly meters on obviously our main hubs....but I'd like start measuring our data...otherwise you're relying on billing and that's not always accurate." (5)

Installation of automated monitoring systems, that could offer live data across all sites, were felt to be high up on the modernising agenda. In addition, the participants specifically discussed several initiatives within Trust buildings that had been implemented. These included pre-set temperature, automated, electronic heating systems linked to radiators and thermostats; motion sensor LED lighting; and installation of solar panels on certain sites. Solar panels were believed to be a long-term investment though, as savings from the investment may not be realised for several years, leading to some frustration at Trust SMTs resisting the financial outlay.

“...the stumbling block on it was the length of time for pay back which was eight years. Our Trust seemed to be concerned about the pay back. Had they done it when I wanted it done...three years ago...my calculations have shown that we would have at least saved £120,000 over those three years.” (6)

Water reduction strategies were also felt to be an important target area for utility modernisation, with some participants working directly with water utility companies to make improvements.

“...we work closely with other local water authorities and they’ve been providing all sorts of help...especially with potential leaks. When we identify an increase [in water usage] then they go out to site and check it for us...and also they carried out water audits on our sites. They are providing us with some free devices so we can fit into shower heads to go and reduce the water supply coming out.” (5)

Participants also reported the installation of electronic sensor taps and shower outlets across their real estate. Urinals that had older interval timed flushing systems were also a cause of contention.

“[There’s] a tiny station that’s got a huge water consumption. It’s because [their] urinals are flushing every few minutes. If a crew’s out...mostly out all day then they’re just flushing away.” (5)

AST estates and facilities are estimated to be around 1,000 sites and the spending on these accounts for over £100 million every year (NHS England, 2018b). Modernisation of AST real estate is an essential element to the Greener NHS national programme (London Ambulance Service NHS Trust (LAS), 2022). New buildings, major redevelopments and major refurbishments need more energy efficient construction that conforms to the ‘excellent’ standard of the Building Research Establishment Environmental Assessment Method (BREEAM), better asset performance can be obtained through, automated, measurable real estate management and validation of proven carbon reduction strategies (BRE Group, 2022a; LAS, 2022). Building lifetimes can more than 60 years, so whole life performance and impact of buildings on the environment is seen as essential to meeting a greener NHS (NHS England and NHS Improvement, 2020; BRE Group, 2022b).

Some participants reported that building efficiencies might also lead to some building closures, whilst others added that savings and efficiencies could be achieved through the merging of ambulance station resources with other emergency services locations.

“We are reducing properties, we’re reducing the footprints...and we are collaborating with other blue light organisations where we can share properties. So that helps both organisations reduce spend and reduce carbon emissions.” (3)

Merging resources close to the original site, ensures that performance is not affected in that locale, however it can save money through shared facilities and also raise money from the sale of land for reinvestment into modern resources that meet sustainable standards (HM Government, G.B., 2015; NHS England, 2018b).

5.3.2 Reduction in Fleet fuel use

In the UK, DCAs travel on average 120 million miles and use approximately 43 million litres of fuel at a median price of 99 pence per litre (NHS England, 2018b). Vulnerability to rising fuel costs can significantly strain AST annual budgets and the 2022 fuel ‘crisis’ has increased prices to unprecedented levels (GOV.UK, 2022).

Reducing fuel consumption

Strategies to reduce ambulance fleet fuel consumption, and thus carbon emissions, was felt to be the biggest priority amongst the participants.

“...my boss basically said ‘I want you to look at the fleet and the way in which we can reduce our carbon footprint on that front’...because 60% of our carbon footprint was essentially from the fleet...that is our core business.” (5)

To reduce noxious emissions from the use of fuel, some ASTs were reported to be using an additive to their diesel vehicles called AdBlue, which is a synthetic urea, which turns nitrogen oxide into steam and nitrogen. (Fleet Alliance, 2022).

Whilst this was helpful to reduce carbon emission equivalents, the product does not reduce the consumption of fossil fuels, so the focus from the participants needed to move on to the vehicle itself and how it operates.

The amount of fuel used in each ambulance fleet vehicle is determined by numerous factors, such as the traffic conditions, efficiency of the engine, vehicle weight, maintenance, speed at which it is driven, aerodynamic efficiency, engine idling, powering of ancillary devices and driver behaviour (Energy Saving Trust, 2016). The participants, in their aim to reduce overall fuel consumption, discussed some of these issues.

Most fleet vehicles being used within each Trust were diesel vehicles. Reducing chassis weight was identified as a targeted area, moving away from DCA designs, which have excessive chassis weights. Transitioning to a lower emission fleet of vehicles was felt to be crucial in reducing a Trust's carbon footprint; however, participants were also mindful that changing a whole fleet was a longer-term objective that required very close collaboration with their Trust's SMT and Fleet department. One quicker solution, promoted by some participants, was to limit speed of vehicles during non-emergency use, along with telematics monitoring of how vehicles were being used.

"We've put speed limiters on all of the vehicles...which are on our telematics systems...so all of the A&E vehicles are fitted with telematics. When not on 'blues' [an emergency call] an ambulance is limited to 56 miles an hour and a PTS [non-emergency patient transport service] vehicle is limited to 56 [miles per hour], but an RRV is limited to 70 [miles per hour]. Because we now have telematics, we can tell exactly how often our 'blues' are used which is only 4% of the time...which is

crackers. That created quite a big saving 2 years ago when it first came in.” (1)

One participant highlighted that this type of initiative still had its bureaucratic challenges for implementation by the SMT and Fleet department.

“We’ve telematics installed in all of our PTS. The bureaucracy meant that it’s taken three years to get that through. The finance has been there...but it’s a case of three years of negotiating between the different organisations and making sure stuff gets through.” (4)

The same participant also highlighted that there were negative aspects to speed limiters experienced by staff, particularly around driver safety.

“One of the big issues has been that they [drivers] put themselves in quite dangerous situations...because they’re overtaking they don’t have any power...so it limits out. We were looking at our PTS and having them limited at about 56 or 60 miles per hour and some of them had some really close near misses, because they hadn’t realised they had speed limiters on.” (4)

So speed limiters were felt to be a controversial tactic, in fuel use reduction, especially with its effect on driver behaviour. One area explored by one participant, which did not affect driver safety, examined the drag effect of speed by improving the aerodynamics.

“So we’ve looked at improved light bars through aerodynamics design. We went through a programme with [Named] University to have a look at how we could actually change the actual aerodynamics.” (4)

Research has indicated that an aerofoil-based roof design integrating the light bars can reduce the overall aerodynamic drag by up to 20% (Taherkhani *et al.*,

2015). This could reduce fuel consumption within one AST's ambulances fleet activity operations by 5% saving £350,000 per year and reduce carbon emissions by 250 tCO₂e (Taherkhani *et al.*, 2015). Better aerodynamics are also now a key feature of consideration within the National Specification for DCA design (NHS England, 2021a).

Engine idling was also identified as an area for change. Predominantly, engine idling was necessary for keeping the radio, lights and other ancillary medical equipment charged whilst away from static ambulance stations. Ambulances can be left secure, with the engine running through a system called 'Runlock' (NHS England, 2021a). On station, the ancillary equipment can be charged by an electronic hook up called 'Shoreline'.

"... there's a lot electrical equipment on the ambulances...so if you turn them off the batteries run flat...so past practice was to just keep the engines running and keep the batteries topped up as well. Obviously that's just kicking out emissions and using fuel...so all our ambulances now are on charge...they're not allowed to leave the ambulances on RUN-LOCK..." (3)

Alternatives to using 'Runlock' being considered by the participants included battery storage systems, such as hydrogen fuel cells and solar powered batteries.

"We are also looking at battery storage...the kind that they use in Sainsbury's home delivery wagons. So, when they turn the engine off...not everything defrosts in the back. We are looking at whether that has potential...but we are limited for space in the back of an ambulance." (1)

Several participants mentioned the use of solar panels on vehicles to charge batteries.

“We were the first one in Europe, nigh the world, to put solar panels on emergency frontline RRVs and it worked well. It’s been proven that solar panels put on the top of a DCA can now produce 30 amps...that 30 amps can run all of the equipment in the back of that vehicle, not actually requiring a secondary battery system. All you need is a storage unit for power. So cost savings, environmental savings are fantastic.” (6)

There was some scepticism however, with the data and figures to justify an effective use of solar panels for ancillary equipment, suggesting that more empirical research is needed before a financial commitment is made.

“Putting solar panels on the top of vehicles so that they can turn the engine off, without everything just powering down. We can’t just get that to stack up, whatsoever. [Named ambulance service] had the funding to do it, but that’s been pulled...as the calculations weren’t quite good enough from what I’ve heard. [Another named ambulance service] have done a few...and they swear by it....but I’ve never seen the calculations.” (1)

Several participants also raised transitioning to an alternative fuel sources as a key feature. Bio fuels were being used, but were not felt to be part of the longer-term strategy for reducing carbon emissions.

“It’s a good part of the mix at the moment...I mean most people don’t know it’s about 5% of diesel and petrol has it in anyway. It’s a bit of a counterproductive element really. I don’t think it can become full term because we don’t have enough land mass to grow everything that needs to go into the fuel that we’re using.” (4)

This viewpoint on biofuels very much echoes the sentiments already expressed by Hawkins (2008) and Brown *et al.* (2012a) (in Chapter two) where there can

be questions over its effect on engine efficiencies and disproportionate land use for growing and refining fuel sources.

One participant discussed hydrogen use, for their ambulance fleet.

“Hydrogen has got a massive potential. It’s ‘brown’ hydrogen at the moment...but if it was from a green source, it’ll essentially need electric in water and you’ve got Hydrogen. The problem is they haven’t got the infrastructure.” (4)

Hydrogen-powered vehicles are being researched and investigated for their future use and could hypothetically lessen emissions by 87 ktCO₂e annually (Hydrogen East, 2021; NHS England, 2021b).

Use of Electric or Hybrid Vehicles

All of the participants expressed their views and experiences of EVs as an alternative to using fossil-fuelled vehicles. Like the hydrogen fuelled fleet alternatives, EVs appeared to still be in the unproven and experimental stage for suitability in EMS delivery. Some staff were noted, by the participants, to be using privately owned EVs to commute to work and wanted their Trust to provide EV charging points at their place of work, however investment into an electric infrastructure appeared to be non-existent.

“I know a lot of the people in the Trust have bought their own electric hybrid vehicles and that’s flagged up the issue...because people are asking are we putting charging points in...but at the minute the answer’s no.” (3)

There was a noted enthusiasm from all participants to explore EVs as a zero carbon alternative for their fleets.

“Most of the vehicles are diesel at the moment. There are very few petrol if any petrol cars. We haven’t any hybrids...no EVs...nothing. Other services have been putting in place EVs and hybrids. It is an area I’d like to go down.” (5)

Nearly all, however, expressed how the technology was not yet suitable for all emergency vehicles to move towards electrically powered motors and that they were prohibitively expensive to implement, without any supported funding stream. One participant had been successful with securing external UK Government funding, from the Office of Lower Emission Vehicles (OLEV) also known as the Office for Zero Emission Vehicles (OZEV) to support a trial of EVs within their Trust, for non-emergency journeys (GOV.UK, 2021b).

“So we successfully got some OLEV funding...it took ages actually...I applied back in January, so two of them are HQ pool cars...used by everyone.” (1)

“I knew it was going to come out...so I was waiting for it to be announced...and we got an application in within three days to make sure that we were definitely in. You just have to be really quick about these things...as they are always quite short lived...it was the first people that got the applications in.” (1)

So, experientially, it was felt that managers had to be very cognisant and aware of what opportunities for funding were available and also to be quick on the uptake for application. The application of the trial demonstrated that for certain types of journey, EVs were making cost savings and reduction in emissions.

“We don’t do that much long distance driving in pool cars. We looked at all the mileage...what we were doing every day and realistically we were

doing about 4 miles...so well within the tolerable limits of an electric car. They've only been in 8 weeks...but it's created quite a big saving, because there was about 75% of funding towards them. They are far cheaper than running diesel cars. It's a really good way of testing them in a real environment...because I can see in 10 years' time, we will be running electric PTS vehicles and we will be running electric emergency care." (1)

The OLEV funding was 75% towards the lease costs and 75% towards the infrastructure costs, allowing ten charge points across the Trust and five vehicles.

The funding was for two years to trial them, but it was also noted to have given the participant the impetus to ask Nissan if they could also trial one of their larger vans in maintenance department that commutes between 12 -13 stations between them.

"So we are going to trial an electric van with one of them in the New Year...just to see how that 'cuts the mustard'. I think that that will be the next stage really." (1)

There was also a feeling amongst the participants that EVs were not quite yet at the technological level to meet emergency response operational requirements, with range on a battery charge, time of recharge and lack of supporting infrastructure being the main areas of concern.

"There's this wariness of range access with EVs. My problem has been we don't have the infrastructure in place to recharge them...so we have to position our pool cars in a location that would mean that they could do that. There's a network but it's pretty rubbish...which doesn't work for us. If you're having an operational vehicle it needs to recharge ideally within five to ten minutes. It's not going to happen." (4)

The perception of nearly all the participants was that EVs are one of the tools to meet a zero carbon fleet; however, the current technology meant that it was not yet suitable for emergency response vehicles that operated 24 hours a day, seven days a week. There was, though, a recognised benefit in non-emergency vehicle use, such as pool cars, maintenance vehicles and patient transport journeys that could plan their activities around range and charging facilities. Some also felt that the technology of hybrid vehicles (electric motors with fossil fuel engines as a dual capability) was suitable for emergency response and non-emergency vehicles. Hybrids offer the reassurance that range and refuelling was no longer an issue and offer a reduction in CO₂e emissions, fossil fuel consumption and better mpg; ultimately saving on fuel expenditure.

Traffic Management Schemes

One participant discussed their experiences of their Trust collaboration with a UK HEI, exploring a European project involving traffic light management schemes and how they could improve traffic flows for ambulance vehicle journeys.

“...think of it as a glorified Sat-Nav...that sits on your dashboard and essentially tells you how quick...or slow...to drive to the next set of traffic lights, for them to be on green. So, you will always sail through on green. It's reducing that 'stop-start' kind of time. The UK only has one site that's doing it and they want us to use them on PTS vehicles on the trial. We started the software on 11 PTS vehicles. They've seen a 60% reduction in times spent below 10 miles per hour...which is amazing...and an increase in 4 miles per hour overall when the vehicles are on those roads. There's only 11 vehicles and there's only like 20 junctions along this road that has the system on...so realistically for us, the savings are totally negligible at the minute. However, they can see about a 12% reduction in fuel usage...if you roll that out across the city. Not only would it have environmental and cash implications...it should be a smoother patient journey.” (1)

This initiative is similar to the radio frequency trial developed by Shankar, Gautham, and Ashvarma (2015). The technology however, is still very much in its inaugural stages and further research would be needed to measure the impact of the scheme across a wider geographical area in order to justify the estimated savings anticipated.

Eco-driving

Fuel consumption can also be influenced by driver behaviour, and some participants have explored the introduction of Eco-driving skills and educating the workforce in optimal driving performance. Eco-driving was a concept endorsed through the Green Passport (GrEAN, 2011). Training courses have been developed within some ASTs, via internal organisational driving instructors, as part of new driver qualification and refresher training for existing staff (Centre for Sustainable Healthcare, no date). Eco-driving skill development consists of various techniques designed to educate and influence the behaviours and habits of drivers. A sample of these can be seen in Box 5.1.

However, the practicalities of implementing the training programme for staff was felt to be highly problematic, due to the complex logistics in taking staff off operational duty with the financial cost in replacing them with other staff.

“I said to my boss...“well OK, one of the very quick wins is to have Eco-driving skills...so teach them. But I’m going to struggle to get more than ten Paramedics to come along unless it’s on their day off.” (4)

- Reduce drag – only use accessories that you need. Take off unnecessary roof racks, bike carriers and roof boxes as they affect your vehicle's aerodynamics and fuel efficiency.
- Plan your journey – avoid traffic, roadworks and getting lost.
- Check your tyre pressures – under inflated tyres are dangerous, increase fuel consumption and wear out quicker.
- Check your revs – change gear between 2000 and 2500 revs.
- Turn off the A/C – it uses more fuel.
- Take your foot off the accelerator when you don't need to accelerate. Staying in gear when going down a hill and not touching the accelerator, uses less fuel than coasting in neutral.
- Switch it off – turn off your engine when you are stopped. An idling engine can waste 3 litres of fuel/hr.
- Back in, not out. Reversing at slow speed with a cold engine is heavy on fuel. It is best to drive off steadily on a cold engine first thing and rely on backing in with a hot engine later on.
- Conduct gentle braking – delaying a gear shift until just before the engine starts to shudder will also save fuel.
- Anticipation – gauge distances and come to a stop using existing momentum.

Box 5.1 Eco-Driving skill development (Greenfleet.net, 2020b)

Dissemination of Eco-driving to all staff was experienced as a difficult task to implement, unless staff were motivated to complete

“I had real difficulty with [implementation]. The problem is when you've got staff that are at work, ideally you want staff to come during work time...but a lot of them came outside of their own work time because nobody would let them off.” (4)

The potential, though, was to engage AST Driving Tutors to incorporate the eco-knowledge into their core driver training. Participants did also question the longevity of knowledge retention and maintenance of Eco-driver behaviour.

“Eco-driving is a very difficult one to monitor long term because it’s usually like a 6 week ‘die off’. It’s something we haven’t monitored on a long term because I noticed that people were going back to driving like idiots after a while.” (4)

A few participants had previously quoted estimated savings that could be achieved, but also recognised that actual savings were very difficult to quantify. Some participants were introducing telematics in monitoring staff driving performance, to identify individuals that would benefit from Eco-driving training.

“We are trying to get some driver profiling put together and we are working with other ambulance services and our telematics provider...which is called ORTUS...and Cranfield University, to try and get what those parameters are...what is good driving and what is bad driving...and then trying to pick those individuals out. You’ve got to train the ones that are bad drivers.” (1)

Telematics, that offers ‘real-time’ data analysis of driving performance, could be one way to identify better driving efficiency. It shows a live status of an ambulance vehicle in terms of movement such as when stationary, in transit, moving with blue lights on, static on station, attached to a shoreline cable, waiting at hospital, and vehicle off road time (Ortus Group, 2022). In addition, fuel consumption, AdBlue levels and any warning lights are collated and provide the metrics that all help to cut fuel expenditure, reduce carbon emissions, improve road safety and compliance (Ortus Group, 2022).

5.3.3 Procurement and waste disposal

Tackling waste minimisation is seen as a priority factor in AST Green Plans (NWASt, 2020; YAS, 2020; East of England Ambulance Service NHS Trust (EEAST), 2021). This includes coordinated action with supply chain contractors on reducing packaging within procurement of equipment; pharmacological products and avoidance of single use plastic items where possible; reusing or recycling medical devices where appropriate; and the monitoring of waste being disposed.

Waste management by operational staff

One of the early actions to take, for all of the participants, was to coordinate and centralise waste contracts, ensuring that these were fit for purpose and cost effective. Historically, contracts appeared to have been costly, disparate and under supervised.

“[We’ve] changed the contracts because we had 150 different contracts with different organisations. [The waste manager] consolidated them all across the whole of [Named Trust], because there were basically Councils picking it up and we had to pay different rates for different things.” (4)

One participant also explained that their new waste contract included a collaboration with other emergency services, offering an even greater value for money.

Centralising contracts offered not only an economy of scale to reduce annual expenditure, it also offers more detailed data provision of the volume and what type of waste is being generated. This is recognised as a key strategy within optimal waste management practice (GB DH, 2013; Nichols and Allum, 2015; NHS Shared Business Services, 2022). A recent Waste Management and Minimisation Services Framework Agreement ensures that Trusts can access a straightforward route for engaging NHS compliant clinical healthcare waste services (NHS Shared Business Services, 2022). This agreement suggests possible savings of 12% for clinical waste and 15% for domestic waste.

Waste disposal was acknowledged by the participants to be behaviourally driven, so staff engagement was seen as essential for them to be more judicious in their use of equipment, reuse where possible and apply correct waste segregation and disposal in the right waste stream. Participants expressed that when waste segregation was done correctly, savings could be realised from reducing the costly waste streams and using cheaper alternatives that had less environmental impact. Some participants, however, were sceptical that staff were actioning policies correctly.

“[Waste is] managed between me and the Infection Prevention and Control manager...and our assumption was, because we both turned up at around the same time, that Paramedics knew how to dispose of their clinical waste. But it turns out that they didn't and we've really had to go back to basics about how we dispose and why we are doing it in a certain way.” (1)

There was some participant disagreement with how they felt about the ease of waste disposal, some believing that waste segregation should be an easy process to follow.

“It’s not really complicated at all...but I’d hate to think of what it would be like if we had a complicated waste stream. (1)

Whereas others recognised that the several different streams (and colour coding) were complicated and time consuming for staff.

“Waste Management strategy...within the NHS is so complicated. Its black bags, yellow bags, tiger bags, orange bags, green bags, black bags...and then if you wanted it incinerated versus if you wanted it to go to general wasteif you had some of the incinerator stuff in the general waste stuff... the whole of the general waste would then become incineration waste (4)

Incorrect waste segregation can be a costly error, leading to higher costs, when non-clinical waste is disposed of into clinical waste receptacles. As Pereira *et al.* (2013) advised, as soon as general waste is mixed with clinical (infectious or offensive) waste, it becomes contaminated, and thus becoming clinical waste itself, costing far more for disposal than necessary. For the NHS, the differences in cost per tonne for varying waste streams are significant, with the median costs calculated for infectious waste as £475; offensive as £241; municipal (general or residual waste as £142; and municipal recycling as £114 (Royal College of Nursing, 2019).

Some participants identified that the issue of incorrect waste segregation was due to the lack of facilities on ambulance response vehicles, noting that the contemporary vehicle design was not compatible with the space available for different types of waste bins. One participant also noted how waste segregation was affected by the critical nature of the work and that clinical care took priority, with waste processes being largely forgotten.

“The battle has been getting the mind-set changed on the way we get Paramedics to think about where they’re putting things. It’s very difficult when your front line staff [has] somebody bleeding all over the place.” (4)

So, there are a number of factors which appear to affect the behaviour of operational staff with their waste disposal practice. This is similar to the conclusions reached within the SLR (section 2.6 Theme 4); notably with time pressures (Church, Briggs and Tran, 2019; Hallihan *et al.*, 2019), vehicle design and accessibility of waste repositories (Church, Briggs and Tran, 2019; Hallihan *et al.*, 2019) and attitudes towards following infection control policies and applying sustainable practice (Richardson, Allum and Grose, 2016; Simpson *et al.*, 2017).

Recycling

Whilst there was no recycling reported during operational activity especially for consumable products, there were initiatives being implemented across ASTs for recycling segregation on ambulance stations and non-operational buildings such as training facilities and headquarters. It emerged that recycling was a

new intervention for some, as it had not been given much emphasis before their arrival as sustainability leads.

“Before I joined the Trust there was either no recycling collection, or it was just all of over the place.” (2)

There was also a reporting of the recycling of equipment and hardware. Selling or swapping items seem to be a theme between three of the participants.

Recycling significantly features in the strategic Green Plans for ASTs, with one Trust reporting an exchangeable £70,000 worth of furniture being saved from disposal into landfill through repurposing in the organisation, or reuse by charities, through the ‘WARP-it’ scheme (YAS, 2020; EEAST, 2021; Warp-it, 2022). Moving away from a single use mentality (along with a reduction in plastic use) and adopting a recycling ethos is fundamental to meeting carbon reduction targets, whether it is through using waste streams or repurposing of hardware and equipment. Good sustainable practice however, extends to the whole of the supply chain, including modifications to the way goods are purchased in the supply chain with more considered approaches to procurement (NHS England and NHS Improvement (2020)).

Procurement issues

Some participants were mindful of the way that the whole supply chain has an impact on what is being purchased for use, the materials that it is made from, the packaging that accompanied it and whether it can be used more than once. This meant liaison with procurement teams and reviewing tender documentation to ensure that sustainability was featured within the process.

“We’re starting to look at our suppliers and how we can reduce waste...making sure our staff are all trained up on sustainable procurement. It’s looking at the whole life cycle of a product. A lot of what we buy is basically disposable...but we are looking at stock rotation as well...making sure we’re not buying too much of something.” (5)

All participants felt that there was much more work to be achieved in this area. Indirect carbon emissions from the producing and transporting of goods are scoped as GHGP Scope 3 (World Business Council for Sustainable Development, 2015; NHS England and NHS Improvement, 2020). ‘Delivering a Net Zero NHS’ (NHS England and NHS Improvement, 2020) makes a convincing argument for the role that all purchase and supply chains must undertake in order to lesson ASTs’ carbon footprints. Tackling this area requires close collaboration with supply chain contractors, which involves having a positive sustainability influence within supplier organisational culture in decarbonising their own processes, the monitoring of supplier sustainability data, and ensuring that sustainability is driving the choices made with all purchases (LAS, 2022).

NHS England (2022c) has promoted several planned phases to help achieve this. From April 2022, the NHS Supply Chain has implemented a compulsory ‘social value’ weighting of 10% upon all NHS procurements, effective from April 2022 and from April 2023, the NHS will request all suppliers to produce a carbon reduction plan for their UK Scope 1 and 2 emissions (for all contracts above £5 million). From April 2024, that obligation for a carbon reduction plan will apply to all procurements.

5.3.4 Confidence in the measurement of initiatives with carbon emissions and carbon savings

Within the targeted successes theme, there were varying confidence levels experienced by some of the participants in how they were assessing and measuring the carbon reduction initiatives that they were implementing. Most were basing calculations on presumed or anticipated savings from the manufacturer's information. Some also found that tools used for calculating carbon footprints were not comprehensive enough to encompass the unique and complex factors of an AST.

“Savings in heating and gas is measureable by the quotes we use and we can get that information from the bills. The same with electricity but with all that LED lighting...you can't really isolate those checks... so that is a presumed saving.” (3)

“How can you prove something's worked if you haven't got the measurements in place...you know [have] confidence in measurements.” (5)

Having robust reporting methods and accurate calculations of carbon emissions are an essential component of confidence in the data (Brown and Blanchard, 2015; NHS England, 2022b). Decision-making and choices involving sustainability tend to evolve around modelling and impact assessments for new investments (NHS England and NHS Improvement, 2020), however the true savings should be reflected from accurate and definable data, post intervention, which is applicable to the nuances of each organisation. Jennings and Rao (2020) concur with this, but also add that complexity with reporting still exists, with large gaps in the data and areas needing investigation to ensure the accuracy of the carbon estimations and achievement of targets. They also add

that the carbon footprint of many medical procedures and practices remain unquantified and may be highly challenging to quantify. This leads to the theme of longer-term ambitions of sustainability managers and their closer collaboration with universities and research establishments to add empiric data.

5.4 Theme 4 Future Ambitions

Most participants expressed an enthusiasm for outlining what they wanted to achieve in the future in order to cement their sustainability status within their employing organisation. These were categorised into prospective objectives along with their considered interest for areas that would require collaborative research with HEIs. (These can be seen in Figure 5.5)

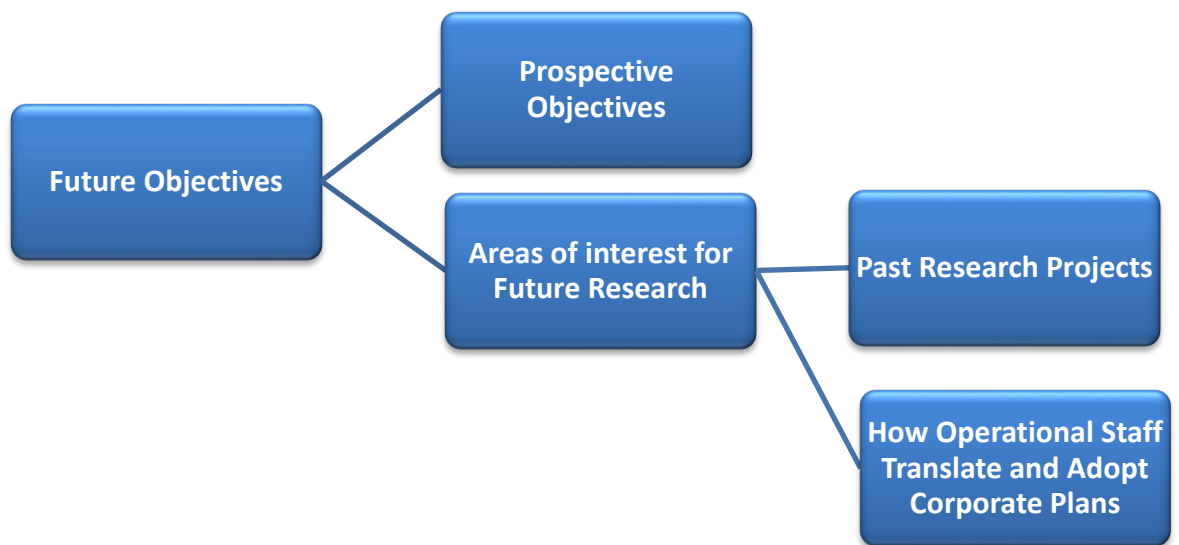


Figure 5.5: Future Ambitions - The long-term objectives for further sustainability and carbon reduction strategies

5.4.1 Prospective objectives

There was a variety of short-term aims that the participants wanted to explore. Some sought more publicly recognised schemes added to the credentials of the organisation, such as the GCC award. These were seen as vital to promote their activity and successes, whilst also bolstering prestige for future funding applications. Others expressed enthusiasm for projects that involved renewable energy generation in buildings, with solar panels and wind turbines.

5.4.2 Areas of interest for future research

All participants articulated eagerness for collaborative research with HEIs, as they saw this as a way to achieve empirical data that would quantify, qualify and justify sustainability initiatives. Some expressed frustration that ASTs were slow in adopting collaborative research initiatives, due to the pressures of maintaining operational activity, but were very keen to harness more opportunities.

“There’s a lot of stuff that needs to be done because when I did the aerodynamic design stuff...we were the first report that had looked at ambulances and I was like” how, how can that be?” (4)

Past research projects

Some of the participants had collaborated with HEIs before, so had created the networking with academia and provided the sampling platform for data gathering, with a few achieving positive outputs for publication.

“The projects I’ve been working with [Named] University over the past six years, have been from Waste Management through to Energy Management Awareness Campaigns and the outcome of them.” (4)

Other projects have included air pollution, heatwaves and climate related major incidents and impact on ambulance response times; vehicle design aerodynamics and impact on fuel consumption; and traffic light flow for ambulances on emergency calls. This demonstrates that ASTs are a relatively untapped resource for experimental and experiential research, offering a unique environment for primary research connected to sustainability (Holland and Dutton, 2019). There was, however, an area which the majority of the participants were fascinated by, which was the attitude and behavioural traits of operational staff, in their views and opinions on sustainability initiatives.

How operational staff translate and adopt corporate plans

The theme, which the participants most wanted to explore, was connected to how operational staff were implementing the proposals within each published Green Plan. They recognised that staff behaviour was a key component of the success in adopting sustainability initiatives and was a difficult aspect to measure or understand simply through surveys, often leading to a presumption that all staff are always compliant at all times. An interest was expressed in having primary research data, which understood what was actually happening within ambulance stations, across their Trust and regional boundaries.

“I want to know, how best to go and talk to our staff...what methods work...how to go and get things through to them, what motivates them to go and make [sustainability] changes. How that message is getting out to

people...it's very difficult to pin them down because they're always out and they work different shifts.” (5)

The SLR in Chapter two, identified a lack of research connected to the sustainable behavioural traits of EMS staff and how they adopt 'green' practices into their day to day working. Investigating how and why operational staff adopt the strategic aims of their AST's Sustainability Manager would be a beneficial area for future research. It would allow an in-depth understanding of staff attitudes, values, norms and behaviours, to allow a progressive response to change (Nichols *et al.*, 2013)

5.5. Limitations and Conclusions

Whilst the methodology and methods implemented for this phase of research has adopted measures to maintain the principles of rigour: reflexivity, adequacy, authenticity, trustworthiness and resonance (Braun and Clarke, 2013a; Cristancho *et al.*, 2018), there are some limitations. Firstly, there is a methodological limitation, in that the findings of the interviews are accounts of the phenomena, from the participants, rather than direct evidence (Green and Thorogood, 2018). Although the experiences of the participants' accounts have been faithfully represented, with the application of consistent reflexivity throughout, to avoid bias in reporting or interpretation, these are still verbally created opinions. So, there may be an element of a Hawthorne effect, or 'participant reactivity' with the participants offering responses that they feel that they ought to give, rather than what they want to give (Paradis and Sutkin, 2017).

Secondly, there is a sampling limitation with the number of participants. Despite gaining ethical approval from nine of the ten English ASTs, three trusts were unable to provide a willing participant. The sample group was highly purposive, as there is likely to be only one sustainability manager for each Trust, and thus the three non-participating Trusts may not have appointed such a manager with a sustainability remit, or that they may not have been enthusiastic or confident in taking part. Had all ten ASTs participated, this sample group would have had maximum representation. The findings however are still not statistically generalisable, but does have conceptual transferability (Green and Thorogood, 2018), not only to other UK ASTs, but also to international EMS organisations embarking on analogous journeys within carbon reduction management. Similarly, the findings may be of interest to other emergency service organisations with comparable strategic planning.

Thirdly, one of the interviews (participant 2) was initially conducted via video conferencing; however, the internet connection was sporadic and intermittent. Consequently, the interviewer reverted to telephone only, which somewhat affected the rapport and the quality of the participant responses offered. The data from this participant was limited and may have been more data-rich had the communication platform been more reliable.

The findings however, revealed a valuable insight into the experiences of SACRM Managers within English ASTs. Aspects included the challenges of implementing policy with SMTs and operational workforces; the factors that

incentivise an organisation into adopting sustainability change; how they considered staff resistance and how to overcome it; the specific areas to target with short term and long-term aims; as well as their opinions on what their future objectives need to be. This Phase two of the thesis has provided a contemporaneous 'snap-shot' of SACRM in NHS ASTs, but more importantly, has highlighted areas for further research, exploring the cultural attitudes and behaviours of the operational workforce in how they interpret and adopt the strategic plans within the policies, into their day to day activity in the field. Within Theme two (section 5.2.2) which discussed the willingness of the operational workforce, several areas were identified as focussed areas for further research. Such as why there was a perceived resistance of operational staff to accept and adopt sustainability changes and why they were not adopting sustainability directives, despite education and training being offered. This indicated a deeper exploration of the cultural activities encountered by operational staff in their provision of healthcare services, along with an understanding of the uniqueness of their everyday practice, in terms of healthcare process and how that related to sustainability effectiveness. This theme is carried forward into Chapter six, where the phase three methodological context is discussed and the research question formulated.

Chapter Six: PHASE THREE – Philosophical Positioning, Methodological Selection and Formulation of the Research Question

6.0 Methodological Context (Relativist and Social Constructivism Theoretical Positioning)

This chapter presents the continuation of the philosophical positioning discussion (from Chapter three) and leads to the formation and substantiation of the research question for Phase three, which evolved from the findings in Chapter five. Conclusions drawn from the previous chapter indicated a need for research into the working culture of ambulance service staff. This research would aim to gain a fuller, deeper and greater understanding of staff attitudes and behaviour concerning sustainability. Therefore a suitable research approach was determined that encapsulated how best to proceed.

The exploration of a culture, understanding more about the social or human situation that this group experiences, was best suited to qualitative methodologies (Goodson and Vassar, 2011). Approaches to any social inquiry should also consider how they are rooted in both the epistemological and ontological stances, in terms of their relatedness to social reality (Bassett, 2004; Rashid, Hodgson and Luig, 2019; Sullivan, 2019). There were a number of qualitative research genres to consider and choose from, such as grounded theory, phenomenology, ethnography and narrative inquiry, each with pragmatic and efficient ways of capturing data for improving service delivery (Higginbottom, Pillay and Boadu, 2013). Understanding the worldview of

individuals, studied *in vivo* and from their own perspective, however, required a person centred viewpoint, which enabled exploration of the meanings, expressions and values that individuals have (Savage, 2006; Holloway and Galvin, 2017; Daynes and Williams, 2018). A critical investigation of an individual's standpoint of what they do and how they make sense of their experiences, should incorporate subjectivity (Merriam and Tisdell, 2016:16), so a naturalistic philosophical paradigm was deemed best for this phase three study design. This aligned to the qualitative paradigm and research, conducted in natural situations (Daynes and Williams, 2018).

Skeggs (2001), Iphofen (2013), Reeves *et al.* (2013) and Rashid, Hodgson and Luig (2019) all argue that the study of individuals and the culture within which they function is underpinned by the ontological assumption that they can only be understood through observing them in their authentic, everyday world as the naturalistic setting. As previously discussed in Chapter three, Müller and Brailovsky (2020) and Dudovskiy (2022c) posit that humans cannot be separated from their knowledge, or how they interpret their world, and constantly move between small social lifeworlds or 'multiple realities' that have a variety of different meanings to different people. Iphofen (2013) adds that multiple perspectives suggests a 'relativity' about the world and how it is viewed. A positivist, realist position was considered, but rejected, in favour of a relativist ontological position, as it was deemed as the most appropriate positioning for the research design. Campbell and Lassiter (2015) also maintain that there are many different ways for human beings to be themselves, so inter-subjectivity should be promoted and valued. As knowledge is gained from

mental constructions, through a person's lived experience in a particular context and inter-personal relationships with others, an interpretivist social constructivist epistemological paradigm was also adopted (Goodson and Vassar, 2011; Iphofen, 2013; Klenke, 2016; Whitley and Siriwardena, 2022).

One of the methodological limitations identified within the adoption of the phenomenological approach in Phase 2, was that verbal accounts from individuals alone might not have truly reflect the phenomena under question and thus their actual actions and behaviours remain uncorroborated. So a research design was sought that explores what actually happens in the workplace rather than just what is imagined or perceived to happen (Cupit, Mackintosh and Armstrong, 2018). This led to the consideration of ethnographical methodology within the design for Phase three. This ethnographic methodology could then be used to inform, guide and underpin ethnographic data gathering methods that would provide the kind of full and rich data set that surveys, interviews or focus groups could not (Campbell and Lassiter, 2015).

6.1 The Case for Ethnography

Cutler (2004) argues that a primary component in understanding how a particular culture functions, is to obtain the cultural perspective from an individual's viewpoint who has the lifeworld experience in it. Daynes and Williams (2018) endorse this, by emphasising that within social enquiry, people do matter. They add that when exploring and studying social groups, the

combination of submersive observation of individuals, for witnessing behavioural actions, and interactive dialogue for their explanatory justification, is commonsensical. Ethnography is a very pertinent methodological approach for this, and has more frequently been applied in healthcare and medical settings (Bressers, Brydges and Paradis, 2020). This methodology is highly applicable for defining an issue when that issue is not yet clear, or embedded across multiple sectors within a culture, and people are better understood when combining a researcher's observation of behavioural actions with an insight into their beliefs to justify their actions (LeCompte and Schensul, 2010; Higginbottom, Pillay and Boadu, 2013).

Deriving from the Greek for 'a writing of culture', ethnography focusses on the cultural members, their behaviours and how they make sense of their world (Holloway and Wheeler, 2010; Reeves *et al.*, 2013). Higginbottom, Pillay and Boadu (2013:1) describe ethnography as the 'work of describing culture, learning *about* people and *from* them'. Its roots derive from anthropology and later expanded by social scientists who wanted to explore the holistic insights and the nuances of people who live and work together with shared experiences (Streubert-Speziale and Carpenter, 2007).

Savage (2000) argues that there is little consensus for ethnographers about the ontological and epistemological roots of ethnography and Bressers, Brydges and Paradis (2020) add that modern ethnography can be constructed from realism, constructivism, interpretivism, relativism and post-modernism.

Hammersley and Atkinson (2007), Parker (2007), and Iphofen (2013) all promote ethnographical research as having a strong foundation in naturalism and that the social world should be researched in its natural state and not controlled by artificial manipulation. They also add that the social world should not be assumed to exist through causal relationships or by the subsumption of social interactions under universal laws, but that it is constructivist because multiple realities or understandings exist. Human relations are centred upon derived social meanings, such as intentions, motives, attitudes and beliefs. All of these can mean different things, to different people at different times. Indeed, both Iphofen (2013) and Russell and Barley (2020) emphasise that the epistemological foundation of gaining knowledge from actions and thoughts are best understood from studying the social context that individuals belong to. Reeves *et al.* (2013) further emphasise that ethnography can provide a rich triangulation of real-time, observed social interaction and behaviours interwoven with verbal discussions on perceptions, values and beliefs. Ethnographic research processes can reveal the overt dimensions of a culture as well as divulge the covert, or hidden, subcultures that may exist, allowing an insight into aspects which interviews alone would not provide (Higginbottom, Pillay and Boadu, 2013). Whilst limited by the perception that ethnography is unlikely to be generalisable, it does have its own criteria for transferability and the depth of understanding that it achieves leads to further recommendations for other methodological research approaches because of its findings (Savage, 2000; Goodson and Vassar, 2011).

6.1.1 Traditional Ethnography

Classical ethnographical methodology emerged from early researchers such as Bronislaw Malinowski and Alfred Radcliffe-Brown, who conducted holistic and immersive studies of small remote rural societies. This was later embraced by the Chicago School of Sociology for use with more urban style societies (Reeves, Kuper and Hodges, 2008). Over the last century, traditional ethnography has proliferated across healthcare, education, business and social sciences (Reeves *et al.*, 2013). Ethnography is considered to be an experiential, exploratory and unstructured form of research (Müller and Brailovsky, 2020). It is not intended to be a single complete package of research, but acts as more of a springboard for opening up new perspectives and thinking, leading to the creation of more targeted and iterative research. Typically ethnographical research requires multiple data collection methods (participant observation, interviews and documentary analysis) over a protracted time, ranging from months to sometimes up a year (Reeves *et al.*, 2013; Pink and Morgan, 2013; Vindrola-Padros and Vindrola-Padros, 2017). It incorporates the emic (the insider view) and the etic (outsider view) standpoints, whilst recognising the actuality of multiple realities within social constructivism, and acknowledging that differences exist within social groups (Higginbottom, Pillay and Boadu, 2013; Bressers, Brydges and Paradis, 2020).

Jowsey (2016) also strongly emphasised that ethnography does not just include description of the data gathered, but also involves a theoretical and analytical interpretation. Consequently, the researcher's own positionality, subjectivity and

preconceptions must to be considered; thus involving a high degree of reflexivity in how they interact within the environment as well as how they construe and report the findings (Savage, 2000; Goodson and Vassar, 2011; Webster and Rice, 2019). This reflects the relationship between the emic and the etic; and the comparisons of what people are observed to do, with what they ought to do (Bassett, 2004; Iphofen, 2013).

A fundamental principle of qualitative research is that when a researcher is studying other people's lives, they are inseparably connected to what they study (Klitgaard *et al.*, 2022). Reflexivity, in ethnography, concerns the tussle between being a researcher and being a member of the culture. Participant Observation has a dual role of both an insider and an outsider, that intimately places the researcher inside the cultural group, as well as having to observe the social world and the host community from an external perspective (Streubert-Speziale and Carpenter, 2007; Wind, 2008). Indeed, in some ways, the very act of a researcher being present within the environment, arguably changes the culture (Streubert-Speziale and Carpenter, 2007; Wind, 2008; Daynes and Williams, 2018). Once within the field alongside the participants, the researcher must be very astute to the aims of the observation, whilst simultaneously building a close working relationship in the environment. Researchers, thus have to consider how they might have an impact on influencing the activity, or even altering the culture, whilst immersed. Therefore, researchers need to be clear about their own participation throughout the research design (Klitgaard *et al.*, 2022).

Reflexivity is a mixture of self-examination, self-awareness and reflection about how the researcher and participants think (Parker, 2007; Iphofen, 2013). It incorporates the reasoning behind our judgements, what the focus may be on, what is overlooked or taken for granted, how questions are asked or answers interpreted, and characterises the findings in writing (Rashid, Hodgson and Luig, 2019). Reflexivity is indispensable in ethnographical research (Pink and Morgan, 2013). No researcher can take an entirely objective posture in understanding and re-counting another's culture. Patton's (2015) suggested triangulation of reflexive questions provided a solid foundation for reflexivity practice (see Figure 6.1) and was adopted as part of the self-analysis during the study.

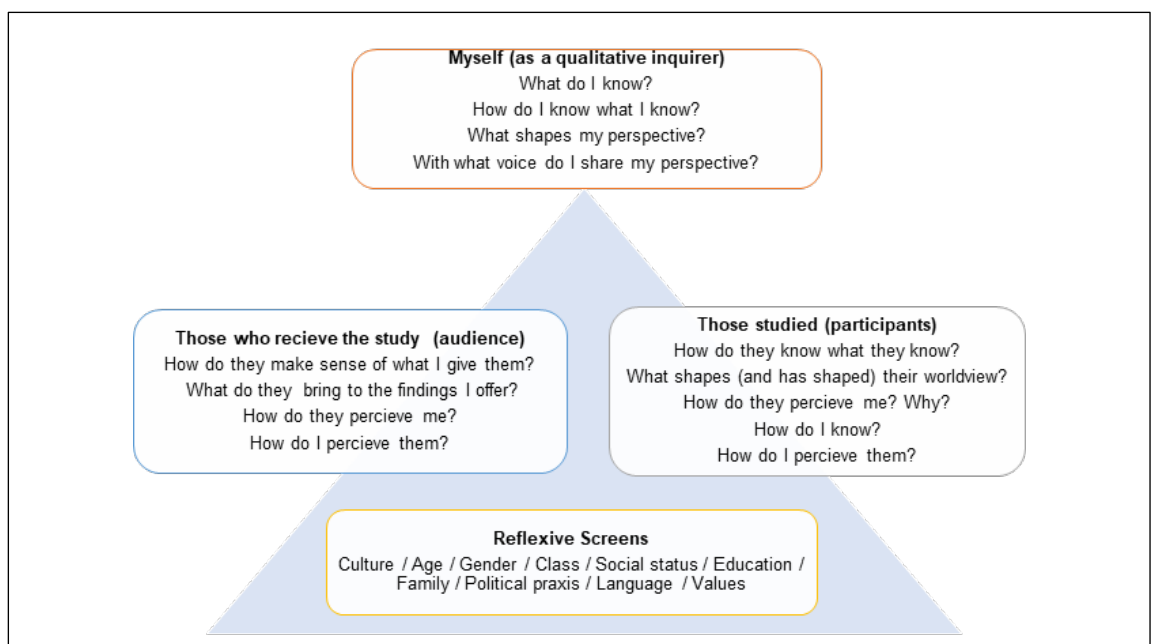


Figure 6.1 Reflexive Questions: Triangulated Inquiry (adapted from Patton, 2015)

It enabled reflexive thinking from the perspective of the study participants, the researcher and also the audience for whom the findings are intended.

6.1.2 Observation

One of the defining feature of ethnography is participant observational data gathering techniques within the fieldwork, also known as 'immersion' (Savage, 2000; Rashid, Hodgson and Luig, 2019; Webster and Rice, 2019). There is, however, a difficult blending of participation and observation, with a variety of levels (Seim, 2021). The depth of immersion can vary from the overt to the covert, so the position and justification of the form of participation is essential. Gold (1958) presented a typology of research roles (Figure 6.2), outlining a continuum of immersion that defines the level of participation ranging from the complete observer to the complete participant (Pope, 2005; Reeves *et al.*, 2013; Takyi, 2015; Seim, 2021).

The 'Complete Observer' (or passive observer) (1), is where the researcher has no contact with the participants, but is hidden and observing at a distance (Merriam and Tisdell, 2016:145). This level involves observations via video recordings, live video links, Closed Circuit Television (CCTV), or observations from behind two-way mirrors. The 'Observer as a Participant' (2) implies that the ethnographer has a field relationship with the participants, and is overtly known to the group as a researcher; however, the participation is secondary to the data gathering (Merriam and Tisdell, 2016:144). This is accepted as a peripheral membership role and not as an active member (Adler and Adler, 1998, in Markham, 2018). The researcher observes and intermingles closely, has a rapport with the participants, but does not participate in the activities constituting core membership of the group.

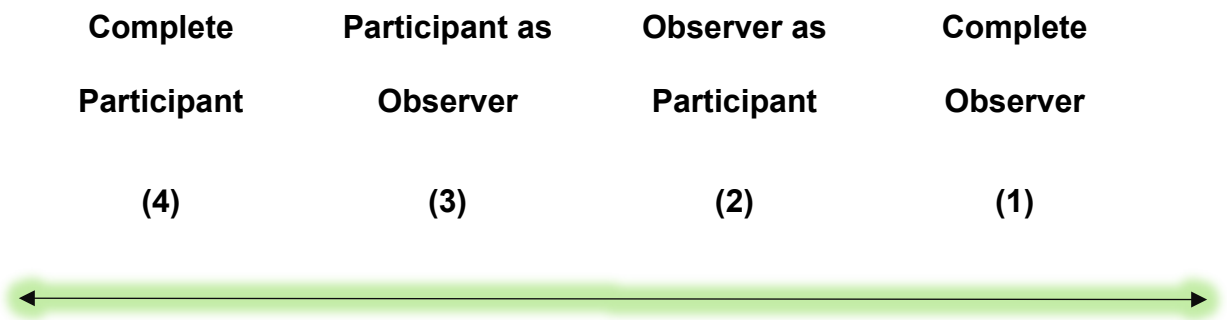


Figure 6.2 Gold's typology of research roles (Gold, 1958; Reeves, *et al.*, 2013)

The 'Participant as Observer' role (3) is where the participants overtly know the researcher's observer activities, but the data collection is secondary to the researcher's participation in the group's activity (Merriam and Tisdell, 2016:144). The researcher is present at, involved in and gathering data as a member of the group, but is participating fully (LeCompte and Schensul, 2010). This is also known as 'embodied ethnography' or "enactive ethnography" (Monaghan, 2006; Holmes, 2013; Wacquant, 2015; Hancock, 2018; Seim, 2021). The last role, the 'Complete Participant' (4) is where the researcher is actively part of the group but is covertly concealing the observational role from the group, to avoid disruption of the natural activities (Merriam and Tisdell, 2016:144). Often referred to as 'going native' this level can avoid any potential Hawthorne effect in the data gathering, but does have questionable ethics as it involves research by deception (Iphofen, 2013). This can be circumnavigated by another level that was later introduced called Collaborative Partner (or marginal native), where the role of the researcher is close to being a 'Complete Participant' (4), but the investigators identity is made known to the group, but not the subject under investigation (Merriam and Tisdell, 2016:145) . Through the latter three levels ('Observer as Participant (2)' to the 'Complete Participant'

(4) with exposure in the field, relationships are built between the researcher and the research participants as well as an in depth understanding of the environment that they work in (Webster and Rice, 2019). This then allows contextualisation of what participants do and say.

The 'Observer as Participant' role (2) has the advantage of allowing a researcher to access settings that are harder to enter as a 'Participant as Observer' (3) if they lack the appropriate qualifications or experience in the role (Seim, 2021). The ease in gaining a point of entry, however, should not be the limiting factor for choosing this level of immersion, as the 'Participant as Observer' (3) may expose the researcher to more tacit knowledge, hidden talk and unspoken or honest truths due to being more integrated and part of the cultural group (Seim, 2021:5). Wacquant (2015:5) was also a strong advocate for the 'Participant as Observer' role (3), arguing that an ethnographer must "dive into the stream of action to the greatest possible depth, rather than watch it from the bank".

Seim (2021) offers an alternative approach by advocating the merging of the two styles of 'Observer as Participant' (2) and 'Participant as Observer' (3) into what he described as 'Hybrid Ethnography'. Seim (2021) was influenced by Roth's (1983) review of two ethnographical studies within a US EMS organisation: Mannon's (1981) *Emergency Encounters* and Metz's (1981) *Running Hot*, where the former adopted the 'Observer as Participant' (2), and the latter as the 'Participant as Observer' (3) role. The terminology changes

slightly between authors. Table 6.1 outlines the equivalent changes in phrases used. The numbers have been included to also outline how they equate.

Table 6.1 Comparison of ethnographical observation levels of immersion terminology between Gold (1958) and Seim (2021)

Gold (1958)	Seim (2021)
Observer as Participant' (2)	'Participant Observation' (2)
'Participant as Observer' (3)	'Observant Participation' (3)

Both Mannon's (1981) and Metz's (1981) methods were found to be valid, however Metz's study was deemed to have gained a slightly enhanced field depth, through better intimacy within the worker's relationships. Seim (2021) then mixed both approaches for his own ethnographical study within a private EMS ambulance company. He initially conducted 'Participant Observation' (2) and then replaced the 'ride along' or 'third manning' role by becoming an Emergency Medical Technician (EMT), working as an assistant to a Paramedic, for the same company over a nine-month period. The transition to an 'Observant Participation' role (3) revealed that ambulance staff appeared less prone to providing general and clichéd answers about EMS work when questioned as a related employee. Moreover, as an employee, he had access to organisational emails, gained access to company online message boards, was privy to operational staff meetings, and began to communicate with other EMS staff more regularly via social media messages. Adopting a hybrid ethnographical position, thus allows a flexibility to move between roles, in terms

of field positioning, analytic gaze and data assembly (See Figure 6.3). This is further explained in Section 6.2

Field positioning refers to the flexibility of the researcher to move around the social environment to observe diverse personalities and different working environments. When placed as an 'Observer as Participant', choices can be made to move around the organisation, as the researcher is supernumerary to the usual manning rota, rather than in one fixed location, with an allocated crew member. Therefore, from a data gathering perspective, what is lost in depth from being an employee, is gained in breadth as a third-party observer.

'Analytic gaze' refers to the 'Participant Observation' and 'Observant Participation' preference of diverse methods of viewing the world. 'Outward gazing' refers to the focus on other people that are interacting, passively witnessing activity, whereas 'inward gazing' refers to the experiences and observation of oneself as being part of that activity. 'Participant Observation' offers an outward gaze first and an inward gaze second and 'Observant Participation' offers the reverse opposite.

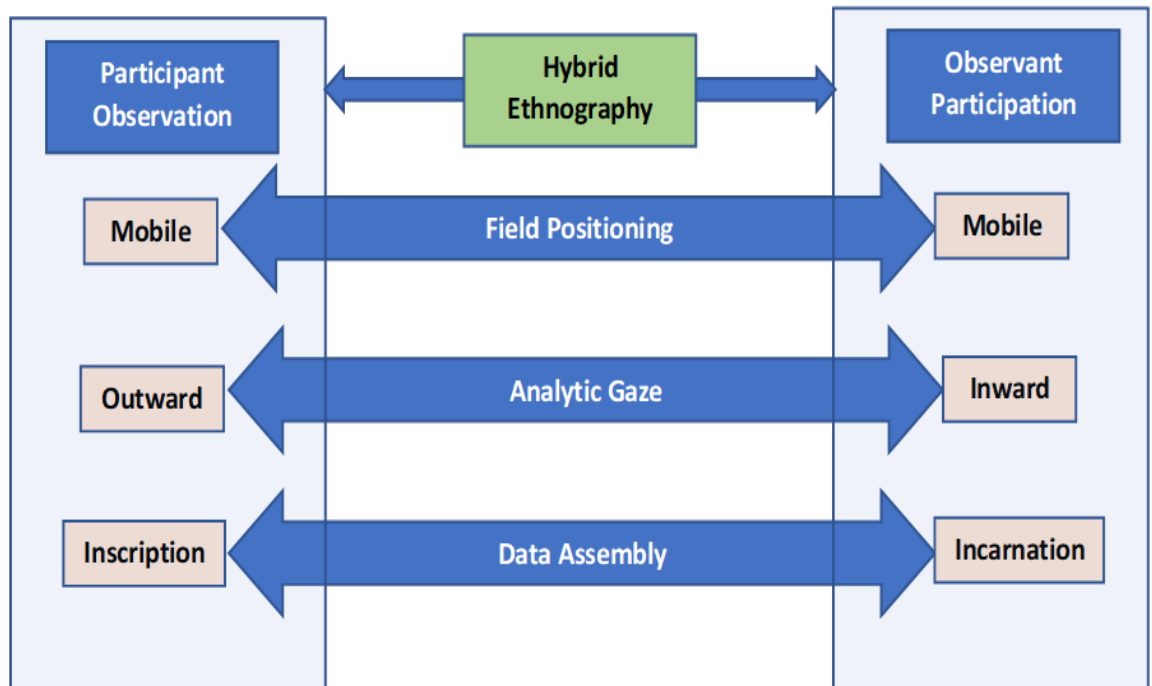


Figure 6.3 'Participant Observation' (2), 'Observant Participation' (3) and Hybrid Ethnography (adapted from Seim, 2021)

The differences in both the field positioning and analytical gaze mean that the data assembly will differ. Observational data, describing experiences and observations, are usually captured through field notes, either as handwritten notes or as audio voice recordings from the researcher, both during and immediately after their immersive encounters (Rashid, Hodgson and Luig, 2019; Webster and Rice, 2019). 'Participant Observers' characteristically make notes within the field and then expand on those musings later, away from the activity. 'Observant Participators' are less able to do this and field notes are scarcer when the activities being observed need the researcher's full concentration on the task in hand. Documentation is more difficult and so experiences are more likely to be stored as recollections to be translated into text later. Both versions

of data assembly involve an experience before writing (i.e., a form of incarnation before inscription), 'Participant Observation' leans more towards inscription over incarnation and 'Observant Participation' vice versa.

Ultimately, though, the level of immersion was better determined by how the researcher role was thought to influence the data being collected, if they themselves are participating within the very activities being observed (Seim, 2021:5). Wind (2008) suggests that interactive observation goes both ways, with the participants trying to understand what the researcher is doing (and not doing) and saying (or not saying). So, a continuous compromise of when and how the observations take place is needed during the field activities.

Wind (2008) proposed a redefining of participant observation as Negotiated Interactive Observation (NIO) as a more suitable method to define ethnographic fieldwork in healthcare systems. Wind (2008:80) recognised that by being present in the field and being part of the culture, participant observation could affect how interactions between the participants and the researcher took place, through either puzzlement, anxiety, or excitement. Wind (2008:87) therefore suggested that the concept of NIO captures what happens when a researcher is doing fieldwork without assuming that they become one of 'them'. It allows researcher participation in activities that does not directly affect or influence the overall research objectives, but also ensures that they retain an outsider, etic stance on the activities that are to be observed. This concept bridges the gap

between being an observer as participant and being a participant as an observer.

6.1.3 Focussed Ethnography (FE)

Bressers, Brydges, and Paradis (2020) posit that ethnography is often viewed as a deliberate and intensive immersion, and is not effective in short-term durations. Within the last few decades, however, Health Service research has adapted classical ethnographical methodology into a more suitable subcategory, with rapid ethnographical periods, rather than through a long-term engagement (Vindrola-Padros and Vindrola-Padros, 2017; Cupit, Mackintosh and Armstrong, 2018). These periods typically traverse a few weeks or up to a couple of months (Reeves *et al.*, 2013). Examples of these include, Rapid Assessment Procedures (Scrimshaw and Hurtado, 1987) Rapid Ethnographic Assessment (Bentley *et al.*, 1988) and Focussed Ethnography (FE) (Knoblauch, 2005). Hughes *et al.* (1995:61), Vindrola-Padros and Vindrola-Padros (2017:321) and Müller and Brailovsky (2020:36) describe these adaptations as 'quick and dirty' techniques, that incorporate the complexities of service delivery, the social and cultural factors influencing healthcare provision, and the emic practices of care provision in much more intensive and shorter time frames.

There are some authors, however, who are sceptical with this hybrid evolution, debating what should be considered under the 'ethnographic label' (Van Maanen, 2011; Pink and Morgan, 2013; Cupit, Mackintosh and Armstrong,

2018; Müller and Brailovsky, 2020). Seim (2021) highlights that disagreements around items of analysis, case selection, and the politics of representation still exist. For some, time duration is seen as a key element to providing rich data and thick description, where the fieldworker immerses 'heart and soul' into the environment, often at the expense of removing themselves from their own social world, in order to experience the same conditions that others experience, day in and day out. (Goodson and Vassar, 2011; Van Maanen, 2011). Classical fieldwork also posits that the anthropological starting point is from a state of innocence (or near innocence) of the culture to be observed: thus suggesting that an extensive period, in a single setting, is needed to build rapport and build frameworks of thoughts and topics through thought and experimentation (Goodson and Vassar, 2011).

However, rather than being superficial and classed as a limitation, FE retains the 'essence' of classical ethnography and is more of a means to creating alternative ways of knowing about a certain aspects of people and the cultural context within which they participate (Pink and Morgan, 2013; Cupit, Mackintosh and Armstrong, 2018). The main difference of FE from traditional ethnography is the practical considerations of what is practicable within the timeframe available (Rashid, Hodgson and Luig, 2019). The reduced immersion time is recompensed by other types of intensity, such as having focussed research objectives, being data intensive, better selection of informants and purposeful entry points into the participants' lives, often involving multiple sites (Knoblauch, 2005; Pink and Morgan, 2013; Rashid, Hodgson and Luig, 2019; Müller and Brailovsky, 2020). FE is more of an 'ethnographic place', which allows certain

economies of time to be made, during the research (Pink, 2009). The concept of the 'ethnographic place' positions the researcher as the focal point central to the action, right from the start, with their research intentions clearly outlined to the study participants (Pink and Morgan, 2013).

FE goes beyond simple observation, in that participants are also asked potentially intrusive questions, to corroborate and understand why certain actions were taken. FE can be particularly useful in a healthcare context as the shorter durations also impose less burden on the research sites, the participants and potentially patients (Cupit, Mackintosh and Armstrong, 2018). On a more pragmatic note, there is also the association between the duration of fieldwork and research deadlines, finance and resources (Pink and Morgan, 2013). Within this thesis phase, FE offered a more reasonable methodology for the funding and resources available.

6.2 Why a Focussed Ethnographical Methodology was chosen for Research in UK Ambulance Services

This Phase Three research adopted a relativist ontological stance, with an interpretive, social constructivist epistemological positioning (see Figure 6.4). The exploration of attitudes, values and behaviour are contingent upon social and cultural environments (Iphofen, 2013). Ethnography was determined as the most appropriate methodology, as it offered a rich, holistic insight into operational ambulance staff's views, knowledge and actions and reactions within the environment of which they work. It offered a comprehension of

sustainability culture, perspectives and behavioural practices as well as an understanding of staff attitudes towards organisational initiatives (Reeves, Kuper and Hodges, 2008; Vindrola-Padros and Vindrola-Padros, 2017).

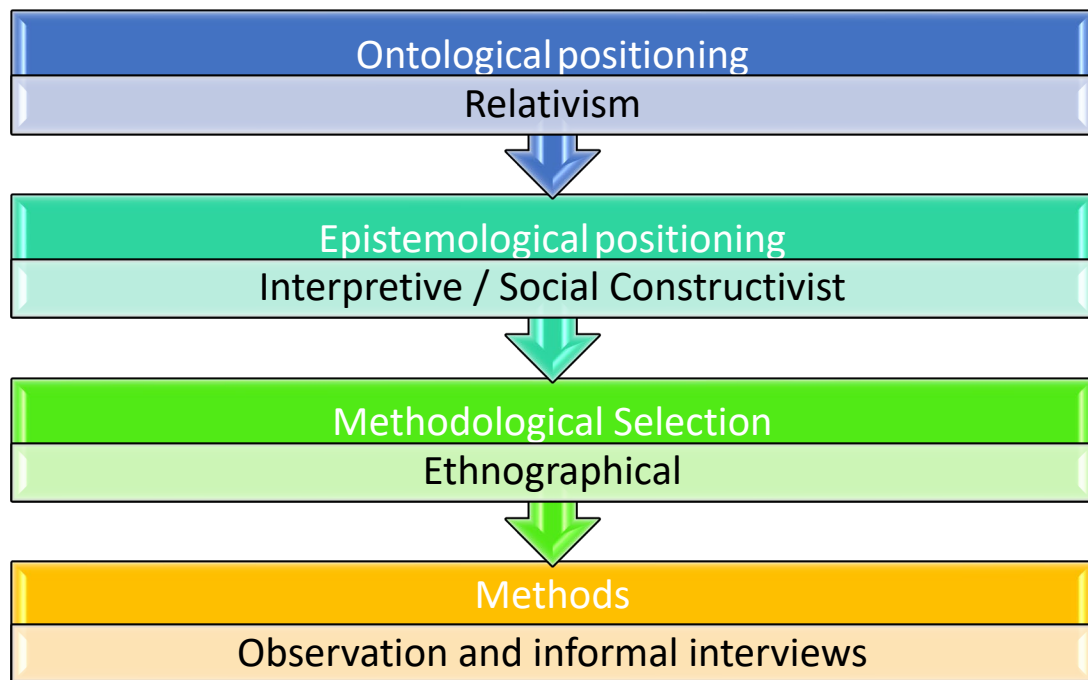


Figure 6.4 The Phase Three Methodological selection from the philosophical positioning

Ethnographic research offered several advantages over other methodologies. For example, being a ‘Participant Observer’ (2) enabled immersion into these settings, thus gaining a close understanding of sustainability behaviours and its nuances in different contexts of ambulance stations and operational ambulances in the field. The overall goal, of this phase of research, was to uncover the ‘situated rationality of action’ within UK ASTs. Ethnographical methodology allowed the investigation of the realities of ‘how things worked’ in each Trust (Van Maanen, 2011; Watson, 2011) netting multifaceted, naturally

occurring social interactions in situations that were not subject to experimental control (Webster and Rice, 2019).

This research approach was inductive and interactive, within a particular socio-political organisational context with the data collection being utilised as a lens to build local cultural theories (Goodson and Vassar, 2011). This design revealed the ways in which ambulance personnel's actions made sense in their own working context, even if they appeared inappropriate or counter-productive (Murphy and Dingwall, 2007). Ethnography provided opportunities to collect empirical insights into AST activities that were usually unseen by the public. The use of ethnographical methodology was not simply just about studying people; it also encapsulated a theme of learning from them, allowing an insight into the operational 'adoption' of strategic sustainability policy and plans (Whitehead, 2004). Gaining a perspective on workforce sustainability practice and what ambulance staff did in the field, how they did it and why they did what they did, allowed this thesis to compare the micro to the macro (Savage, 2006; Higginbottom, Pillay and Boadu, 2013; Andreassen, Christensen, and Moller, 2019). This revealed an understanding of the connections between everyday staff actions and interactions, with the wider sustainability policies being endorsed by UK Ambulance Sustainability Managers and the wider NHS.

Rashid, Hodgson and Luig (2019) recommended that FE is the realistic choice of methodology for healthcare educators who notice interesting interactions in their own workplace environment, that need exploring. As this phase was a

small-scale research project, undertaken in typical EMS locations, observing collective activities and drawing meanings through a cultural lens, there was a strong rationale for FE being selected. Focussed ethnographical methodology was thus implemented, as it was the most realistic to achieve within the resources, funding and timescales of the thesis. Andreassen, Christensen, and Moller (2019) and Rashid, Hodgson and Luig (2019) emphasised that for this particular methodology, the researcher should have a contextual knowledge and familiarity of the working environment, prior to the data collection. Coming from a paramedical professional background, the researcher was suited to this pre-requisite.

Ethnography is a research methodology, which allows a choice in the depth of immersion (Savage, 2006; Seim, 2021). At the time of conducting the Phase Three research, Wind's (2008) NIO was the observational role that was adopted, as this was the foundation of literature sources that were available at the time, allowing a transition between 'Observer as Participant' (2) and 'Participant as Observer' (3). This was reasoned as the best level of interaction with the group, allowing both an emic and an etic perspective, alongside a smooth integration with trust and rapport being built, without being involved in the very actions that were being observed (Pope, 2005; Iphofen, 2013; Andreassen, Christensen, and Moller, 2019).

Entering into the role as a uniformed Paramedic researcher, allowed some 'Participant as Observer' (3) interaction with activities not associated with

sustainability behaviours (such as manual handling assistance, carrying equipment when requested and offering certain medical advice when it was sought); however, the researcher avoided (by personal negotiation) any practical activities that involved sustainability issues. When any activity that was intentionally being observed within the research objectives (such as judicious use of consumable equipment, how waste was generated, segregated and disposed, and how vehicles were driven or operated), the researcher reverted to an 'Observer as Participant' (2) role. This then avoided any researcher influence on the participant's activities that would have been influenced by the researcher's own sustainability practice. This also satisfied the professional and legal status of the researcher, as a HCPC registered Paramedic. As the researcher was not directly employed by the host organisations, and was acting under an honorary contract as an observer, this was the most pragmatic option for vicarious liability cover whilst in practice.

Retrospectively, upon writing this chapter, this was very much in alignment with Seim's (2021) Hybrid Ethnography and the flexibility that was offered between the two levels of immersion (See Table 6.1). 'Participant Observers' are able to gain a deeper inquiry into a culture and the social life of its people (Seim, 2021). Having the flexibility to negotiate an engagement between 'Participant Observation' (2) and 'Observant Participation' (3), allowed a strategic surveillance of day and night working, weekend shifts, access to wider geographical locations and access to managerial and ancillary roles (such as shift supervisors, station cleaners, garage mechanics). Whilst 'Observant Participants' (3) are able to go deeper, with an added embodied experience,

they are at times limited in the breadth of experiential locations. Having the flexibility of Seim's (2021) hybrid approach allowed variation across these roles, thus gaining a better rapport with the ambulance staff, whilst at the same time, 'negotiating' what sustainability activities were being studied (through NIO), to ensure that the researcher's activities was not influencing the data assembly (Wind, 2008).

An example of reflective reflexivity can be seen in Box 6.2 with a narrative contextualising the choices made when determining the Phase Three methodological route.

Reflective Reflexivity

A narrative of personal reflexivity contextualising the choices made when determining the Phase Three methodological route

The methodological choices that were made for the Phase Three design, were again determined by deliberating the potential gaps in SACRM knowledge and the limitations within the design for Phase Two. One of the interesting findings from Phase Two was that the AST SACRM managers thought that the EMS environment had a unique complexity and that this 'uniqueness' was creating barriers to the success of some of the strategies within the operational workforce. Consequently, a logical progression was to explore the operational workforce, to understand if there was a connect or disconnect with the AST strategic aims of their 'Green Plan' and the translation of those aims by the wider workforce.

I was originally inclined to adopt a quantitative design for Phase Three, which would then offer a mixed method approach within the thesis. The quantitative paradigm could have potentially led to a quantitative survey, using Likert scales, which canvassed a much wider opinion from across the UK AST workforce. This may then have enabled generalisability for the UK AST workforce population, because of a much larger sample size available and thus a triangulation across the findings of Phase Two and Phase One.

One of the reasons, however, why I opted for Focussed Ethnography (FE) and an ethnographical component, was that one of the limitations from Phase Two had been that it was still relying on the accounts of the participants, that were giving you 'their versions' which may not have truly represented their actual feelings or behaviours. Simply, that they may say one thing but then behave in a completely different way. There is no real triangulation of their attitudes and

opinions with their actual behaviours demonstrated within their contextual working environment. So, they are giving you their accounts their values and their opinions and feelings, but the behavioural traits may not match. That was a cause for concern, moving into Phase Three. With a survey I was still canvassing values attitudes and opinions, but what I was missing was to see the actual behaviours of people in the workforce and to see whether it truly reflected their values, opinions and their attitudes. By choosing FE, it enabled me to undertake a more naturalistic approach to immerse into the environmental context...the 'unique' environment in which they worked and operated. I felt that the only real way of observing behaviours was to 'get in there' and watch them in their day-to-day practice. On reflection, it was one of the best decisions that I made, because when you are immersed within the workforce and you are directly observing what they are doing in their own environment and you then ask them for their rationale for why they are doing what they are doing, it was discovered that on a number of occasions, there was a complete cognitive dissonance between their values, attitudes and awareness of what they should be doing, contrasted against their observed behaviours. For example, some participants knew what they were doing was potentially wrong (to put domestic waste in the clinical waste stream) but they rationalised their behaviours because there were barriers in the way of correct disposal, whether that was a lack of facilities or lack of time. So having both observation and informal interviews combined, allowed an interpretation that everything was not as it superficially appeared. I felt that I would not have obtained that perspective from a standalone survey. I may not have obtained that insight from phenomenological interviews with staff. It opened so many different possibilities and it was fascinating to observed how a workforce behaved.

From some extensive literature searching, when deciding upon the conceptual framework and methodological choices, FE had not been used before in the context of EMS research. Following the adoption within Phase Three it appears to have only been used twice in the context of international EMS and both of those were not exploring SACRM (Perry, Reynolds and Clare, 2018; Dercksen, *et al.*, 2021). It is an underestimated methodology that is highly transferable for future EMS research.

Box 6.1 Reflective Reflexivity - A narrative of personal reflexivity contextualising the choices made when determining the Phase Three methodological route

6.3 Phase Three Research Question, Aims and Objectives

Having clear aims and objectives were a key part of FE. This phase involved answering the research question of:

Are operational NHS ambulance staff adopting sustainable attitudes and behaviours?

The aim was to observe and explore the activities, attitudes and behaviours of operational ambulance personnel in two of the 10 NHS Ambulance Trusts located in England in their approach to sustainability

The secondary objectives were;

- To critically appraise the level of awareness and willingness of operational ambulance staff with following Trust organisational policies and current sustainability initiatives that had previously been implemented.
- To clarify the current level of commitment of operational ambulance staff towards sustainability and their working environment.
- To critically discuss the perceived attitudes and behaviours of the operational workforce with the policies and how cooperative staff are when translating organisational objectives into current practice.

Short periods of immersion were undertaken across several ambulance stations to provide a sub-cultural context, rather than one intensive longitudinal study in one location (Hogan, Dolan and Donnelly, 2009). Short periods in each location helped to avoid researcher influence over time as the participants become more aware of what was being observed and avoided the risk of Hawthorne effects

changing participant behaviour. The methods of data gathering were to be observation, supplemented by informal interviews to corroborate and understand the participants' rationale for actions, alongside their views and perceptions of sustainability in their practice. The methods of the research are further discussed in Chapter seven.

Chapter Seven: (PHASE THREE) Methods

7.0 Introduction

This Chapter presents a justification for the methods implemented in the Phase three research design, it outlines the rationale for the data gathering method used to answer the research question and how that data was analysed. By using ethnographic methodology, a rich, holistic insight into operational ambulance staff's views, knowledge, actions and reactions was obtained, within the environment in which they worked. The choice of ethnographical methods allowed the documentation of sustainability culture, perspectives and behavioural practices as well as an understanding of staff attitudes towards organisational initiatives (Reeves, Kubar and Hodges, 2008). It also offered a triangulation of key themes from the Phase two findings to augment the thesis transferability and confirmability (Finlay, 2011; Polit and Beck, 2013)

Focussed ethnographic research occurs in the field, with an emphasis on cultures and sub-cultures within a discreet community, in order to obtain an in depth understanding via an inductive paradigm (Streubert-Speziale and Carpenter, 2007; Higginbottom, Pillay and Boadu, 2013; Daynes and Williams, 2018). Both Higginbottom, Pillay and Boadu (2013) and Reeves *et al.* (2013) advocate that the observational opportunities should include directed, intermittent and purposeful field visits, across multiple sites, with key participants chosen for a willingness to share their knowledge and experience in EMS work. Therefore, this phase required careful and considered planning in

order to gain admission to research sites, through appointed gatekeepers, within the ASTs selected (Reeves, Kuper and Hodges, 2008).

7.0.1 Ethical Approval for Research

Attaining access, with the correct ethical approvals, required a lengthy process to position the researcher in the right environment with the right people (Reeves *et al.*, 2013). The NHS Health Research Authority, The UoP Faculty Research Ethics and integrity Committee and both of the selected AST's R&D Teams granted ethical approval (see Appendix 13). Following Ambulance Trust confirmation of capacity and capability to support this study, management approval and an accompanying 'Letter of Access' was granted by each of the participating ASTs, to enable observations and participation with staff in areas that also included care provision to patients.

7.1 Research Design (Ethnographical Phase)

The participant observation was designed to take place within ambulance base stations as well as within the peripatetic operational environment (inside response vehicles or at the locations of incidents). Two UK ASTs were selected as host trusts, through a purposive selection, which offered geographical and cultural variance within the UK, but were also considered as being data rich environments. Both Trusts had expressed an interest in participating within this research project, as they were keen to understand how their policies and initiatives were being implemented at an operational level. Once enrolled in

principle, the two Trusts identified gatekeepers who could assist with the logistics of observational placements.

7.1.1 Form of Participant Observation

Pope (2005) advised that participant observational roles were rarely fixed and moved flexibly along a continuum from observer to participant. Within this research phase, the level of participant observation, or as Wind (2008) referred to it as Negotiated Interactive Observation, was to have flexibility between The 'Observer as Participant' (2) and the 'Participant as Observer' (3). These were explained in Figure 6.3. Although FE mostly involves the 'Observer as Participant' (2) role, having the flexibility to participate in certain activities allowed a better bond with the participants. Building a trusting relationship with ambulance staff was vital to gaining a better rapport for understanding the behaviours within the ambulance service culture (Zadrožna, 2016; Rashid, Hodgson and Luig, 2019). Whilst the researcher was not acting in a covert role as a 'Complete Participant' (4), it was important to strike a balance between openness and transparency as to the purpose of the study, and not to influence or change the actual behaviours or the activities under observation, through a Hawthorne effect (Pope, 2005; Monahan and Fisher, 2010). Therefore, for ethical purposes, the researcher was overtly placed as an observer researcher and the overall, generic aim of the study was outlined to all participants, but not the specific detailed areas under observation. Generic information was offered and outlined in the PIPs (Appendix 15), however, simple statements that the researcher was observing sustainable practice, avoided specific details on what exactly was being observed. This tactic then helped to avert a possible change

in practice and social behaviour. Although Monahan and Fisher (2010) alleged that 'observer effects' are unavoidable and that they themselves can generate critical insights into staged performances, Pope (2005) warned that too much openness could put a strain on relationships and affect practice ability while under direct observation. So it was determined to best minimise the 'observer effect' as much as possible. There was also particular emphasis to all participants that this phase of research was not concerned with evaluating any one person's individual performance. The study was a service observation, canvassing a cultural perspective on sustainability within the operational workforce. The aim of which was to understand if there is a concerted awareness and effort to meet organisational aims of carbon emission reduction and adoption of 'green initiatives'.

FE tends to be scheduled over short time frames, so fieldwork is conducted in phased segments (Rashid, Hodgson and Luig, 2019). Iphofen (2013) suggests that a sampling strategy should involve the researcher time available, people required and the events to be observed, so the sampling frame and data collation methods were controlled and systematic. The observational immersion was arranged to take place through 20 x 12 hour shifts across both ASTs (ten shifts in each Trust). The research sites selected were planned to include at least one large urban station (> 40 staff) and one smaller rural station (<30 staff), to note if there was any difference in attitude or behavioural culture that emerged amongst them (Beebe, 2014). Sites were chosen to represent different types of patient populations, ambulance service sub-cultures and service utilisation (Vindrola-Padros and Vindrola-Padros, 2017). Within each shift,

observation was conducted partially within a group environment within an ambulance station, and some of the time with individual crewmembers as they responded to incidents.

7.2 Recruitment of Participants

Ethnographic fieldwork relies on the research participants being involved collectively in a social world, organisation or joint activity. Delamont and Atkinson (2018) cautioned that ethnography follows the social contours within a selected setting and although some participants are central and others are peripheral, the difficulty with recruitment is that individual participants should not be treated as separate, from each other. Although, they are required to be enrolled methodically, one-by-one, it is the individuals' interactions with others and their environment which is the focus.

So, the sampling frame and process for participants in this phase of research was therefore part purposive and part convenience (Iphofen, 2013; Delamont and Atkinson, 2018). Recruitment of participants and locations for observation, were made via the SACRM Manager (of both Trusts), as both were assigned and allocated the role of a gatekeeper within their Trusts. Having a gatekeeper inside the organisations offered a Trust approved, legitimacy for the researcher to enter into the research environment (Pope, 2005; Iphofen, 2013). Each gatekeeper initially liaised with the researcher to negotiate the requested stations identified from the sampling framework and identified potential dates for the observational shifts. This was completed through a Placement Request

Application Form. The gatekeepers then disseminated research information to their relevant station OMs for agreement and expression of interest to participate and identified who were amenable to hosting the researcher, through nominating their stations. Once the OMs had agreed in principle, the gatekeepers offered the choice of stations to the researcher, who then selected a purposive sample of destinations and confirmed the shift times.

The researcher then made contact with each of the OMs, initially through an the Invitation Letter (Appendix 14) and then through a telephone conversation, to explain the research protocol, its purpose, aims and overall process of the study and to agree the attendance process. The dates of each proposed observational shift was determined and the relevant documentation was shared; (PIPs) (Appendix 15) and consent sheets (CS) (Appendix 16) were sent to the OM for circulation at each station, at least 3 weeks prior to any immersive visit. All OMs were asked to be the point of contact, should the need arise with any professional issues, whilst in practice.

Station staff that were rostered to be on duty, during the established research shift dates, were given the PIPs and CSs for information. All participants, therefore, had sufficient opportunity to discuss (with the OM) their willingness to participate at station level, through various staff meetings and communication platforms. The use of Ambulance Station notice boards was also encouraged to disseminate information to staff in advance. The OM then identified operational crewmembers that were willing to host the researcher within their ambulance

response vehicle and therefore participate in the study. So, by the date and time of the station visit and research shift, both the gatekeeper, the OM, the researcher and the hosting participants were in a consensual agreement (see section on Consent for further detail). This process can be seen in Figure 7.1.



Figure 7.1 Recruitment Process for Observational Shifts

Once the researcher was allocated a ‘third manning’ shift with the nominated host crew, access was thus gained to the whole station and further recruitment could be made dynamically on the day for any further willing participants. This

allowed observation to be flexible and opportunistic, following the enquiry to avenues beyond the initial allocation (Wolf, 2012).

7.2.1 Sampling

Stations for observational shifts were purposively selected for the range of geographical or locational variance, size, staff complement and whether it served an urban area or rural community (Vindrola-Padros and Vindrola-Padros, 2017). The inclusion criteria for participants under observation, comprised of operational ambulance staff employed by the AST, which included Paramedics of all grades and position; EMTs; ECAs; and Station support staff (housekeepers, cleaners, mechanics, store persons or administrators at the location). All genders, over 18 years of age, were contained within the sample selection. Exclusion criteria applied to all patients, members of the public and visitors to the station.

Pope (2005) had previously warned that it was difficult to quantify exact numbers within the planning stages of ethnography, as the group or station participation could vary according to consent obtained during the observation stage. The sample size of observed participants was estimated to be 40 or more. Working on the principle that each 12-hour observational shift would give access to a minimum of two crewmembers on each shift, then that indicated potential access to 20 x 2 participants for observation and informal interviews. The mixture of purposive and convenience sampling of participants through the OMs, allowed some independence from the gatekeepers, who may have had a

vested interest in controlling what participants could contribute towards the study (Iphofen, 2013). No incentives or payments were offered to the participants.

7.2.2 Consent

Negotiating access into the research setting and gaining valid consent of voluntary participants is an essential process in ethnography and cannot be separated from the data gathering (Pope, 2005; Iphofen, 2013). Valid consent must be informed, voluntary and exercised by persons competent to consent (Busher and Fox, 2019). Delamont and Atkinson (2018) argue that fully informed consent prior to the fieldwork itself is not always practicable and can be very problematic throughout the research process. There may be a limit on what can be disclosed before the data gathering becomes tainted with a change in participant behaviour. Gaining consent therefore, within this phase, was considered as a fluid process, both in the planning stages and in situ (Russell and Barley, 2020). Capacious individuals have the right to change their mind at any time during the data gathering process, so consent was negotiated throughout the research engagement (Parker, 2007; Iphofen, 2013; Busher and Fox, 2019).

There were various procedures for ensuring that consent was obtained from all participants involved in the observational research phase. Information that was offered to the participants and the research sites, ensured that they were aware that overt research in sustainability was taking place, without any deception,

however information on the nature of the data being gathered was generic, to avoid a behavioural change in practice (Iphofen, 2013). The CS had particular emphasis on the fact that involvement was purely voluntary and that each participant had the right to withdraw from the study at any point of the data gathering process (during the researcher's time spent within that Trust). There was also a point of contact for independent advice on participating in the research and a contact point should any participant have wished to raise a complaint about the researcher or the way that the research was being conducted.

Process for obtaining consent from the host crew

Firstly, the researcher made advance contact with those participants who had agreed to host the researcher on their response vehicle, during their shift. Consent was often informally agreed at this stage via email. On arrival at the allocated station for the observational shift, the researcher then met with the crew prior to the shift commencing. At this point, the researcher again explained the aims and purpose of the research and allowed them to ask any questions before signing a CS.

During the event of an incident allocation, any patient encountered was asked by the leading Trust Paramedic for a verbal consent for 'a Paramedic Observer' (the researcher) to be present during patient interaction. They were also offered or left the Information Sheet for Patients (Appendix 17). If any patient, relatives or carers gave any objection, then the researcher removed himself from the

immediate environment. If in a response vehicle (car or ambulance), the researcher sat in the driving cab away from the patient treatment area.

If the researcher joined another crewed response during the course of their shift, then immediately before or during the initial stages of an allocated 'response call out', verbal consent was dynamically agreed with them and confirmed with a signed CS when it was convenient after the incident. Patient confidentiality was thoroughly maintained at all times. The Researcher was also a registered Paramedic with the HCPC and so upheld the standards of conduct performance and ethics (HCPC, 2016), in the same way that is required of an operational Paramedic.

Process for obtaining consent whilst on an Ambulance Station

Whilst conducting observation within an Ambulance Station environment, the process agreed within all formal ethical approvals, for obtaining consent, involved several layers. Firstly, agreement and permission was gained from local the Trust Gatekeeper and Trust Research and Development Department, along with station OM. Following this, Participant Information Pages (PIPs) and CSs were circulated at each station prior to any immersive visit. Through arrangements with the OM of each station, it was anticipated that there was at least three weeks for potential participants to decide whether to take part or not, before any researcher visit. The OM was also asked to identify if any potential participant at the station may need adjustment for translation from English or

have special communication needs. Consideration could then be made for adjustments in the PIPs and CS.

When attending each shift, especially during the initial points of contact, the researcher introduced himself to everyone present at the station, outlined the purpose and aims of the research, offered them the PIPs and established written consent from them. If at that stage, anyone objected to being observed, they were excluded from the observation notes and informal interviews.

As consent is a continuous process, on each re-visit by the researcher to the station, consent was re-negotiated and sought with each person present (verbally, if already previously signed a written CS; written, if they have not previously signed a CS) (Pope, 2005; Russell and Barley, 2020). Consent was also verbally confirmed on all audio recording of informal interviews, which augmented the written CSs previously signed.

7.3 Procedures

Participant observation of the ambulance crews meant undertaking activities within a healthcare provisioned environment, which involved patients and members of the public. The emphasis of the research was on the ambulance crews as the primary focus of observation and not the patients. The nature of ambulance responses meant that they did involve social and patient interaction; however, the observation was focussed on the actions and behaviours of how

ambulance staff operate in relation to sustainable practices in clinical practice, as advocated by the Trust's Strategic Green Plan. For example, the researcher observed how they managed waste and utilised equipment and resources at the scene of an incident.

7.4 Ethical considerations

Several ethical deliberations were made in the research planning, to navigate through the moral complexities of conducting ethnography. The rigour of biomedical ethics in upholding the Nuremburg Code (1947, cited in Renshaw, 2019) and the Declaration of Helsinki (1964, cited in Renshaw, 2019), has led to the broad expectation that researchers must consider the risks of research to all involved (Parker, 2007).

7.4.1 Intrusiveness into normal lives

Intrusion into the participants' working routine was minimised (as the researcher was mostly a passive observer) both during station activities and allocated 'response call outs'. Risks considered in this study involved consideration of the intrusiveness of the observation on the organisational priorities, the participants' time and the patients' needs (Iphofen, 2013). A potential burden for the organisation and participants included the fact that they were participating during their operational time, inside of normal working hours, which may have been experienced as stressful, so timings for any informal interviews were built around occasions, which were convenient to the participant, their needs and service provision (Murphy and Dingwall, 2007). Dynamic risk assessments and

monitoring of participants' psychological stress (and researcher mental health) were included within the observational strategy. Approaches of debriefing and counselling for their well-being were included, through accessing contracted counselling services, through employing organisations. Reminders of the service were verbally mentioned, with the participants, if the need arose. Counselling details were also detailed in the PIPs.

Aspects to do with the topics of sensitivity, legality and professionalism, where an issue may have arisen (through observation, or during an informal interview with a participant concerning an illegal act or a breach of a professional code of conduct), were also addressed (Murphy and Dingwall, 2007; Iphofen, 2013). To pre-empt this, the participants' information sheet contained a paragraph emphasising that the study was concerning sustainability issues only and that any explicit disclosure of unethical or unlawful behaviour, which had or may put others at serious risk, would result in reporting this to the participant's line manager. This was also emphasised prior to commencement of any informal interview.

There were also situations where it was necessary for the researcher to step in as a HCPC qualified Paramedic. The intention was for the researcher to be mostly a participant observer and not as a fully immersive participant observer. This is to avoid the researcher thus becoming the focus of the intended research. However, ethically there were situations where there was a duty to act within a professional capacity, such as encountering multi casualty incidents,

where medical provision took priority over the research, or where a patient's life was compromised, if the researcher had not participated (Iphofen, 2013). The researcher was dressed in a paramedical uniform; however, the researcher was also wearing epaulettes and professional identification to the university where they worked. Patients, relatives and carers were informed of the researcher status upon first contact.

7.4.2 Maintaining confidentiality and anonymity

Researchers have an obligation, to remove any others' opportunities to identify their participants' identities or individual contribution to the data gathering process (Iphofen, 2013). Wolf (2012), Iphofen (2013) and Busher and Fox (2019) however, advise that the researcher can only strive to protect participants' identities and not absolutely guarantee it. Some individuals may recognise their own contribution, or recognise others from a group conversation and choose to disclose identities to others, or disclosure may be required by law if any criminal activity is exposed (Delamont and Atkinson, 2018).

Each participant was given a unique identification number (UIN), known only to the researcher, and transcriptions of interviews or field notes used that UIN (Wolf, 2012). Once the UIN was allocated, all the data was effectively anonymised to that number. Anything said during any informal interview was treated in confidence and anonymity was maintained within the data sets, so that individuals could not be identified from them. No information about the participants was made available to anybody outside of the study team and only

the principal researcher had access to the participants' personal data. If any personal information emerged during the interview audio recordings, then this was redacted in the transcription process.

Data protection is the cornerstone of maintaining confidentiality (Iphofen, 2013). All hard copies of CSs, field notes and informal interview transcriptions were compiled by the researcher and stored securely within a locked filing cabinet in a lockable office on the University campus. All electronic data was uploaded and stored on the researcher's university encrypted ONEDRIVE account, which was accessed through a password protected university computer. All audio recordings completed during the data gathering were downloaded onto the ONEDRIVE account after each shift. During transit between the research site and UoP campus, the data (CSs, audio recordings and field notes) were securely held in a lockable briefcase and kept in close personal proximity at all times.

The UoP Research Data Management (RDM) policy requires that data obtained from research must be kept for a minimum of ten years from collection (UoP, 2019). After publication, the anonymised data will be stored in the UoP Repository (UoP, 2018b; 2019). The gatekeepers will be informed of when the research has been completed and links will be offered to any published material.

7.4.3 Benefits of the research

This research phase aimed to develop knowledge of how SACRM is being adopted and implemented 'on the ground' for both the employee and the employer. It also intended to explore any indication that strategic policy was influencing operational staff. This knowledge could then foster development of strategies, which may further encourage AST staff with a RRR attitude, educate an AST workforce to be more 'sustainably literate' and create new strategies to meet organisational aims with SACRM. Sequentially, this may help to reduce organisational expenditure and reduce carbon emissions. The data generated by this research provided valuable insights into what sustainability activities were used amongst the ambulance workforce, whether Trust Green Plan systems and processes were being followed and the attitudes of staff towards sustainability policy implementation. The research findings provided an insight into motivational techniques for sustainability behaviour adoption in other ambulance or EMS services within the UK or internationally.

7.5 Methods of data gathering and analysis

Data collection took place within various environments and from different forms of social interaction, such as observing activity and listening to consensual conversations during emergency or urgent incidents, patient management, hospital handovers, re-stocking or refuelling, stand-by locations, station lunch breaks. A variety of data collection tools were considered within this phase, which was congruent with focussed ethnographical methods (Higginbottom, Pillay and Boadu, 2013; Reeves *et al.*, 2013).

The data collection methods involved a strategy of field notes from participant observation, unstructured informal discussions audio recorded on a digital Dictaphone and analysis of operational or vocational documents related to sustainability. The rationale for using several methods of data collection was to retain rigour, trustworthiness and credibility, gathering in-depth data about sustainability attitudes and behaviours. Iphofen (2013) and Rashid, Hodgson and Luig (2019) refer to this as method triangulation, which is the combined use of field notes from participant observation, with interviews and document reviews to confirm findings. Data source triangulation was also applied, gathering data from numerous participants in diverse settings at different times. Having a range of data sources helps to increase the rigour of the study (Iphofen, 2013; Rashid, Hodgson and Luig, 2019).

7.5.1 Field Notes

Ethnographical field notes are considered as the foundation on which ethnographies are built and establishes the validity of findings (Wolf, 2012; Daynes and Williams, 2018). They are the primary record of personal observations, as well as personal thoughts, interpretations and reflections on potential biases (Pope, 2005; Walford, 2009; Russell and Barley, 2020). These provided the mainstay of raw material for the analysis. Walford (2009) and Daynes and Williams (2018) highlighted that there are numerous similarities and differences between ethnographers in how they construct and record their field notes, but Bressers, Brydges and Paradis (2020) added that, in essence, they should capture an understanding of the space, culture and behaviours of people within the immersive environment. Therefore, the researcher cultivated

and refined a description about ambulance staff and their culture as it was generated through interactions.

In this phase of research, the researcher used an observational activity log (Appendix 18), a notebook and an encrypted dictaphone as a variety of means to capture 'jotted' data during activities that could range from periods of slow, methodical activity to the fast paced, emergency situations encountered within EMS delivery (Bressers, Brydges and Paradis, 2020). Thompson and Burkholder (2020) emphasise that field notes should always record the contemplation of the researcher as much as the activities being observed. Field note data incorporated dating, timing, describing activity and who was involved, phrases or verbatim quotes of dialogue that were being expressed, patterns of behaviour, thoughts on why situations and circumstances may be happening, and sensory information capturing the reactions of the researcher to observed events (Emerson, Fretz and Shaw, 1995; Walford, 2009; Wolf, 2012; Bressers, Brydges and Paradis, 2020). This also included diagrams, mind-maps and illustrations to augment textual data. Lofland's (1971) framework for field note recording was also adopted (See Box 6.1 below), which offered additional dimensions for contemplation (Lofland, 1971; Lofland and Lofland, 1995). Recording of activities and events took place discreetly away from the direct vision of the participants, so that they did not feel under pressure whilst undertaking operational activity, nor were they allowed to read any of the data recorded.

Acts – brief occurrences of actions

Activities – actions of longer duration

Meanings – verbal accounts of the participants to define what is going on

Participation – holistic involvement of participants

Relationships - who is involved and with whom

Settings – descriptions of whole sites.

Box 7.1 Lofland's (1971) Framework for ethnographical field notes

Preliminary 'scratch' notes and 'jottings' were then expanded at a later stage to a fuller and more structured version, after the shift had completed, which provided a 'thicker description' of the cultural journey (Emerson, Fretz and Shaw, 1995; Walford, 2009; Daynes and Williams, 2018; Bressers, Brydges and Paradis, 2020; Thompson and Burkholder, 2020). So, to create high quality observations, the inductive reasoning of how and why circumstances were happening was captured, as well as the what, who and when of the event.

7.5.2 Informal interviews

Informal interviews were also incorporated as a complement to the field notes to provide a rich, holistic picture of the EMS operational environment (Wolf, 2012). Both individual and group discussions were undertaken where possible to allow an analytical review to draw connections between the observations and

inferences from the data (Bressers, Brydges and Paradis, 2020). Campbell and Lassiter (2015) affirm that interview data captures the thoughts and interpretations of people that influence and drive the actions observed allowing the researcher to make sense of their lives.

Any informal interviews (conducted for a deeper understanding of participants' thoughts that underpin observed actions) took place at the convenience of participants and their employers, in a safe, ethical and confidential environment away from patient care interactions, thus not interfering with any patient treatment or any aspect of patient care or other workload (Rashid, Hodgson and Luig, 2019). Following consent, conversations were audio recorded and then later transcribed for analysis alongside the field notes. Techniques used for the informal interviews involved non-judgemental probes, often using open-ended questioning (Walford, 2009; Rashid, Hodgson and Luig, 2019). This allowed a nuanced understanding of the meanings and justifications behind participants' actions and allowed them to share their thoughts and feelings on what they believed or perceived.

7.5.3 Sustainability information observed during placement

Any notices, posters, booklets or bulletins that incorporated sustainability information for staff was also included within the researcher observation and added into the field notes, to corroborate organisational strategic communication strategies, or highlight any divergences in desired sustainable practice.

7.5.4 Data Analysis

Gertz (1973) promoted the phrase of 'thick description', which encompassed a comprehensive description of the setting, events, relationships, environment, people and their interactions in relation to the subject under study. This 'thick description' builds an understanding of the nuances of the culture and possible alternative meanings. This then leads to a 'thick interpretation' and is represented by the participants' voice and stories in verbatim quotes, arbitrated by the researchers' own interpretation, in order to draw conclusions about the subject under study. Applying these principles enriched the credibility and authenticity of this phase of research (Rashid, Hodgson and Luig, 2019).

When considering how sustainability is shaped within EMS delivery, three levels of analysis were applied; the micro (the operational staff as individuals and as a collective group), the meso (the AST) and the macro (historical or socio-political) (Rashid, Hodgson and Luig, 2019). Whilst most observation was conducted at the micro level, all levels were related to each other. So, it was important to also contextualise and understand the findings in relation to the meso and macro levels.

Manual thematic analysis of informal interview transcription, field notes and station literature, was employed, using a coherent set of inductive coding and categorisation, which classified and interpreted text for meaning (Wolf, 2012). This followed the process advocated by Braun and Clarke's (2013a:201) seven stage approach (Box 4.3 in Chapter four). TA was used for identifying themes

and patterns of meaning from the gathered data in relation to the research aims and objectives (Braun and Clarke, 2013a).

7.6 Rigour

Rigour is assessed through its credibility, transferability, confirmability and dependability. Horst, Hijorth and Tacchi (2012) and Higginbottom, Pillay and Boadu (2013) argue that determining procedural and analytical rigour can be difficult, as qualitative constructivist approaches, vastly differ from positivist approaches and ethnographical designs themselves can vary, according to the locale and purpose of the observation. Ethnographical validity generally follows the same principles as qualitative designs and the deep understanding it allows; however, it also has the added dimension of decrypting lies or inconsistencies, by situating actual actions and behaviours with perceived viewpoints and stated beliefs, observing life unfold in real time (Daynes and Williams, 2018). The standards for focussed ethnographical rigour within this research design included several aspects.

Firstly, dependability represents the reliability of the data gathered during the research process (Polit and Beck, 2013). An explicit description of the research design methods has been offered in this chapter, to attain overall validity. This included an incorporation of how key decisions were reached during the research process. By keeping an accurate process record during this phase, decisions about the research can be available for external scrutiny (Finlay, 2011).

Secondly, a triangulation of data gathering methods was used to compare and contrast the similarities and nuanced differences (Wolf, 2012; Higginbottom, Pillay and Boadu, 2013). Confirmability refers to similarity between other independent researchers concerning the data's accuracy, relevance and meaning (Polit and Beck, 2013). Transcriptions and TA were shared and reviewed by both supervisors for collaboration and confirmability.

Thirdly, a variance in ethnographical sites and participants was incorporated to offer a greater diversity in the data being gathered. Transferability refers to the range and scope of other settings, groups or contexts for which the findings can have applicability. This research provides an ample amount of expressive data, from a diversity of settings and individuals, so that other readers are able to evaluate the applicability of the findings to comparable situations (Finlay, 2011; Polit and Beck, 2013).

Finally, authenticity incorporates the extent to which the researcher has honestly and dependably represented the various realities from the data and highlights the observed experience of the lives in their cultural context (Polit and Beck, 2013). This incorporates an amplified awareness of researcher bias and adept use of reflexivity to represent the data with integrity, by contextualising the participants within their own working culture (Bressers, Brydges and Paradis, 2020). As this focussed ethnographical design was performed within the researcher's own familiar working environment, it was imperative for the researcher to be non-judgemental and to be aware of how pre-conceptions and

biases could influence the data gathering and interpretation (Wolf, 2012; Higginbottom, Pillay and Boadu, 2013). Reflexivity incorporates an awareness of the researcher's own influence within the research process. The influence of the researcher's identity, positionality, personal beliefs, emotions and power dynamics was consistently considered throughout the data gathering and analysis (Iphofen and Tolich, 2018).

The truth-value or confidence in the research, through believability of the reported findings, demonstrates credibility to external readers (Merriam and Tisdell, 2016:242). 'Thick' field notes, audiotaping and verbatim transcription; inter-coder checks; and peer review have enriched credibility in this ethnographical phase.

7.7 Resources

There was no external funding allocated to this phase of research. Researcher time for immersion within the two ASTs was supported by the host University employer and was taken as allocated study time for the PhD research award. As the ethnography was conducted across a large geographical spread within England, there were also accommodation and transportation costs self-funded by the researcher. The researcher's faculty provided all other costs that involved printing of hard copy resources. There were no costs or expense for either of the ASTs during the ethnographic observation.

7.8 Chapter seven summary

This phase of research involved a careful discussion and justification of the methods chosen to meet the focussed ethnographical design. More importantly, the methods had to meet ethical obligations and expectations that protected the participants, the host organisation and the researcher (Iphofen, 2013). Key features that were deliberated within this research design included, the level of participation, the areas and people to be observed, how data was to be captured and analysed and how reflexivity was incorporated to enhance validity. The research design incorporated several considerations with the maintenance of rigour to ensure that the findings had credibility, transferability, confirmability and dependability.

The decision to use FE was made because it promoted a fast and intense data collection, within a particular sub-culture of a population, by researchers with a familiarity of the field of study (Rashid, Hodgson and Luig, 2019; Andreassen, Christensen and Moller, 2019). This did not, however, mean that the methods of data gathering was quick and easy (Pope, 2005; Vindrola-Padros and Vindrola-Padros, 2017). For a successful research design, the data gathering methods chosen still had to be suitable for quality data capture and thus followed the 'essence of its parent ethnographical methodology (Cupit, Mackintosh and Armstrong, 2018). So, planning the procedures of data gathering and triangulating it via multiple forms available, gave a robust 'richness' to the findings (Vindrola-Padros and Vindrola-Padros, 2017). From the immersive periods of targeted observation, 'thick data' was gathered which reflected a contemporary insight into the working culture of EMS staff and their

consideration towards meeting sustainability objectives. These findings are reported and discussed in Chapter eight.

Chapter Eight: (PHASE THREE) Findings and Discussion

8.0 Introduction

This chapter presents and interprets the FE data, obtained during immersive observation amongst operational staff, within two English ASTs (these are named Trust A and Trust B). The gatekeepers of each AST enabled access to a variety of metropolitan, urban and rural base stations.

Trust A covers a population of over five million people, with over 7,000 staff members, operates over 1200 vehicles in over 60 ambulance stations and receives an average of over 3,500 emergency and routine calls a day. Trust B covers a population of over 5.5 million people with just over 4,000 staff members, operates vehicles in over 90 ambulance stations and receives an average of 2,700 emergency and routine calls a day. Both Trusts have a substantial increase of populations during holiday seasons.

This ethnographic study took place over a five-month period between August 2018 and January 2019. The data and findings were gathered and analysed in relation to a pre Covid time-period. A total of 18 visits occurred, with each shift duration being 12 hours (or more, with overruns). These visits took place within nine different allocated ambulance base stations. All allocated stations provided a 24 hour, seven days a week provision of EMS delivery. In reality, however, peripatetic working meant that access to additional 'ad hoc' ambulance stations and static 'standby' points was made possible, due to movement of vehicle resources to alternative stations during busy operational activity. Static 'standby'

points were locations such as temporary porta-cabins or leased rooms in areas where there were high incidence of emergency calls, but lacked a permanent ambulance station to meet the response times. Overall, 66 participants consented to participate in the study. The sample group included a variety of Paramedics, student Paramedics, Advanced Paramedics, Paramedic Supervisors, Lead Paramedics, ECPs, EMTs, ECAs, OMs and station cleaners. The observational activity took place in four main clinical areas; the incident location; inside ambulance response vehicles; static locations (main base stations or standby points) and EDs.

Six main themes were formed from the collation and interpretation of the data, by observing staff activities involving waste disposal, equipment use, utility use, fuel consumption, SACRM education and sustainability communication. These themes can be seen in Figure 8.1.

Each theme is supported with direct quotations from the participants, but due to word count limitations, additional quotations have been placed in Appendix 19, that reinforce the point of discussion.



Figure 8.1 Identified themes within Phase 3 findings

8.1 Theme 1 - Waste Disposal -The Negation of Segregation

An early observation, noted across both Trusts, concerned how waste was generated, segregated and disposed of by operational staff, in the peripatetic environment and on base stations. These practices were a direct reflection on how one of their Trust sustainability objectives was being implemented. Both ASTs visited had accessible infection control and waste policies. These policies

outlined waste regulations and the promotion of colour coded waste segregation and suitability of disposal options, at the point of production. Documents were available to staff on Trust intranets and posters promoting waste segregation were observed on most AST notice boards. The waste generated both in practice and in ambulance stations (being considered for segregation), was observed to fall into the following categories; sharps, infectious, offensive, domestic (general) and dry mixed recycling waste (Table 8.1).

Table 8.1 Categories of Waste Segregation in Practice

Type of waste generated	Colour coding	Items include:
Sharps	Yellow or Orange plastic bins	Any article that can cut or puncture the skin by having a fine edge or point (Needles, scalpels, stitch cutters, glass ampoules, sharp instruments or razors).
Infectious	Orange bag	Any waste that has been in contact with a patient who is either infectious or potentially infectious. (e.g., a patient with symptoms of acute diarrhoea and vomiting).
Offensive	Yellow bag (with black stripe)	The majority of clinical waste (that is non-infectious). Includes soiled items such as PPE, soiled gloves, incontinence pads, used vomit bowls, and dressings / bandages, nappy waste).
Domestic	Black bag	Similar in nature and composition to waste generated at home, not containing any contaminated or infectious materials, sharps or medicinal products. Gloves that are not contaminated can be disposed of as household waste into the domestic waste stream.
Dry Mixed Recycling	Clear / transparent bag	Includes, washed food tins, mixed plastics, packaging waste, paper and card.

Within informal discussions, most staff were aware that there were financial differentials between the type of waste stream, especially between clinical and domestic waste, but not the actual costs. Waste segregation activity was highly evident, across both ASTs and all areas visited, however there were significant differences in how this was successfully achieved, depending on where the waste segregation was taking place, what context and what type of waste.

8.1.1 Staff Compliance to waste segregation during patient encounters

There were noticeable differences observed in waste segregation within patients' homes or workplaces, when compared against waste segregation that occurred in the rear of an ambulance or RRV.

Clinical Care provision within a Patient's Residence or Workplace

During encounters, within a patient's home or workplace, it was routinely observed that waste generated tended to be sharps, offensive, infectious and general waste. The sharps and clinical waste were consistently disposed of, in accordance with their local Trust protocols. There was also a considerable amount of general waste created, which mostly consisted of plastic and paper packaging from consumable equipment that was not considered as infectious or offensive. This, however, was observed to be managed in different ways.

Some participants placed the domestic waste directly into an offensive waste bag, which then inappropriately contributed towards the clinical waste stream.

When those participants were later probed for their decision-making rationale, some were conscious that they could have segregated domestic waste, but it was not routine practice to carry a general black waste bag within their response equipment bags. They only carried a yellow clinical waste bag.

“Normally [within] the response bag...there is a yellow striped tiger bag that gets opened up. Everything goes into there and everything will go in there. I mean no sharps obviously...I mean the sharps protocol is adhered to quite strongly by everybody...as for syringes and things like that...it all goes into a yellow tiger bag” (2)

This practice was confirmed through participant observation, where each response bag was checked at the start of each shift and domestic waste bags were found absent on every occasion. Others felt that either it was not appropriate to ask the patient to take their waste, or that there was no time for segregation due to the patient’s condition.

“You know...when you are dealing with a patient...we are up against time constraints and things...you are unpacking things and just throwing it away...you don’t want to be messing around trying to find the right bin.” (10)

Some participants asked carers or relatives to dispose of the domestic waste in their home bins, or asked the patients if it was agreeable for them to use their home bins.

“If I’m in a patient’s house, if it’s just packaging and just ordinary bits and pieces...and no sharps...or its not contaminated with anything...we just bulk it all up and I’ll just say [to the patient] can I just put this in your bin.” (65)

Some participants were observed to place general waste into their uniform pockets and dispose of it later at the station or at the local ED. There was, therefore, observational evidence of some appropriate waste segregation between clinical and domestic waste within this contextual setting, but there was no segregation of any dry mixed recycling from the consumable equipment items used.

Clinical Care Provision within the rear of an ambulance or RRV

When observing the same clinical practice with similar patient conditions, but taking place in the rear of an ambulance or RRV, almost all operational staff placed their domestic and clinical waste (with the exception of sharps) within clinical waste bags (either a yellow offensive bag or an orange infectious bag). This also included participants that had previously segregated and disposed of their domestic waste into the correct streams, within a patient's house. When asked later for their rationale for actions, responses included;

"If that same procedure [cannulation] was done in the patient's house...the cannula, sharps themselves, would go in the sharps bin that's in there [points to response bag]. Everything else, the packaging etc. would go in the patient's bin. But yeah...in the back of the ambulance...everything would go in there [points to the clinical waste bin]." (27)

This was a common occurrence observed across both ASTs and all stations, with the vast majority of participants. When asked whether they were consciously aware that their behaviour was contradictory to their organisational policies, nearly all accepted that they knew that this was inappropriate, but justified their actions through either a confusion of what is classed as clinical

waste, a lack of waste disposal facilities, time to segregate, or simply a general apathy towards waste segregation.

“Once I’ve separated my sharps...then everything else gets thrown into the yellow waste bin. It’s a good job we are talking about this now...as this coffee cup will probably end up in the clinical waste bin as well. If I’m being brutally honest...if I’m emptying a clinical waste bin after another crew...there’s usually an empty coke bottle...or a rotting apple...or something like that in it.” (27)

“When you are dealing with a patient...we are up against time constraints and things...you are unpacking things and just throwing it away...you don’t want to be messing around trying to find the right bin” (10)

“I think there is bit of a ‘can’t be bothered’ attitude...sometimes it is just easier to throw it into the yellow bin.” (18)

This contradictory behaviour was observed to be irrespective of position, grade, experience or qualification of the operational clinician. Most participants expressed that they felt that their inappropriate segregation was due to a lack of access to black bin liners or lack of general waste receptacles.

“On station we have access to mixed recycling and things like that...and that’s all fine...but we don’t spend the majority of time on station and I don’t think we produce the majority of waste on station. So on our ambulances we only have typically one bin...so actually separating waste out...it’s quite a difficult task. The majority of the waste we produce on ambulances and the disposal of that waste is very expensive, compared to domestic waste. It’s like a lot of things in this service, it feels like there is a bit of lip service towards it where they provide bins on station...but we are never on station.” (10)

Some defended their actions by arguing that black bin liners were not available from the equipment stores on station.

“We are not provided with black bin liners for vehicles. On the new vehicles, we do have a cupboard for general waste, but we are not provided with bin liners to go in there...as far as I’m aware.” (31)

Participants claimed that black bin liners were kept in a locked cupboard at their base station, only accessible by contracted cleaners, for domestic use, within that ambulance station. Others said that their actions were due to a lack of space for the provision of a general waste bin within the rear of an ambulance. For those participants that could get access, some had said that they had previously secured a black bin liner to the wall of the ambulance with Micropore tape. Nevertheless, this was discontinued because when the large, bulky bags were even partially filled, they often became unstuck, spilling their contents and posing a hygiene risk. Others said that the practice of taping a bin liner within the saloon was unprofessional and gave the wrong impression to the patient, so had never attempted to adapt; hence, an integral bin was felt to be essential in expediting domestic waste segregation.

It was observed that there were indeed challenges with space due to equipment storage, leading to a lack of provision with waste facilities, when working within the rear of an ambulance or RRV. Whilst all vehicles were noted to carry a clearly labelled sharps bin and an accessible clinical waste repository, a general waste bin provision was sporadic and a recycling facility non-existent. The designation of a general waste bin or cupboard was dependent on the vehicle make and design. No RRVs had a visible general waste facility. Some later models of ambulances did have cupboards for bins dedicated to general waste and were clearly labelled as such, but they were noted to be in relatively inaccessible locations. When opened, however, it was discovered that they were being used as a supplementary clinical waste bin, or to store other items

of equipment, such as cleaning products, patient documentation or consumable equipment spares.

“Genuinely...it’s the only bin [clinical waste] we have on the truck...that I’m aware of. I don’t think we have a domestic style bin...so there is nowhere else to store it. I think there is a cupboard down there labelled domestic waste...but there is always a clinical waste bag in it....and I don’t think we have black bags to fit it. It’s out of the way there, quite frankly.” (54)

Two participants, during a discussion, were adamant that there was no general waste facility on their vehicle and when the researcher casually pointed to a cupboard marked ‘general waste’, they remarked;

“...well I have worked for nearly two years on this ambulance and I have never noticed or been shown that.” (49)

“It’s not something that I look for. I don’t think about separating stuff...because it’s down there [points to cupboard just above floor level at the rear of the ambulance]. You just can’t see it” (48)

The participants then shouted to the crew on an adjacent ambulance.

“Have you got a domestic waste bin on your truck?” (49)

“Probably not, no. We’ve got the yellow one [clinical waste].” (50)

“Have a look, we’ve just found one on ours.” (48)

“I don’t think we have, but I’ll have a look.” (50)

Both crews enter the rear of the ambulance.

“There it is...[points to the labelled domestic waste cupboard and opens it]...but there’s nothing in it. We don’t know where the bags for it are.” (49)

“It just might be miscommunication. I’ve never noticed it before. I’m going to look for some bags for it when I get back to station. It needs a small domestic waste bag...but I don’t think we have that size.” (49)

For others, when asked why they disposed of their general waste within the clinical waste stream, they simply explained it was due to traditionally taught methods and habitual practice;

“That’s the way we’ve always done it....we all do it. I know that we shouldn’t but it’s easy and more convenient to just chuck it in there [clinical waste bin]. Nobody checks up on you. You’re making me feel guilty now. I’ll have to go and get a black bin bag out now.” (52)

“That’s the way that I’ve been doing it since I started my career.” (26)

Part of the behaviour may have been influenced by a lack of audit in waste management practice. If there were no regular checks to ensure practice is following policy, then the traditional, habitual behaviour was felt more likely to continue.

“We do get chased when there’s the wrong [colour] bags in the bins. But no one is going through the right bags to see if they have got appropriate things in...which is fair enough. I wouldn’t take up the job of digging through people’s clinical waste.” (10)

“I...as a Lead Paramedic we sometimes audit, by poking your head in the clinical waste bins now and again. But as long as it’s got the little [clinical waste] bags going in the big [clinical waste] bags and its wound down and got a seal on it...it’s been done properly. I’m not going to break a seal on a bag to see if it’s been done correctly. That meets the criteria for the waste company to come and collect it. (53)

It was also observed that the clinical waste bins on most ambulances were of small capacity (around 5-10 litres in volume) and were frequently described by ambulance crew members as inadequate for their needs;

“There’s only one bin on here [the ambulance] which is a clinical waste bin, made from a converted sharps bin...which is no good to man or beast really. It is too small.” (31)

On several occasions, within numerous ambulances, clinical waste bins were overflowing and sometimes spilling contents, due to the amount and size of general waste items being deposited in them. Items of general waste which were directly observed being placed in clinical waste bins by ambulance crews (or later observed within them) included general packaging (often from sterile items of consumable equipment, coffee cups and lids, soft drink cans, banana skins, apple cores, sandwich wrappers, takeaway food containers and a half-eaten kebab. Whilst the EMS activity and the crew's refreshment habits were arguably still generating the same volume of waste, ironically, by not segregating into hazardous and nonhazardous waste this made that one overfilled clinical waste bin hazardous to the crew and patient until it was emptied.

The operational staff commonly felt that there was little to no guidance on what should go into domestic waste or even what could be recycled from the domestic waste, generated from consumable equipment use.

"I don't think I have [had guidance]. If I have...it must have been many moons ago on my ECA early days...but I can't recall the sort of instruction on that." (2).

"It [recycling labelling] has never once been discussed...in a clinical update, university, or anything like that...no one has ever spoke to me about recycling." (27)

Part of this was due to a lack of information on waste disposal process, part of this was also due to insufficient recycling information on the packaging; but ultimately, there was a widespread misconception as to what was classed as medical waste and general waste. Many participants disposed of any

consumable item, into clinical waste, if it had made contact with the patient. Whilst this would be reasonable if the patient was infectious, or items were contaminated with blood or body fluids, there were, however, items such as syringes, gloves, plastic tubing, electrocardiogram (ECG) electrodes and unused, but opened items that could have been segregated into general waste.

“There is a general waste bin on this ambulance...but you don’t get them on every ambulance and arguably you could put your coffee cup in there...or anything that hasn’t touched a patient. But you always get concerned that if you were to put the packaging that the cannula comes in...or the dressing wrapping in there, it’s medical waste...so to avoid confusion, anything medical goes in the orange [clinical waste] bin...even if it’s not contaminated. I get concerned about having medical packaging in a black general waste bag. I don’t want the Trust to get fined for having medical waste in a black [general waste] bin” (27)

The lack of knowledge was also partly due to not knowing what items were made from and therefore what could be considered as recyclable.

Frequently, phrases that encompassed the fact of being “Time starved”, “space starved” and “patient focused” were given as justification for recycling segregation not to take place.

“Because of the demands and pressures, I don’t think you’d have enough time to recycle.” (53)

One participant even commented,

“If it was my own money, I would think more about it....but it’s not....and I have too many other things to think about.” (49)

Participants generally felt that there was a lack of information on what clinical items could be recycled; however, staff were overwhelmingly skeptical about

whether recycling segregation could realistically take place within the peripatetic environment, even if there was time for this to happen.

“Some people do not have the capacity...or are just lazy and put their recycling into the general waste bin in the kitchen. So if they can't do that in the kitchen...when they have got time...then they won't probably do it here [in the ambulance], because you have that mentality. You have the people that don't care and the people that do care. For the people that do care, then you have the time factor.” (65)

Some were also adamant that they were clinicians and it was not their role to be waste collectors.

One participant, however, did mention a local initiative that they knew about, where two staff members on a different station, were segregating general waste into recyclable products. They had been trialing this for a couple of months.

“...two members of staff have taken that upon themselves. They have labelled up all [the bins in] our vehicles and provided separate bags....black bags for any recycling items...so it's any packaging that hasn't been used. Things like giving sets...cannulas. Anything sharp wouldn't go in there....but anything that hasn't been used goes in that recycling and there's a specific bin for those bags. They just use black bags because we don't have them on the ambulances. It's sorted through by these individual members of staff...who then sort it into the recycling on station, for collection. That's an initiative that's local and unique to that particular station. The recycle bin seems to be getting full most weeks you know...so obviously people are undertaking.” (10)

When asked if management were aware of the initiative, they said,

“I'm sure they are aware of it. They haven't passed any comment on it...but they were copied in on the emails that came out about it.” (10)

Which implied that there was local management awareness, but was not necessarily promoted across all stations. The two staff members were voluntarily completing this activity either in their quiet times on duty, or in their own time when off duty. It was evident that small beginnings can have a wider influence amongst some of the operational staff, with one participant confessing that;

“Before some guys started doing it on station, it never crossed my mind that this packaging didn’t need to be in there [clinical waste] (10)

During conversations, a few participants also questioned why their AST was procuring so much single use consumable items and not considering equipment, which could be autoclaved or re-used safely. This is discussed in Theme 2.

8.1.2 Staff Compliance to waste segregation on base stations

Waste disposal within ambulance stations was observed as an area of high activity, with better segregation facilities and yet still variable in its effectiveness. It was observed that improved waste facilities existed on ambulance stations for the disposal of waste generated from clinical practice and also for the segregation of general waste from domestic or welfare activities. Larger sharps bins and clinical waste bins were widely available throughout the sites visited, where returning crews could safely decant and dispose of their peripatetic waste and make vehicles ready for subsequent call-outs. These were generally located in sluice rooms or garaged areas, designated for that purpose. There were also more conspicuous general waste bins and recycling bins positioned

around stations, within both the garaged areas, shower and locker rooms, communal staff duty rooms and kitchen areas. The larger urban stations tended to have purposefully designed recycling bins, labelled for mixed dry recyclables, whereas the smaller stations tended to have more generic all-purpose bins, which were re-purposed for recycling by a homemade, laminated label. Some office areas also had additional bins for confidential waste and paper waste segregation. Within both Trusts A and B, the generic bins had been provided by the organisational management.

Effectiveness of domestic waste segregation into dry mixed recyclable and non-recyclable items was however quite varying. Through visual inspection of general waste bins, it was noted that there were still large quantities of recyclable materials being deposited into the general waste stream. It was evident, from watching operational staff's behaviour that bin location, size and ease of use were influencing factors on where they chose to deposit their waste. For example, on several stations visited, where there was a choice of a domestic waste bin and a recycling bin, general waste bins tended to be large and unlined, in a convenient location, whereas the recycling bins were smaller, tucked away in a less convenient location and were fitted with a swing lid that had a tendency to fall off. One example in particular, was from one metropolitan station visited in Trust A, which had garage capacity for 18 ambulances. Behind the parking bays were concrete pillars, where it was observed that a large, open lidded dustbin, with a black bin liner, was positioned on the side of a pillar facing the ambulances. The smaller, lidded recycling bin was on the opposite side of the pillar facing towards a wall, in a tight inaccessible area. When watching

returning crews, the convenience of discarding unsegregated domestic waste, especially when returning late at the end of a shift, or during times of intense activity requiring quick turnaround times, was a large factor in why the recycling bins were largely empty. The vast majority had a preference to quickly deposit everything into general waste, instead of segregating what were dry mixed recyclables into a separate designated bin. When later asked about the facilities, most staff confirmed that any effort to recycle items was heavily influenced by their time available to do so and the accessibility of the available facilities.

“On station, you know all the bins....I just don't know what they all are. There's no sign up for waste recycling...it's just different coloured bins. I'm terrible....whatever one I'm stood next to, it goes in there. They are not next to each other with a poster above them saying what should go in where.” (27)

Some staff also confessed to a general indifference to recycling, adding that it was a waste of time, as it all went into the same general waste stream, once it had left the station.

“The recycling...I believe that we do on station...the company that collects it, don't recycle it. It all goes in together. Because it's not domestic, they would have to pay for it to be recycled. That's fact. That's why there was a black domestic waste bag in the recycling bin and not the transparent recycling bag. So it's things like that that make you disheartened.”(52)

On a different station in Trust B, this was proved an accurate assumption. Observational time was spent in the duty room of a metropolitan station, which had a large staff complement and busy footfall throughout the day. It was observed that the vast majority of personnel depositing waste were frequently and consciously separating their recyclables from non-recyclables. Waste

facilities there were excellent, with purposefully designed recycling and general waste bins, of similar size and located adjacent to each other. Both were easy to use, clearly labelled and accompanied by good information about what can be recycled, on the noticeboard above them. On inspection, after an afternoon of observation, both the recycling bins and the general waste bins were full, but had appropriate items in each segregated waste stream. Later in the afternoon, however, the station domestic cleaner was then observed to empty the bins and mixed both the recycling with the general waste, decanting them into a larger black bin bag. These were then taken outside and deposited into the large general waste wheelie bin, for contractual waste service collection. The cleaner later explained that they were only ever issued with black bin liners and not transparent ones, so black bin liners had to go into the general waste commercial wheelie bin. Thus, the concerted effort of correct segregation by staff, was thwarted by a procedural process error. This was a similar procedural phenomenon that was reported within Church, Briggs and Tran's (2019) study to improve waste management in Australian EDs, where cleaners were observed to be re-mixing waste streams to simplify collection.

On smaller ambulance stations, which did not employ domestic cleaners, it was noted that on several occasions, the recycling bins were used as an overflow for the general waste bins, because no one had emptied and changed the full black bin liner.

“People don't use it [the recycling bins] properly. Anything goes in it. Some people will try...but others will spoil the whole purpose of it. It's been like that for a long time. People rushing...with 20 minutes to eat dinner...they just don't think of what they are doing.” (32)

This then negated the whole purpose of recycling segregation. On many other stations, notably in Trust B, it was observed that both domestic waste bins and recycling bins both had black bin liners in, so were essentially duplicating receptacles for general waste.

One participant who had worked on both a large urban station and a smaller rural station, inferred that waste disposal behaviour demonstrated by staff was influenced by the presence of an OM on site;

“The urban station...definitely has more impact on how we manage our bins. I think that’s only because they are constantly policed by OMs. [Redacted station] doesn’t have a permanent OM on station, but when they do arrive...sometimes we get a bit of stick for bins not being emptied correctly or sharps bins not being correctly filled out.” (2)

So, for some, staff could be influenced by the provision of appropriate waste facilities and management monitoring of activity. Whilst labelling on specific bins was noted to be largely consistent across both Trusts, information on items that could be recycled tended to be infrequent. There were some posters or leaflets on station noticeboards, but these were often hidden or overlaid by more recent documents.

Some positive initiatives regarding recycling were also seen across both ASTs. In both Trusts, when operational staff identified ‘out of date’ consumable equipment, items would be re-purposed, rather than going directly into the waste streams. They would be collated in the station stores for re-distribution to the Trust Training Departments and used for practice by staff, for skills

acquisition or skill retention. In another smaller, rural station within Trust B, staff had collectively agreed to support an initiative to sell their recycled general waste (generated from general waste segregation) to raise money for their chosen charity. This station was observed to have a high degree of staff enthusiasm for appropriate waste segregation, with more recycled waste generated than general waste. On other smaller rural stations, waste streams also extended into compostable items, where the compost was used on allotments, developed on small plots of Trust land adjacent to the ambulance station. Whilst some stations had been successful in re-purposing these land plots, through the agreement of their local OM, staff at other stations had disclosed that they had also tried to initiate this, but could not secure local Trust approval. What the initiative did indicate though, was that a recycling process was feasible in practice, if staff were encouraged by management, motivated towards achieving the goal and given the facilities and time to complete the task.

8.1.3 Staff attitudes to recycling at home and at work

Attitudes towards recycling and waste segregation were explored through conversations with staff. Despite the majority of operational staff members admitting that they recycle at home and adopt a generally 'green' attitude, many did not feel it a priority at work. Most insisted that their work environment provides limited opportunities to recycle during their clinical activities.

“At home, I’m all over it [recycling waste]. At work, I’m terrible. I’ve never thought about it at work. You just think about patients.” (27)

Personal values towards SACRM should support sustainability behaviours in practice, but the conditions and context of EMS delivery for enabling this, was perceived as unfavorable. This may be partly due to the nature of EMS work, where prioritisation of time is focused more towards patient care, despite an acceptance that it could be feasible.

“On [cardiac arrests] where it’s time critical...you’ve got ROSC [return of spontaneous circulation]...you’re trying to move your patient...everything just gets ‘hoiked’ into a clinical waste bag. Honestly, I hate excuses...because afterwards, once we are at ED and have handed over the patient, you could go through all that waste and try and find out what is recyclable and general waste. The only time constraint there is to get the ambulance ready to go again [within 15 minutes]. But one person is doing the paperwork and another person is generally tidying....and any spare time is spent chatting to your mates...or you’re grabbing a coffee. So I couldn’t really argue that there is not enough time to do it. I’m probably using time constraints as an excuse really...why we couldn’t do it, apart from laziness. An extra five minutes to segregate waste, wouldn’t be unachievable.” (27)

8.1.4 Discussion on attitudes and behaviours when managing waste

Effective waste segregation and recycling are key components of an ASTs’ sustainability strategy. There appeared to be a cognitive dissonance between the majority of the participants’ attitudes towards waste segregation and the behaviours of waste segregation. Most participants would argue that they were environmentally aware and knew what the expectations were, however in most cases, their behaviours demonstrated a lack of compliance with waste management policy. Where general or recycling waste amenities existed, they were either not publicised, or were not utilised due to a challenging location or absence of suitable liners. From the ethnographical data gathered, improving the behaviours around waste segregation and disposal, both in the peripatetic and station environment, was highly dependent on the provision of appropriate

facilities, convenience, visibility of the waste bins and ergonomics involved in the action of waste disposal. The prehospital setting offers unique challenges to RRR behaviours; however, some small steps can create big changes.

Tee and Low (2016) advocated that there are four elements for fostering waste segregation behaviour. These are (a) accessibility to appropriate bins (number of bins, distance to them and ease of disposal), (b) information on segregation, (c) incentives for adopting it, and (d) reminders to reinforce waste segregation behaviour. Kolodko, Read & Umar (2016) refer to these four elements as enablers for the path of least resistance, by removing the barriers and providing motivation for changing the existing bad habits. Simple modifications to practice could enhance the conditions for waste segregation behaviour that is more aligned to the aims of the ASTs' sustainability policies.

(a) Accessibility to appropriate bins,

Within the peripatetic environment, improvements should be made to provide more accessible waste facilities for the segregation of domestic and recycling waste, especially from the consumable equipment used (Table 8.2).

Table 8.2 Recommendations for improving accessibility to appropriate bins

Accessibility to appropriate bins	
1	Staff to carry all types of colour coded waste stream plastic bags in their response equipment, to facilitate segregation in the patient's home or workplace.
2	Dedicated depositories for all waste types should be provided within all emergency response vehicles and appropriate size bags should be made available to staff.

Historically, UK operational ambulance staff were not widely consulted on vehicle design and ergonomics of its use; however, opportunities were recently available for contributing within the National Ambulance Vehicle Specification for English NHS Ambulance Trusts, which concluded in October 2021 (NHS England and NHS Improvement, 2021b). For future DCAs, there has been specification made for a 7 litre capacity bin for domestic waste (at the head end of the stretcher in Zone B), two clinical waste bins (at the head end in Zone B and foot end of the stretcher in Zone D) and a 2.5 litre capacity sharps bin (at the foot end of the stretcher in Zone D) (Figure 8.2). This is a missed opportunity to fully influence segregation behaviour and add a recycling facility in addition to the domestic waste bin. The number, size, positioning and ease of access to recycling bins (i.e. whether the recycling bins are larger in capacity or open lidded) are key factors when waste disposal behaviours were observed or discussed (Lansana, 1992; Malakahmad, Za and Nasir, 2010; Kolodko, Read and Umar, 2016; Hallihan *et al.*, 2019). Either, all of the waste stream receptacles should be located together in one location as a waste stream cupboard, or at the very least, both the general waste bin and the recycling bin should be located adjacent to each other. In addition, both bins could have

adaptions made where the recycling is more accessible than the general waste and clinical waste bins, to encourage segregation at source (Tee and Low, 2016).

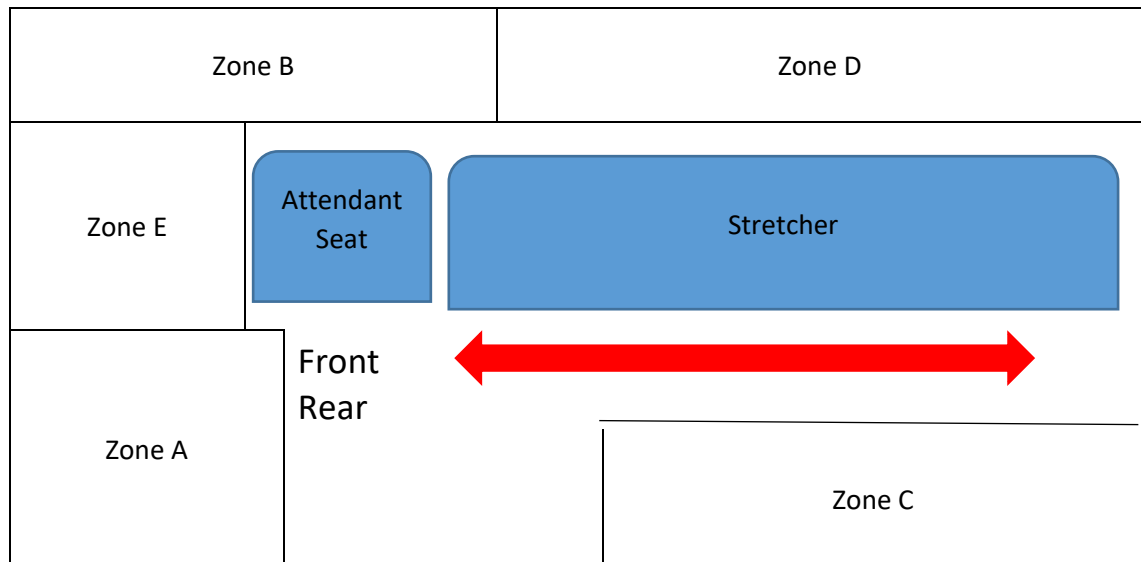


Figure 8.2 Diagram showing the National Ambulance Vehicle Specification for English NHS Ambulance Trusts Saloon Layout (NHS England and NHS Improvement, 2021b)

This principle should also apply to the provision of domestic and recycling bins on ambulance stations and other Trust static sites. All waste stream bins should ideally be in the same location, recycling bins should be made more accessible in size and familiarisation is needed to ensure staff know their facilities. In the longer term, better investment in building infrastructure is needed to incorporate future benefits of better building design and layout of stations.

(b) Information on segregation

The communication of waste segregation expectations could be improved. Facilities and processes should be better promoted to operational staff (Table 8.3).

Table 8.3 Recommendations for improving information for better waste segregation

Information on segregation	
1	Advertise the benefits of waste segregation
2	Inform staff about the costs involved with different waste streams
3	Offer knowledge of what items can be recycled (especially from the consumable clinical equipment). Procurement to source items with less consumable packaging and more Trust guidance on recycling may also need to be considered
4	Provide demonstrations or protocols on how waste segregation can be achieved in a time starved, space starved working environment (Armijo de Vega, Ojeda-Benitez and Ramirez-Barreto, 2008; Chase 2009; Kaplowitz, 2009)

(c) Incentives for adopting it,

Incentives are powerful motivators that encourage certain behaviours, such as waste segregation (Tee and Low, 2016). These can be differentiated into monetary and non-monetary incentives (Table 8.4).

Table 8.4 Recommendations for incentivisation

Incentives for adopting better waste management	
1	Provide tangible local station benefits from any local efficiency savings made, such as donations to staff welfare or social funds or nominated charities, or enhanced opportunities for funding on training or educational courses.
2	Provide feedback on waste segregation performance as this may enhance the fostering of pro-environmental behaviour as a non-monetary incentive, which can outline the stations that are doing well and those which need to improve. Even appreciation letters and small gifts can encourage desired behaviours. (Carrico, 2011; Tee and Low, 2016).

(d) Reminders to reinforce waste segregation behaviour

Finally, reminders are vital to encourage the continuation of effective segregation behaviour (Table 8.5).

Table 8.5 Recommendations for reinforcing waste segregation behaviour

Reminders to reinforce waste segregation behaviour	
1	Provide written and verbal promotion of waste segregation in signage, labelling and staff literature,
2	Reinforce the message through constant updates from management or staff meetings, where it is an established agenda item (Tee and Low, 2016)
3	Performance should be measured by each AST through regular local audit to confirm compliance to waste disposal policies and continued improvement and refresher training given in low performing areas (Gupta, 2009; Kalia <i>et al.</i> , 2021).

Overall, there were significant changes that could be considered within practice to ensure waste segregation and disposal were meeting the expectations of ASTs' policies. Providing suitable facilities is only one aspect of managing this, as equally staff have to be influenced into using them correctly at the right time, in the right place, every time. A positive attitude, education and sharing of good practice amongst operational staff can encourage positive waste behaviours (Shafee, Kasturwar and Nirupama, 2010). Central to this is the local leadership, through station managers, supervisors or 'GCs' setting an example to others.

8.2 Theme 2- Equipment Use - Auspicious and Judicious practice

This theme was developed from the ethnographic data that involved how operational crews were selecting and using the equipment, provided in the course of their daily practice. It covers three main areas; consumable equipment (e.g. cannulas, ECG electrodes, oxygen masks, suction tubing), PCR's, and drug restocking.

8.2.1 Consumable equipment

Operational staff tended to select and use consumable equipment, as and when it was needed; however, there were exceptions where sustainable improvements could be made. One area witnessed was the taught practice of ambulance crews assembling consumable equipment in preparation for a subsequent procedure. For example, on numerous occasions, an ECA would use a syringe and plastic ampoule of saline to draw up a flush, prepare an intravenous drug and open a cannula fixing dressing. The Paramedic would then attempt cannulation, but fail in their attempts and abandon the process, thus voiding the need for the prepared equipment. On other occasions, oxygen masks were opened and connected for use, only to be disregarded after the patient's oxygen saturation levels were monitored and deemed adequate; thus contradicting a patient need for that apparatus.

"I mean sometimes you do get some wastage as a result of...if you're attending say a cardiac arrest ... you tend to open things upand then say hang on a minute...we don't really need that." (2)

"I watched a cardiac arrest where four IO [intraosseous] needles had been opened...due to the crew flapping. That's four hundred quid and they only needed one." (53)

It was appreciated that most preparative processes expedited the care for the patient, but the time saved was arguably negligible; however, the cumulative costs in discarded consumable equipment could be quite expensive. When participants were asked about their views on judicious equipment use, it was often discussed as a professional and ethical obligation to treat the patient first and foremost, with concerns over costs and items used being non-existent.

“From a personal level, I don’t think people give two hoots about costs...because they don’t pay the bills. We are quite a blasé group of people who just do what needs to be done and we don’t care about costs.” (54)

Some participants were aware of the costs of consumable items.

“In the stores...they’ve got the price of a lot of things up, so like an IO needle costs this much...and that’s interesting. It’s like them saying don’t use this if you don’t have to...because it costs a lot. It’s not every item, but all the expensive stuff has a price above it.” (7)

For some, judicious use of equipment was not a consideration because they did not see any direct benefit to potential savings created.

Another anomaly observed in practice was about stockpiling and lack of stock rotation with consumable items that were infrequently used. Operational staff checked their equipment stock levels on their VDI, and some checked that these items were still within their expiry date; however, there was no discernible stock rotation, where items closest to the expiry would be used first. A similar occurrence was noted in the station stores, where new stock was added and mixed with a box of older stock; increasing the likelihood that out of date consumables would occur. A small change in process for judicious and necessary use of consumables in sequence to a successful procedure, could collectively save AST money and unnecessary disposal into the waste stream. It is not about denying a patient the appropriate care at the right time, it is simply that equipment use is more considered, deliberate and cost effective (NHS England and NHS Improvement, 2020).

One participant (50), who was also an OM, said that their line managers had updates on consumption use and costs at finance meetings, but this did not 'trickle down' to the operational level. Another participant, who was responsible for stock ordering of the station stores, suggested that each stock item should have a labelled cost per unit adjacent to their storage box on the shelf, so that staff could appreciate the cost of what they are using and may then be more mindful of unnecessary wastage. Similarly, if staff were educated in stock rotation and storage, it may reduce the incidence of date expired items being disposed of.

Some participants commented on the over reliance of single use items for infection control measures and the move away from reusable items.

"Even the laryngoscope handles have changed...they used to wash them...but now they just chuck them out. Everything is single use." (7)

Participants also expressed the view that the Procurement Department could contribute towards lessening the overuse of plastic within consumable equipment use. Several participants commented on areas where plastic could have been substituted with options that are considered as more recyclable.

The procurement spend for the NHS is in excess of £9 billion per year, with one English AST spending around £84 million per year (YAS, 2020). This demonstrates that there can be a significant purchaser influence on negotiating more 'greener' contracts from suppliers (NHS England and NHS Improvement, 2020). AST objectives for plastic reduction in consumable equipment is now

contemporaneously more overt in their Green Plans as part of the NHS Plastics Reduction Pledge (NHS England and NHS Improvement, 2020; YAS, 2020; EEAS, 2021; EMAS, 2022; SWASfT, 2022). YAS estimated that it saved over four tonnes of waste during the year 2019/20, with a cost saving of over £12,000, by removing 200,000 single-use plastic items from its waste stream, thereby reducing packaging, delivery and disposal costs (NHS England and NHS Improvement, 2020; YAS, 2020). There are also overt AST strategies, such as a reduction of packaging, alternative packaging as well as reusable packaging. In conjunction with the NHS supply chain, ASTs have also made positive moves towards decarbonising the procurement of goods from suppliers, encouraging green innovation for alternatives from single use items and distributing supplies in a way that reduces waste and transportation emissions (YAS, 2020; LAS, 2022).

One successful re-usable innovation was introduced to some ASTs during the COVID pandemic. Ambulance services were estimated to be using between 10,000 to 20,000 single use facemasks per day. EEAS replaced single use FFP3 facemasks, with a purchase of 4,000 re-usable JSP Force 8 half facemasks (EEAS, 2021). Similarly, YAS trialed Type IIR accredited re-usable facemasks, which could be used between 30 and 50 times before being recycled (Yorkshire and Humberside Climate Commission, 2021). Through not procuring the single-use masks, as well as reducing the cost of the waste disposal, savings were made of between £400 and £1000 per tonne, as well as significant CO₂e emissions reduction.

8.2.2 Patient Clinical Records (PCRs)

It was observed that in both Trust A and Trust B, there were a combination of approaches being used for data capture within PCRs. On some stations, personnel were still using paper (hard copy) PCRs and some utilised electronic Patient Clinical Records (ePCRS), dependent on equipment availability and training in ePCR use. Operational staff tended to have mixed feelings with adopting ePCR use. Although they understood the benefits of being paperless, some were skeptical about adopting ePCRs as they were slow to use and of questionable reliability due to disconnecting Bluetooth connections and issues with software updates when trying to enter patient information. Participants also complained that scrolling between screen-pages, took their focus away from the patient. In some areas, staff had to use both hard copy and ePCRs concurrently as not all EDs had the compatible software. Some participants, however, were enthusiastic about ePCRS and their enhanced features of accessing System 1 and a patient's wider medical records. These tended to be younger staff members, or student Paramedics, that had been trained in ePCR use from the outset.

A digital low carbon transformation, across the health service, is a critical priority of the NHS Long term Plan (NHS, 2019; NHS England and NHS Improvement, 2020). From observations of the ePCR in use, it was apparent that it was still in its transitional phase across both Trusts, where additional training, better integration with ED systems and software issues still need to evolve for it to be true replacement of the pen and paper. ePCRs are thought to be beneficial with accessing wider health records, sending information across

the web, eliminate paper manufacture and storage (Turley *et al.*, 2011), but any cost savings and carbon emission reductions from going digital and less reliant on paper copies are arguable in the short to medium term. The initial capital investment, supportive infrastructure, annual ICT software updates, rising energy costs of charging, the environmental impact of using lithium batteries and the energy used in cloud servers and data centres, present a counter argument for its sustainable use. It may be many years before savings are realised, both financially and through a reduction in carbon emissions, unless the charging is generated from zero emission sources and they have a long usability shelf life (NHS England and NHS Improvement, 2020). Trusts will still have to stockpile paper PCRs as part of business continuity contingency planning, in case of a catastrophic ICT failure of the network (Fischer, Halibocek and Walters, 2019). So, whilst paper use may be reduced, it has not been eliminated.

8.2.3 Drug restocking

Between the two ASTs, there were different processes for the restocking of drugs after an incident. Both DCAs and RRVs carried a combination of pharmacy, limited prescription only and limited controlled drugs for paramedical administration (England, 2016). Supply of these drugs are regulated and restricted, with stringent storage and restricted access. Re-stocking of these drugs, following their administration to patients, is often necessary during a shift, dependent on the frequency, nature of the incident and patient condition. Re-stocking facilities are secure, have robust recording mechanisms and

generally have stock rotation processes to ensure that drugs with more recent expiry dates are used first. This is especially important as some drugs have quite a short shelf life.

Trust B favoured the process of returning to an ambulance station to re-stock, following an incident where vehicle drug stocks were depleted. These tended to be the nearest ambulance station during times of peak activity, or a return to their base station during quieter periods. Trust A had a process where crews had to re-stock at a designated ED. From placement observation in Trust A, it was noted that some significant journeys had to be made to facilitate this. For example, one crew attended a private house with a patient in cardiac arrest, within one mile of the station. During the incident, they used nearly all of their supply of adrenaline and amiodarone. The resuscitation was unsuccessful and the patient was pronounced dead at scene and was not conveyed. However, the DCA then had to drive 12 miles to their ED for re-stocking. Similar occurrences were noted when working from other stations, where re-stocking journeys from rural stations could mean a round trip of 30 plus miles. This could be argued as justified if this was a process, which enabled Trust A to have better control over the drugs at designated centralised points, offering better stock rotation and reduced the mileage for procurement deliveries to all stations. However, at the same time, this process was very much observed as wasteful in fuel, resource availability time and created needless carbon emissions.

8.3 Theme 3 - Utility Use - Switching on to better housekeeping

This theme encompasses the ethnographic data that observed how operational crews were utilising AST resources of electricity, gas and water, during their time on ambulance stations and static standby points. There were two foci of observation that emerged during the participant observation; Trust energy saving measures and behaviour (and attitudes) towards energy use.

8.3.1 Implementation of Trust energy saving measures

It was evident that, in both Trusts, work had been completed to replace lighting with energy saving light bulbs or eco-bulbs. In addition, some station areas were fitted with motion sensors to activate and turn off lighting in areas, which were infrequently occupied, such as corridors, storage rooms, locker rooms and toilet areas. A few stations had new boiler systems fitted for greater energy efficient heating systems, such as heat pumps, however some stations still relied on wall mounted, or plug in electric heaters. No station visited appeared to have any form of regenerative energy investment such as solar panels or wind turbines fitted.

Several of the stations visited, were considered by staff as being archaic and not fit for purpose. Several participants felt that a continual lack of investment, from a cash-starved NHS, meant that any modernisation programme to enable stations that were fit for 21st century use was slow or non-existent. Some staff commented that it was more likely that rural stations would be phased out or

merged in another location, with the redundant station sold as an asset, before ever being considered for modernisation.

There are obvious financial challenges for NHS ASTs with the modernisation programmes for an antiquated estate. It was encouraging to observe that investment in simple short-term wins had been implemented; however, there were still longer-term ambitions of both Trusts, which did not appear to have been communicated well with the staff. Contemporary AST Green plans now show that there is a myriad of sustainability programmes in progress or within future planning. These include the continued installation of solar panels across Trust sites to provide renewable systems and microgrids that support EV charging; refurbishments, retrofits and new builds that comply with BREEAM accreditation; enhanced insulation of fabric upgrades; and enhancements to enable more natural light into buildings, instead of artificial (NAST, 2020; YAS, 2020; EAST, 2021; SWAST, 2021).

8.3.2 Behaviour and attitudes towards energy use

It was observed that there was little participant consideration towards the electricity usage by staff, whilst at work. There were numerous occasions, in both Trusts, where appliances or lighting fixtures were left switched on, or used when they did not need to be. On one station, where the duty room had a motion sensor main light, staff preferred not to use it.

“We did have a sensor...but then they [the staff] took the sensor out of the crew room...because if you moved it felt like daylight. So at night

time...it gets turned off and we have a little lamp over at the side...which then gets left on.” (53)

On the same station, it was observed that the garage lights were left on all day.

When discussed with some of the participants, the responses included,

“I thought they switched themselves off, but I might be wrong. They never used to. I’m never long enough in the garage to know.” (49)

Other examples observed, included televisions left on with nobody watching them, lighting left on in unoccupied areas, computers being left on whilst not in use, or music systems still playing in empty garage areas. For example, there were at least three of the nine locations visited, where upon arrival at the ambulance station to start a shift, the site was empty of personnel; however, within the duty room, the television was left on and several areas of the building had full lighting switched on, including the garage areas, storage cupboards and locker rooms. In one location, an electric fan heater had been left on, yet an adjacent window was left open. This observation was not just limited to when stations were found empty. Without exception, whenever the last occupants on a station were dispatched to a patient response, there was no discernible attempt observed from any of the participants to turn off any of the appliances, before leaving. In several ambulance stations visited, windows were frequently observed to be left open within duty rooms or toilet areas with heating systems fully on.

In two of the large urban stations, with a large contingent of staff throughout a 24-hour period, televisions were noted to be left permanently on. Operational staff were often observed to be pre-occupied with other station tasks, but the television remained on, with no attempt to turn it off.

“...it’s difficult [to know when the TV should be switched off] as most of the time there is someone there. When I’m leaving there are just crews rotating in and out. I don’t watch the TV much...especially the station one.” (6)

Another frequent observation was that during the transition from dark to light after sunrise, many station duty rooms, offices and ancillary rooms still had blinds closed, and had the electric lights on. There were numerous occasions throughout the daylight hours where lighting could have been switched off, had there been more natural light let in. Some participants, when asked if they were aware of this, said;

“I never noticed that before!” (45)

Some of the participants justified this through saying that the bushes and trees blocked the natural light, or that they wanted their privacy from the outside. This phenomenon was also observed in many of the station garage areas visited, where lighting was left permanently on, despite the skylights and windows letting natural light in. Through discussions with several participants, operational staff felt that it was not feasible to turn all lights off. Some staff felt that it was not their responsibility to turn off lights when leaving the station, prioritising a swift exit to meet response time targets. Others felt that lights should be left on during the hours of darkness for security reasons whilst absent or safety

reasons for lighting the way when returning. No participants were aware of what their station utility bills were each month. Several participants, including an OM, all confirmed that this information was only known to the Estates Department and did not get feedback to the station occupants.

Overall, there was evidence that both ASTs were implementing some programmes of energy efficient modernisation; however, the challenges of real estate, especially with age, meant that much more investment and re-investment was needed. Building design should maximise natural light, and install ecosystems for energy efficiency. Better investment and infrastructure would enhance future benefits. The installation of modified 'room management systems' into ambulance stations and static standby points could also be an energy saver. A 'room management system' is similar to a hotel room, where a key card activates electric sockets when inserted into a card reader. When the card is then withdrawn, the lights, heating and ancillary plugs automatically cuts off (except for fridges or critical appliances) (Lee and Kim, 2020). Speed of activation was more of a priority to the participants than switching individual things off. These 'room management systems' would disable all non-essential electricity sources from one convenient location upon a swift exit from the station. If the location was to be left unmanned for an indefinite period, then a rapid deactivation switch could save the consumption of energy from ancillary appliances and devices. Lee and Kim (2020) found that after the installation of room management systems, University dormitories had daily electrical savings of 142.4 Wh/m² and a savings rate of 28.2%.

8.4 Theme 4 - Fuel Consumption - Reductions and alternatives

A significant theme around fuel consumption materialised, offering an insight into how AST processes, fleet choices and staff behaviour affected fuel consumption. Three sub themes were formulated that encompassed how vehicle design affects fuel consumption, how ambulance deployment processes can create excess mileage and the alternatives to existing fuel sources.

8.4.1 Vehicle design and its impact on fuel consumption

The cost of the UK ASTs' fleet is over £200 million per year (Lord Carter of Coles, 2018). ASTs also expect to purchase or lease a further 2,600 DCAs between 2018 and 2023, as part of replacing the older fleet, with a potential need for an additional 700 DCAs due to changes in performance targets (Lord Carter of Coles, 2018:47). The type of vehicles deployed within an ASTs' fleet is a strategic decision; however, the choices can have a large impact on their fuel performance as well as how they are used operationally in EMS provision.

Observation was conducted on several types and ages of DCA and RRV makes and models. All DCA designs observed during this study were diesel ambulance conversions, where the cab and chassis (the base vehicle) and rear saloon (bespoke conversion) are purchased separately (NHS England, 2021a). There were two main styles of DCA observed, during this phase of research.

The first was a Mercedes Sprinter style that had an approximate 5 tonne chassis weight with a large box design as a saloon. This type also had a heavy, electrically powered, tail lift attached for loading patients, mounted externally at the rear. (Figure 8.3). It was often referred to as 'a yellow and green driven brick' due to its weight and size with an average fuel consumption of 16-18 mpg (Commercial Fleet, 2014). With evolving modifications, to aerodynamics, use of lighter conversion materials and reductions in weight, the fuel consumption of the Mercedes was re-estimated to be 21.18 mpg on average, saving 25% use (Commercial Fleet, 2014).

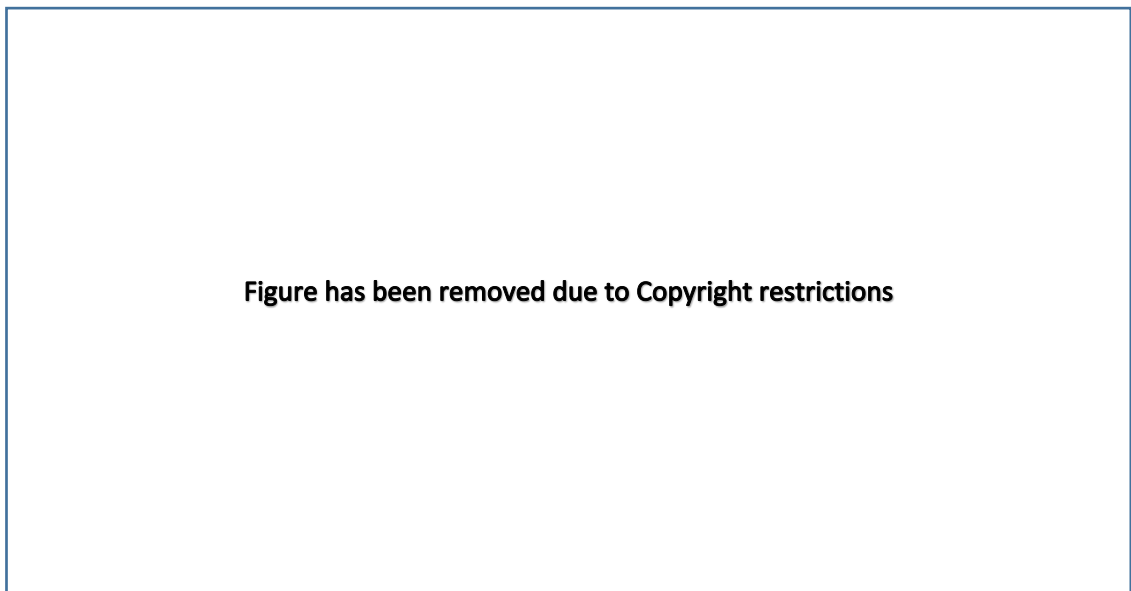


Figure 8.3 Mercedes Sprinter Ambulance Design and Tail lift (MercedesBlog, 2014; WEC Group, 2020)

The second model predominantly used was the Fiat Ducato with a lighter weight conversion (4.25 tonnes), low rear floor and an integrated, electronically operated fold out wedge ramp for loading (See Figure 8.4) (Fleet and Business Hub, 2019).

Figure has been removed due to Copyright restrictions

Figure 8.4 Fiat Ducato Ambulance Design and integrated ramp (Fresh Metal, 2017; VCS Vehicle Conversion Specialists, 2022a)

The fuel consumption of this design was estimated to offer a 7% mpg improvement over previous DCAs (Lord Carter of Coles, 2018; West Midlands Ambulance Service University NHS Foundation Trust (WMAS), 2021). The Fiat replacement programme, tended to favour rural ambulance stations, targeting areas where the smaller design better suited narrow lanes.

Both models required ancillary battery management systems (ABMS) to keep the medical equipment, lights and loading apparatus charged and operating. The ABMS could be charged by either using power generated by the running diesel engine whilst in motion (or when idling using 'Runlock'), 'Shoreline', which is an external, plug-in source on ambulance stations, or from the use of alternative fuel sources (solar panels, hydrogen or methanol fuel cells). During the study, no alternative fuel sources were witnessed as fitted or in use and thus most ABMS systems used engine idling or 'Shorelines'.

One common issue that was observed in practice, within ASTs, was that the continued charging of the ABMS was problematic due to the intense activity and 24-hour use of each DCA with a lack of 'non-operational' time, allowing little opportunity to have 'Shoreline' charging. This meant that most ABMS charging was through engine idling on 'Runlock' whilst in attendance at incidents, on standby locations or parked at ED when handing over patients.

“There are certain standbys...where I was actually consciously thinking about that [use of engine idling]. When I turned the engine off and there was no capacity to plug it in...I had to keep my engine running just because the indicator was showing that my batteries were low. So in order to be able to start the engine and respond...with not completely flat equipment...we had to keep the engine running. In the winter, especially some cars...the older ones...we had to let it run more because the battery was so flat that after half an hour I had to use the emergency start battery. I am aware....of unnecessary running of the ignition...but you can't really do much about that. I had a few members of the public who knocked on our window and were like, “are you aware of carbon reducing” and stuff like that...but I say really sorry I can't....because batteries are so flat...lights and everything will go off...heating and everything.” (6)

There were frequent occasions where engines were observed to be idling for more than 20 minutes in duration. The rationale for this, often offered by the participants, was that the ramps would not operate otherwise, or that the patient compartment needed to be kept heated, or that the lights needed to remain on. There was one particular occasion that occurred in Trust A, towards the end of a 12-hour day shift, where emergency calls had been continuous all day. Upon arrival at the local ED, the crew being observed (33 and 34), unloaded the patient from the vehicle and joined a queue of other ambulance staff and patients waiting for ED staff to hand over. Outside it was a dark and cold evening, during winter. During the wait, the researcher returned to the ED parking area, where it was noted that there were six other DCAs parked

outside. All the DCAs had their engines running on idle, with rear doors open, ramps or tail lifts deployed, lights on and heaters blowing out hot air. It was another 25 minutes before the first crew were able to hand over their patient. It took 45 minutes for the researcher's allocated crew to handover. During this time, more DCAs arrived and left their vehicles in a similar fashion, with engines idling. This practice increased fuel consumption and it also spewed out harmful CO₂e emissions, in an area directly outside the hospital entrance.

Charging the ABMS is a critical feature of an ambulance resource to ensure that the equipment is functioning for patient care. Whilst alternatives, have been trialed in some Trusts, such as solar panels and hydrogen or methanol cells, these did not appear widespread or in common usage within the AST research areas. The alternatives do provide an advantage over the traditional means of charging through engine idling on 'Runlock', however much wider investment is yet to be seen. Additionally, there was opportunity for 'Shorelines' to be fitted at ED parking bays for ambulance resource use. With the lengthy waits for handover, this provision may have negated the need for engine idling. It is encouraging to see that some ASTs are considering this within their recent Green Plans (YAS, 2020).

The introduction of lighter chassis weights with more compact saloons and technologies to remove the need to operate the engine for charging, have become key features within the National Double Crewed Ambulance specification, which will have an impact on fuel consumption in the longer term

(Lord Carter of Coles, 2018; NHS England and NHS Improvement, 2021b).

EEAST estimates that they will save approximately 1.9 tCo_{2e} annually through their transition from the Mercedes to the Fiat fleet (EEAST, 2021). Whilst these are positive moves, the specification is still mandating a mixture of fossil fuel engine capability and not alternate fuel sources, such as hybrid or hydrogen. Interestingly, one conversion specialist has designed the UK's first all-electric, zero emission, ambulance, capable of meeting the demands of an emergency service (VCS Vehicle Conversion Specialists, 2022b). This is being trialed in WMAS from October 2022. Despite having a maximum speed of 75 mph, it can only attain a range of 105-110 miles before 4.25 hours of recharging is required, limiting its potential for 24-hour use. Nevertheless, it currently would not meet the UK National Specification of a minimum of 500 miles (from a full tank or charge) (NHS England and NHS Improvement, 2021b). Additionally, with the rising prices of electrical per unit costs in 2022, EVs may not be as economical due to the volatility of the energy market, with one motoring organisation quoting 18p per mile for electric charging, compared with 19p for petrol and 21p for diesel, with electrical costs rising 42% in four months (RAC Drive, 2022). The benefit of zero emissions, however still remains an overriding incentive for further exploration with this technology. The electricity generating process, though, should also be zero emissions.

Some of the participants were yet to be convinced on the roadworthiness of lighter vehicle designs, and felt that they were problematic to drive, less stable during emergency driving conditions and were less ergonomic to work in. This sentiment has recently been exposed in a report from the EEAST (Emergency

Services News, 2022). The compact design has impacted on operational staff capability, where 94 out of 160 assessed were unable to drive the vehicles and others unable to operate safely within the rear of the ambulance due to their tall heights and body shape.

8.4.2 The challenges of meeting response times

The premise of response times are to dispatch the right vehicle at the right time, first time, however dispatch performance is interrelated with availability of resources and the triage allocation model deployed, according to the severity and urgency of the incident (Lord Carter of Coles, 2018:60; Snooks *et al.*, 2021). Triage is conducted at two points: firstly by the call handler, to decide on an appropriate resource and timing and secondly by the operational staff at the incident location (Snooks *et al.*, 2021).

Throughout the observational period, there were numerous experiences where, ambulance vehicles were being dispatched on a Category 2 call (a response in 18 minutes) or a Category 3 call (response required within 2 hours). The DCA (or RRV) would be travelling in one direction, for them to be then given a Category 1 (a response within 7 minutes) emergency call, whereupon, they would alter route and drive back in the opposite direction, only to be later stood down and reallocated to the original Category 2 or 3 dispatch.

“As for the fuel usage...we find ourselves dispatched to a certain job literally miles away...only to be stood down. I know it’s the ‘nature of the beast’ and you can’t help that, but we get re-allocated and get turned around...and then we are back to wherever we started from. Sometimes

we are like “oh my God! How much fuel are we actually wasting here? It is quite frustrating when you know you need to travel back.” (2)

Reasons for this, in the dispatch model, was for either the call handler obtaining more information to re-triage the nature of the call and downgrade the category, or because a dual allocation of an RRV or DCA to the incident location was made and the first on scene had stood the other vehicle down, as not needed. Within both Trusts, this caused numerous observed occasions of between 6 – 32 miles of excess mileage caused by re-allocation. RRVs were observed to be stood down with greater frequency than DCAs as ambulances had the carrying capacity for patient transportation.

Triage by call handlers is fundamental to the correct allocation of category; however, because of the increased activity in the volume of calls, the way that performance is measured, and the increased waiting time of the handover of patients at ED, re-prioritisation and duplication of existing vehicles are the only means available to meet the demand. Unless a vehicle fleet is significantly expanded, or performance measures are amended, or the volume of inappropriate non-emergency calls are reduced, excess mileages will remain as the status quo. Other observed causes of excess mileage included poor directions to the incident location, several hoax calls made by the public, or a customary practice of returning to the crew’s main base ambulance station for a meal break.

The consideration of a patient's destination, if being conveyed, was an important decision made by the participants. It was observed that in Trust A, there was a greater tendency to transport patients to EDs, whereas in Trust B, there was a slightly greater observed tendency of patient non-conveyance. This had an overall effect on reducing additional mileage to ED. Participants in Trust B were seen to explore a wider range of options with referrals to General Practitioners, primary care, out of hours services, pharmacy services or treatment at the scene. This had an effect of releasing the resource far earlier, adding an additional source to the central dispatcher, which could be considered as essential, especially when handover at ED is consistently breaching the 15 minutes NHS standard contract time and waits regularly being recorded as >60 minutes (NHS England, 2021c). NHS England estimates that savings of over £300 million could be realised if there was a reduction of 50% in overall conveyances (Lord Carter of Coles, 2018:16). The higher number of avoidable conveyances witnessed in Trust A were not necessarily poor decisions, but more from a lack of alternative health services to access, or elevated levels of clinical education and experience (Lord Carter of Coles, 2018).

8.4.3 Alternative fuel sources as a choice

Through discussions with the participants, there were varying degrees of knowledge towards alternative fuel sources available or being trialed in ASTs. A few participants were not fully cognisant of any alternative fuel use that could be used, apart from some awareness of EVs being used for support staff making ambulance station deliveries. This suggested that there was little promotion or

communication by their Trust, within their Green Plans. Most participants were openly willing to trial alternative fueled vehicles, but were unconvinced over their current dependability;

“Electrical cars...I read something about that. I would be very skeptical about that to be honest. Well...you need a charging point ...and you don't want to run out of battery or something, when you are on an emergency.” (6)

Some participants mentioned that they either owned an EV or expressed a strong interest in purchasing one; however, a barrier to using them as a commute to work, was that there were no charging facilities offered at their ambulance station. This was highly contentious for some, as despite their continued requests to their Trust, and a commitment to pay for the energy used, they felt ignored. A few participants, especially those that lived and worked in urban environments, chose to commute to work by alternative means and not use their car. Some walked or ran to work, some cycled (with some taking advantage of their Trust's cycle to work scheme) and some used public transport where available. Reasons for this were that in the urban areas, car parking on station was at a premium so not always obtainable, some mentioned the introduction of a congestion charge that was payable, and some wanted to exercise for their fitness. There was less uptake of these commuting methods in the rural areas, as staff there generally lived further away from their base station, so walking, cycling and public transport were prohibited by distance or a lack of availability in public transport.

Alternative fuel sources currently being proposed within ambulance fleets are low carbon options (such as hybrid, liquid petroleum gas and compressed natural gas) and zero carbon options (such as electric or hydrogen). Both electric and hydrogen vehicles are currently being trialed in at least two English ASTs and should be commercially available within the next decade, potentially being phased into the fleet from 2026 (EEAST, 2021). LAS and YAS are also testing an electric hydrogen hybrid named ZERRO (Zero Emission Rapid Response Operations) which uses an electrically powered vehicle, with a hydrogen fuel cell to act as a range extender by charging the battery when needed (ULEMCo, 2021; LAS, 2022; UK Research and Innovation, 2022). Any incorporation of these will require significant future investment both in the fleet procurement and in the infrastructure to support them.

For encouraging the commuting to work, ASTs could consider EV charging facilities at ambulance stations for staff use and improve the charging infrastructure ready for the EV evolution in ambulance fleet purchase. It is encouraging that this is being included on some Green Plans for future implementation (YAS, 2020; SWASFT, 2021); however, promotion of these aims could be better targeted towards their operational staff, through improved consultation. This is discussed in Theme 6.

8.5 Theme 5 - Sustainability Education - Knowledge is power!

The translation and adoption of an organisation's agenda for SACRM, relies heavily on an upskilled, knowledgeable and motivated workforce (NHS England

and NHS Improvement, 2020). Besides the generation of an enabling, supportive culture, a fundamental step for positive sustainability behaviours is to educate staff (Miller, 2022). The ethnographic evidence accumulated from the discussions of participants, demonstrated that sustainability education was highly lacking in both Trusts, with the majority of participants either not having any educational exposure, or some that had snippets of information that were insufficiently communicated. Three main subthemes emerged within the analysis of sustainability education and how sustainability education was perceived by the participants. These were the types of sustainability education opportunities that participants had been exposed to, the application of eco-driver training and how peer influence could sway behaviour.

8.5.1 Extent of sustainability education in ambulance curricula

A common theme in conversation was about how little training and education, operational staff had, concerning the SACRM objectives of their Trust. Most HCPC registered Paramedics gained their title to practice either formally through the Institute of Health and Care Development qualification (an in house, vocational training programme) or more latterly through HEIs as a Diploma of Higher Education, a Foundation Degree or a Bachelor's of Science Honours Degree. ECAs and EMTs are unregistered, yet have vocational training and qualifications to work at that grade. Regardless of how long a participant had been in practice, a frequent retort tended to be that sustainability had either never been included or had been a very limited focus within their foundational training and education.

“As a Paramedic student, I have never had any education on sustainability in the ambulance service. I’ve not heard of anything in staff updates...and there was nothing in the university course curriculum.” (27)

“We had...quite literally an hour...an hour and a half...in one of the sort of death by PowerPoint sessions that we have...so very little content. I think that the course is so intense anyway, it doesn’t make much room for that to be perfectly honest.” (2)

This indicated that ambulance educational curricula, whether provided by academic institutions or more vocational training within the host Trust, was not providing a suitable focus on the sustainability agenda, despite opinion that would embrace it in their learning.

“As far as awareness is concerned...I think it is a whole cultural thing that needs to get more attention...just in the way that we are trained about many things really.” (51)

“A lot of our practice is influenced by education.” (53)

Where participants mentioned that they had received some educational content from their Trust, it was either through their induction event, SME update days, or through mandatory workbooks issued to staff. When questioned about their induction training, participants divulged that they had been given either no or very little information on sustainability aims and objectives within their Trust.

“I had my corporate induction 14 months ago...when I qualified and started work...it wasn’t mentioned at all. If there was ever an ideal opportunity, it was probably there, as everyone goes through that common induction.” (27)

For those participants that did receive some input, their perceptions of sustainability education within the induction training was that it felt like a lesser priority session that was squeezed into an already compact programme, almost

as an afterthought. Comments such as “it was brushed over” and “not felt to have any weight or focus” within the Trust objectives, were commonly stated. Several participants mentioned that the person presenting the sustainability element was not knowledgeable or confident themselves in their delivery; so it sent out a poor message and did not have the intensive impact, as it should have done.

There were similar comments made by participants that had attended a SME training event, where it was felt that the message was lost as the attitude of the person presenting the materials, lacked conviction and enthusiasm. Other participants recognised that the SME was a prime opportunity to target a sustainability message to the operational staff; however, the subject had to compete with many other corporate and clinical updates.

“Learning things about sustainability...that especially has a potentially huge cost benefit for the Trust...I think it could do with more investment in training...being picked up on development days. But then the development days are becoming so jammed packed anyway...because there is so much to try and cover in a day.” (10)

Participants in both Trusts mentioned that they had been issued with a sustainability workbook to complete as part of their SME, which had to be completed by a certain deadline. Whilst some mentioned that this was informative and thought provoking, others simply viewed it as another corporate ‘tick box exercise’.

“We get this mandatory workbook and people don’t take it all that seriously or really take it in. Again...you hand it in...it’s been done...it’s been signed...that’s the box ticked. But what has it done? I don’t think it does anything.” (10)

Therefore, whilst the participants were receiving information through the workbook, many felt that it did not necessarily educate or influence them.

8.5.2 Eco-Driver training

Not all of the participants had received Eco-driver training. Some participants mentioned Eco-driver training, as part of their Trust's strategy to maximise driving efficiency, reduce fuel consumption and minimise harmful greenhouse gas emissions (previously discussed in Section 5.3.2). Some participants were aware that it was linked to sustainability, and others were not, as it was labelled differently in their driver training.

"I think definitely we had maybe a word about that [Eco-Driving] during our blue light driving, but it was more like...not sure someone used the term Eco-driving perhaps...but just normal driving." (6)

The perception of Eco-driving was very mixed, with the majority of participants viewing it negatively.

"Eco-driving was mentioned once...but it wasn't really taught." (27)

"Eco driving doesn't work...as you've seen today in the conditions we have had to deal with." (54)

"Eco-driver training was laughable really." (26)

Others were not convinced about its applicability to emergency driving, but found it useful for their driving in their own personal car.

8.5.3 Peer influence and Green Champions

During discussions on what can influence their sustainability practice, some participants had a strong opinion on how their own attitudes and behaviours were affected by peer behaviour and local cultural norms. For some, especially new members of staff or Paramedic students on placement, 'fitting in' was more important than exercising personal principles. Sustainability behaviour was sometimes suppressed, dependent on the viewpoints of their managers, colleagues or mentors. Some peer attitudes and behaviours were expressed as a barrier to sustainability.

"There are some quite strong personalities in the ambulance service that would be difficult to change their behaviours." (54)

"I wouldn't say there is a peer pressure...but I do think there are people who wouldn't engage and wouldn't be bothered." (11)

Conversely, as participants became more experienced, they felt that they could become more assertive in expressing and exerting their values. Others believed that there were personalities within their station complement, who could be highly influential in creating positive sustainability cultures.

"Peer influence is probably the best way to do it...as we are a stubborn bunch of twits at the best of times and hard to change our ways...but if somebody does it and keeps doing it...it's going to rub off at some stage." (54)

"It would be better received coming from peers rather than management. You get that resistance to change from anything coming from management (27)

'Green champions' ('GCs') was a term used by a few participants, across both Trusts, identifying individuals that have some exertive influence on station

sustainability culture. Whilst the majority of participants in the study had not experienced 'GCs', a few had; however, most were known to have left, given up or simply 'fizzled out'. Some viewed this as a result of too busy clinical commitment during a shift, a wearing down from a general apathy on station, or a lack of communication from their AST management. Despite this, some would consider the GC role as part of career development.

"We all have a part to play. You can't be recycling at home and then completely disregard it at work. Just talking about it makes me curious to do more." (27)

Paramedic Practice Educators (PPEs) and mentors were considered as ideal role models to spur sustainability enthusiasm within their students, through setting expected examples of sustainable behaviour, offering contemporary information that aligns to the Trust's Green Plan, and incorporating sustainability learning objectives within their student's practice portfolio.

"I get exposed to about 8 different Paramedics on [redacted] station. I pick the best of everything from whom I work with...and try to make it my own. Some of them have bad habits and some of them don't. Their habits...not necessarily bad ones...do definitely rub off on you. It's a kind of watch them...do what they do...and you adopt their practice" (2)

8.5.4 Discussion on an educational need for sustainability literacy

Education is a pivotal strategy in supporting staff sustainability literacy and to understand the links between health and climate change and promote the practice interventions necessary to reduce carbon emissions (NHS England and NHS Improvement, 2020; LAS, 2022). The ethnographic data has suggested that there is a deficit in the participants' education supporting behavioural

change, their understanding of their Trust's sustainability strategies and the role that they have in meeting AST goals.

Foundational education that leads to a qualification to practice could be a perfect juncture to embed sustainability knowledge (Richardson, Allum and Grose, 2016). There appeared to be a dearth of sustainability education offered by HEIs or vocational training providers. Paramedic students' attitudes towards SACRM can be positively influenced through education, if offered specific, relevant and tangible methods for sustainable practice (Richardson, Allum and Grose, 2016; Schwerdtle *et al.*, 2020). By educating a future operational workforce with contemporary sustainability knowledge and skills procedures, healthcare professionals can develop the desired values that influence attitudes and changes behaviour (Anåker *et al.*, 2015; NHS England and NHS Improvement, 2020; Schwerdtle *et al.*, 2020). This would require a closer liaison between ASTs, HEIs and education providers for a concentrated drive for SACRM to be embedded into EMS curricula. There is also a potential for the Education Advisory Committee of the CoP to adopt sustainability education into their Paramedic Curriculum guidance, used by education providers as the benchmark for healthcare delivery (CoP, 2019). This would involve SACRM not only as a standalone taught subject, but also fully embedded into every process and activity, including assessment of practice. Elements of sustainability education would also need to extend across an individual's career development. The timing of the education is an important factor. It ideally needs practice knowledge linked with context, so should be targeted throughout continuous levels of qualification, from novice through to expert skills progression (Teherani

et al., 2017; CoP, 2019). In the early stages of clinical training, the focus tends to be on learning Paramedic skills, whereas the wider professional and ethical issues become more apparent once familiar with clinical ability. Adaptions to the educational curricula should also extend into the PPEd (or Mentor) and Paramedic student relationship. By having sustainable practice as a metric of practice competence, and encouragement of student run sustainability initiatives, the green ethos could be embedded into the student mind-set even before qualification. Paramedic students are the PPEds of the future, so changes in educational curricula now, are likely to evolve a sustainable workforce of the future.

Corporate education of sustainability should continue within each AST's induction and SME days, as these are inaugural and annual events, offering opportunity to sell their sustainability messages. There should, however, be dedicated provision in the programme and better delivery by knowledgeable and motivated presenters, using innovative case studies to enthuse the message (Cotton *et al.*, 2007). Equally, the incorporation of Eco-driving should be reviewed by each AST as to the effectiveness of the educational delivery and an evaluation of its continued use. This may require refresher training or intermittent driving assessments to gauge the efficacy.

Positive peer influence appears essential for harnessing desired sustainability behaviours, within a station culture. Many participants appeared enthusiastic and passionate about sustainability, but often expressed that there was a lack

of direction or support from their Trust. This suggests that there is a potential pool of volunteers that would like to undertake more sustainability leadership on their station. Certainly, the individuals mentioned in the voluntary recycling initiative had a positive influence on several other participants, interviewed from that area. 'GCs' were previously experienced by some participants as being a positive influence on station and the local leadership was appreciated more than the tradition of management notices and diktats. However, 'GC' presence was perceived to have disappeared. AST managers should readdress their recruitment, support, communication and contingency planning with 'GCs'; as they provide that link between the corporate message and influenced behaviours in operational areas. 'GCs' can also be innovative, feeding back ideas and information about the reality outside of a Green Plan. Regular updates being circulated via the 'GCs' would significantly improve the information dissemination chain and the communication may be more effectively received by the late adopters and the laggards (Triguero, Moreno-Mondejar and Davia, 2014). The issue of communicating sustainability messages are discussed in Theme 6.

8.6 Theme 6 - Communication issues - Getting the message to stick

Staff engagement is a fundamental aspect for ensuring organisational improvement (Lord Carter of Coles, 2018; NEAS, 2021; EMAS, 2022; SECAmb, 2022). Observing the various forms of communication, how management engaged with staff and understanding how staff perceived their value within their organisational culture, emerged as a standalone theme in gauging sustainability adoption. There were two subthemes developed from the data;

staff awareness of their Trust's sustainability policy and staff perceptions on how management communicated sustainability measures.

8.6.1 Awareness of the Trusts Green Plan

Participant awareness of their Trust's Green Plan was variable. Some had heard of it, whilst the vast majority had not, or knew of what it represented. For those that were aware of it, none had read it, obtaining their information from other forms of Trust communiqués or press releases. Most participants also appeared unaware of who the manager responsible for sustainability was, within their Trust. This inferred that either their organisation's Green Plan or strategies were not readily available, or not widely publicised and disseminated to operational staff.

When asked if they would read it, if it were available, some participants said that they would through personal interest, but the majority were disinclined, citing information overload or too busy within their clinical work.

"I wouldn't know where to find it....or be inclined to read it" (26)

"I've seen it, but I got to be honest though...that with something like that I would probably glaze over a little bit." (2)

8.6.2 Observations and perceptions of how management communicate with staff

The style of communicating SACRM is extremely important to staff attitude and the adoption of improved behaviours (Quirk *et al.*, 2018). Working from different

ambulance base stations, it was possible to observe how various forms of communication were used to offer sustainability messages to the operational staff.

Every station had at least one notice board that consisted of pinned documents and posters, which was usually adjacent to a white marker board, where general messages were written by managers to staff, or by staff written to other staff. Sometimes logbooks were used to note reminder messages for handing over to other crews. On one occasion in Trust A, there was a reminder message observed in the log, written about poor waste management from one crew, who had cleaned a vehicle following its late return. The message said;

“To the crew of [redacted number], in future, could you please not put your fish and chip wrappers in the clinical waste bin as that should not go in there!” (Field note from 11/11/18 Station 7)

It was possible to see some posters, bulletin notices and other documents relating to sustainability on some of the notice boards, but quite often, they were hidden behind other documents, or lost in a ‘sea’ of other documents, making them difficult to stand out or be noticed.

Others had commented that because of the constant clinical activity, there was little time for peer discussion and a lack of time for reading notices

“...there are just so many clinical SOPs [Standard Operating Procedures] and clinical updates that I have to read.” (6)

“It’s just information overload when I stare at that.” (50)

Information being passed by word of mouth was discussed by some participants as being a “thing of the past”, due to long hours spent away from the station and very little time for handovers between crews taking over vehicles at the beginning and end of a shift.

“There is just no time anymore to be a community.” (43)

Other forms of managerial communication, involving sustainability, that the participants highlighted, were from personal station emails. A large proportion of the participants expressed a view that they had not received much formal or definitive information around sustainable practice or initiatives, but were highly aware of ‘passive-aggressive’ messages from management about what they should be doing and what they shouldn’t be doing. One participant described this as;

“...an overuse of the stick and hardly any carrot!” (61)

Many had said that this form of communication, whatever the medium, was distasteful, counter-productive, and likely to provoke an opposite reaction to the intended desired outcome.

“If you go on any ambulance station in this Trust you will see it’s full of passive aggressive messages everywhere, from the signs that people put up. [That’s]...not good.” (27)

Participants perceived ambulance station culture to have a big impact on how staff responded to the way messages and communiqués were sent. Several participants commented on how adopting sustainable practice was problematic

due to some geographical areas being distinctly 'militant' stations with a high degree of resistance to change.

"This is a unionised part of the country and we are in a very unionised Trust. Everything that management tries to implement is always viewed with suspicion. A lot of it is a cultural thing. The 'us and them' mentality still continues." (27)

This was often to the detriment of some individuals wanting to be more proactive with sustainability within their station, but felt that they would either be ostracised or ridiculed due to the lack of local management or peer support. This was reflected through some comments made about their line managers and supervisors. Participants felt that if their Station Manager or Supervisor's general attitudes were blasé towards sustainability, then staff attitude and behaviour would mirror that same indifference. Coupled with the competing priorities of patient care, in a busy, pressurised environment, then some participants also felt less inclined to adopt sustainability as a focus.

"Everyone starts off with good intentions and then have been wronged by management. Good will disappears and everyone just wants to take the easy route to come in, do the minimum and go home." (52)

Local leadership, providing positive SACRM influence, could be a valuable asset to have within the operational workforce, for adopting change. One participant described it as,

"Evolution, not revolution, are needed to show the benefit." (33)

If the promotion of cultural change is to be driven by local management, then some communication cultures would need to have significant change first.

8.7 Limitations, summary and conclusions

Limitations

There were several limitations when using ethnographic methodology, which should be considered in the interpretation of the findings. Firstly, there was the limitation with sample size, within FE. The time spent in field immersion and the intensity of detailed data gathering through observation and informal interviews, greatly limited the sample size that could be selected within the confines of the research parameters (Goodson and Vassar, 2011; Cupit, Mackintosh and Armstrong, 2018). Whilst consideration was made towards a variance of geographical locations and station sizes within two English ASTs, the data was confined within the cultural areas visited. This made generalisation to other, wider populations, difficult (Savage, 2000; Andreassen, Christensen, and Moller, 2019). The findings of the study could only apply to the participants involved, situated in the settings in which they worked. Therefore, any interpretations of data and its findings cannot be generalised to other ambulance operational staff across every stations in every AST within the UK. (Wind, 2008; Goodson and Vassar, 2011). The findings, however, offer an in-depth understanding of the emergent issues, have transferability to other settings and may lead to proposals for future research, with alternative methodologies.

Secondly, there were the limitations of the immersive ethnographic data gathering itself, where researcher competence and acceptance into the culture were a challenge (Iphofen, 2013). Several considerations were made towards the researcher building swift rapport with the participants, to expedite the 'fitting in' (Iphofen, 2013; Rashid, Hodgson, and Luig, 2019). These included the camaraderie of wearing an ambulance uniform, using past experience of ambulance service working to assimilate with routine activities, varying language code or terminology to mirror the participants and to be highly aware of the hierarchy of researcher and participant (Andreassen, Christensen, and Moller, 2019). Despite these measures, there still may have been the potential for a Hawthorne effect from those observed and the responses that they offered when in discussion.

Thirdly, subjectivity is a limitation of all qualitative research, especially ethnography (Iphofen, 2013). Each researcher experiences a culture differently and they gather and interpret the data with a personal uniqueness. Their observational field notes are highly personal and the questions asked during conversations are dependent on the rapport built between each researcher and their participants. Even the findings could be interpreted and categorised with a potential for researcher subjectivity bias. Researcher reflexivity was consistently applied throughout the ethnographic study, with self-reflection occurring both within the design, the immersive observation and the informal discussions, with great care not to introduce researcher bias, lead conversations or influence in the data (Pope, 2005; Higginbottom, Pillay and Boadu, 2013; Andreassen, Christensen, and Moller, 2019). Sometimes, there was a fine balance within

conversations, where the researcher was asked for their opinion, so dynamic judgements had to be made with dialogue, to retain neutrality and not to prejudice participant responses. It was fundamentally important to let the participants do what they normally did and say what they truthfully thought (Iphofen, 2013). Using a triangulation of researcher observation, and informal interviews allowed opportunities to also ask about the context of the participants' actions as well as explore their perceptions and feelings and beliefs (Reeves, Cooper and Hodges, 2008; Andreassen, Christensen, and Moller, 2019). This then strengthened the validity of the data, through trustworthiness and credibility (Rashid, Hodgson, and Luig, 2019).

Summary and Conclusions

Throughout the FE data gathering within both Trusts, it was palpable how dedicated the operational staff were towards patients and their provision of care for them. It was also highly encouraging to observe and understand how sustainability was being considered within EMS practice, along with identifying the barriers and challenges for sustainability behaviours in the workplace.

The overall aim of this phase of study was to observe and explore the activities, attitudes and behaviours of operational ambulance personnel in their approach to sustainability. The ethnography was specifically observing the connection between AST strategic policy objectives and the daily activities of the operational staff. There is close alignment of the phenomenological findings discussed in Chapter five, Theme 2 (Section 5.2.2), where sustainability

managers expressed their perceptions of operational staff, with the findings of the observations within this ethnographical study. Intuitively, the SACRM Managers were aware that there was a miscellany of operational staff attitudes and behaviours, which are both pro-sustainability (innovators and early adopters) and those which are the 'resistors' and 'laggards' towards change (Rogers and Shoemaker, 1971; Barr and Dowding, 2019). Within the workforce, there are also the large numbers of 'early majority' and the 'late majority' adopters with regards to sustainability change (Rogers and Shoemaker, 1971; Barr and Dowding, 2019) which should also be recognised. The ethnographic observations concurred with the previous phenomenological findings, in that there was a diversity of behaviours amongst the staff; however, these observational findings have enabled a thicker and deeper understanding of the attitudes and behaviours of the operational workforce. Within both Trusts, there were three behavioural groups identified. Firstly, there were individuals who were already sustainability pro-active. Strategies should therefore be developed to enable and encourage this group to continue in their position as positive role models for peer influence on ambulance stations. Secondly, there are those that were sustainability willing in attitude, but lacked the facilities, resources, support or means to apply behavioural changes in their practice. Greater attention and consideration towards their challenges should be offered and stratagems to meet their resource needs or process changes should be implemented. They also need to enable them to translate their 'green mind-set' that they use at home, into the workplace. Finally, there are those individuals that still had to be convinced to adjust from traditional practice, emanating both a negative attitude and behaviour towards sustainability change. Part of this may be due to other

cultural factors causing low morale (Unison, 2021; NHS Confederation, 2022), but by meeting the needs of the first two groups, positive peer pressure and communicating successes with progressive sustainability case studies can influence these 'late majority' and 'laggards' towards a more proactive perspective. Local leadership, regular contact and communication with all groups is paramount to keep the green message embedded into all workplace activities. SACRM managers should be targeting all of these groups with more meaningful communications and choice architecture to influence a more positive sustainability attitude and non-enforced compliance, as persuasion is the powerful motivator for adopting new ideas, instigating behavioural change and encouraging sustainability innovation.

In conclusion, there are significant steps that AST management and NHS ambulance personnel can take, to minimise their carbon footprint. It was evident that sustainability is not simply about the publication of ambitious corporate Green Plans, or top down strategic decisions being imposed, but is also about creating small motivational wins, with better monitoring and supporting of behavioural change within the operational workforce. Operational staff are vital to the translation and adoption of the corporate aims and objectives within the workplace and so requires education to improve sustainability literacy, effective communication to understand the Trust's strategy, appropriate facilities and processes in place to adopt the strategy and positive motivation to adapt to the 'green' ethos.

Everyone employed within an AST has a role to play with sustainability, whether it is initiating macro or meso changes, such as re-designing services differently or championing resourceful and effective sustainability behaviours within individual practice and local station communities. Small, yet widespread contributions offer an accumulated, combined effect (Allum, Nichols and Carpenter, 2019a; NHS England and NHS Improvement, 2020).

Recommendations for change are further discussed in Chapter nine, where the thesis is summarised as a whole.

Chapter Nine: Conclusions and recommendations

9.0 Introduction

This thesis aimed to investigate opportunities for sustainability behaviours within Paramedic and Ambulance Service practice. It aimed to explore UK ASTs adoption of RRR approaches in practice, by investigating the attitudes, behaviours and underpinning knowledge of UK ambulance personnel in how they contribute to a SACRM ethos (NHS England, 2022b). In this chapter, the thesis findings are summarised in the context of the thesis objectives before offering a critique of the whole study's strengths and limitations. Finally, the contributions made to original knowledge are expressed, followed by the implications for future practice and recommendations for future research. The chapter then concludes with private reflections on the PhD experience.

9.1 Summary of the Findings

During Phase One (thesis objective 1), a systematic and critical review of published literature around sustainability in EMS, was conducted, that scoped the SACRM research since the UK Climate Change Act (2008). This critically explored the impacts of climate change on EMS operations, identified current SACRM approaches, highlighted the challenges in implementing SACRM strategies, and uncovered the gaps in EMS research, to inform the future phases of research in the thesis. The SLR revealed that climate change is likely to have a magnified effect on EMS activity, with an increase in mortality, morbidity and ambulance responses (Tham *et al.*, 2020; Kranc *et al.*, 2021). Strategies to ameliorate carbon emissions were promoted as being essential.

Addressing collective areas where EMS organisations contribute towards carbon emissions may help to lessen the effects on rising global temperatures and meet national targets for carbon reduction. There were four main areas, within the literature, for concerted attention. These are tackling the overdependence on fossil fuel use, reducing energy consumption, better management of the procurement supply, equipment use and waste disposal chain, and fostering a positive sustainability behavioural change within EMS personnel. Whilst the literature review demonstrated that there is an emerging evidence base on sustainability research, there were also, however, gaps identified, indicating a dearth of empirical research within UK ASTs and especially with qualitative methodologies to obtain 'rich' and 'deep' data. It was concluded that gaining an understanding of the perspectives of those involved, both in the UK strategic management and the EMS operational workforce, would offer an insight into the challenges with meeting NHS and UK carbon reduction targets. This led to the formulation of the research question for Phase Two.

The overall aim of Phase Two (thesis objectives 2 and 5) was to explore the role of NHS ambulance strategic managers in England, with their current experiences, perceptions, feelings, attitudes, behaviour and knowledge, when implementing their organisational Green Plans. It adopted a qualitative, phenomenological methodology for a data rich understanding. Following the findings identified in the SLR, this phase specifically focussed on matters, which decreased resource (fuel, energy and utilities) consumption, promoted supply chain efficiency, encouraged waste segregation proficiency, and facilitated

better RRR practices and engagement amongst operational ambulance personnel. The findings uncovered a contemporaneous comprehension of the challenges with implementing SACRM policy, the strategies implemented, the motivational dynamics in which SACRM managers felt best achieved their goals, and their short to long term aims. Four main themes were formulated from the data. These were, the essential leadership contribution needed for sustainability change, the willingness of the workforce in their engagement, targeted successes that had been implemented, and their future ambitions that lay ahead. Specifically, the findings from Theme 2, section 5.2.2 and Theme 4, section 5.4.2, identified the perceived cultural attitudes and behaviours of the operational workforce in how they interpreted and accepted Trust strategic plans, into their daily activity. Several areas were identified as perceived barriers to positive engagement. These were low staff morale, staff resistance to sustainability change, lack of incentivisation to adopt a 'green' ethos, a lack of SACRM training and education, and the uniqueness of the EMS environment, which makes SACRM difficult. Exploring what was actually happening within the operational workforce was identified as an area to focus on for further research. This raised several areas for investigation, such as why there was a perceived resistance of operational staff to accept and adopt sustainability changes and why they were not embracing Trust SACRM objectives, despite education and training being made available. This signposted the need for a deeper analysis of the cultural activities experienced by operational staff in their healthcare provision, along with an understanding of the uniqueness of their contextual practice or processes and how that related to SACRM effectiveness. This theme was carried forward into Phase three.

Phase Three (thesis objectives 3, 4 and 5) adopted a qualitative, ethnographical methodology with an aim to explore the SACRM activities, attitudes and behaviours of operational ambulance personnel within NHS ASTs in England, specifically around equipment usage, waste management and consumption of fuel and energy. The observation phase enabled an insight into the inter-relationships between people as they conducted their daily occupation, as well as an opportunity to hear how personnel rationalise their attitude and behaviour. Six themes emerged from the field data. These outlined the barriers to effective waste segregation and disposal, the attitudes and behaviours around judicious equipment use, how staff could reduce energy usage on ambulance stations, the challenges with reducing fuel consumption, the lack of SACRM education within curricula, and the perceptions of how managers communicated with the staff. From these themes, it was concluded that there were several areas where ASTs could enhance and encourage SACRM engagement. These were summarised as recommendations towards better provision of facilities, changes to certain processes, engagement with education providers to include SACRM education within foundational training, regular audit and monitoring to feedback on progress, and more positive, encouraging communication, throughout all levels of the operational hierarchy.

9.2 Criticisms of the research methods

9.2.1 Strengths of the study

This thesis explored the complex and wide-ranging topic of SACRM, which was predisposed to a high degree of flux and change across the time span of the

study. Political, governmental and organisational targets were subject to constant mutability, and the evidence base was exponentially expanding in response to these changes. The flow of the thesis accommodated these changes, through constant revision and analysis of the academic, identifying the gaps in research to guide the focus of the research questions, and adopting methodologies, which provided deep and rich data.

The first phase of the study, encompassed a SLR of the published academic literature, relating to SACRM in global EMS delivery. There were three time-periods planned within the thesis, which spanned the publications since the Climate Change Act of 2008, to the thesis submission in 2022. This ensured that the supporting evidence was contemporary, relevant and accurate in order to inform the choices made within phases two and three.

The second phase of the thesis was to funnel the global information and knowledge into a UK focus, exploring the application of SACRM in English ASTs. Gaps in the literature indicated that there was a dearth of empirical research involving NHS ASTs, especially with qualitative exploration. The use of a phenomenological methodology allowed a deeper probe into the perceptions of 'data rich' participants who were at the forefront of AST SACRM policy. The qualitative data obtained contributed towards explaining the values, opinions, views and particular behaviours of strategic SACRM managers within their own social contexts.

The third phase of the thesis further explored an element identified in two of the themes from Phase two as well as one of the conclusions from the Phase one SLR, in that there was little empirical research connected to the attitudes and behaviours of EMS staff in adopting 'green' practices. Ethnographical research methodology offered several strengths over alternative methodologies. Being a 'Participant Observer' enabled immersion into holistic contextual settings, therefore gaining a personal viewpoint of SACRM behaviours and its nuances directly in the field. The overall aim, of this phase of research, was to uncover the 'situated rationality of action' within UK ASTs (Van Maanen, 2011; Watson, 2011) achieving multidimensional, naturally arising social interactions in circumstances that were not subject to experimental control (Webster and Rice, 2019). Ethnography provided observed insights into social practices that were customarily "hidden" from the public view. Gaining a viewpoint on workforce SACRM practice and what operational staff did in the field, allowed this thesis to compare the micro activity to the macro policies (Savage, 2006; Higginbottom, Pillay and Boadu, 2013; Andreassen, Christensen and Moller, 2019).

9.2.2 Limitations of the study

There were some limitations identified within the Phase one SLR. Firstly, only research journal articles from ten selected databases were included. There was no incorporation of the wider grey literature, which would also have encompassed NHS policy, AST policy and promotional media activity of EMS initiatives. These may also have added a dimension of reviewing the SACRM activities of EMS providers and any new interventions. Secondly, there is an argument that a SLR may be subject to selection and publication bias (Hart,

2018). Every attempt was made to avoid this through its design, search terms, eligibility criteria and rigorous data collection and selection protocols. One significant disadvantage, that added considerable demand to hand searching, was through the interrelated meanings of the word 'sustainability'. As it had several definitions or applications within healthcare, including the association with carbon reduction management, the number of returns from each database was magnified.

There were limitations identified within Phase two, which can be read in greater detail within Chapter five, Section 5.5. Firstly, there is a methodological limitation, as the findings of the interviews are based on personal explanations of the phenomena, from the participants, rather than direct observational evidence (Green and Thorogood, 2018). Secondly, there is a sampling limitation with only six participants. The sample group was highly purposive, with a likelihood of only one SACRM manager appointed for each Trust. Four Trusts were not represented. Having all ten UK ASTs participating, would have given a sample group with maximum representation. The findings are not statistically generalisable, but does have conceptual transferability (Green and Thorogood, 2018). Thirdly, the data from one of the interviews was affected by poor internet connectivity and thus limited. There was opportunity for more data-rich findings had the communication platform been more reliable, at the time of interview.

Within Phase three, several limitations were recognised with the use of FE methodology (see Chapter eight, section 8.7). The duration spent in field

immersion and the intensity of detailed data gathering within participant observation limited the sample size that could be selected within the confines of the research parameters (Goodson and Vassar, 2011; Cupit, Mackintosh and Armstrong, 2018). Data gathering was therefore narrowed to the contextual locations selected. This made generalisation to other, wider populations, challenging (Savage, 2000; Andreassen, Christensen, and Moller, 2019). The findings of this phase could only apply to the participants included, situated in the locations in which they worked. The findings, however, do have transferability to other ambulance operational staff across every station within the U.K. (Wind, 2008; Goodson and Vassar, 2011). There were also the limitations of the immersive ethnographic data gathering itself, where researcher competence and acceptance into the culture were a challenge (Iphofen, 2013). There may have been the possibility for a Hawthorne effect from those being observed and the responses that they offered when in discussion (Paradis and Sutkin, 2017).

Lastly, subjectivity is a limitation of the qualitative research conducted in both Phases two and three, particularly with phenomenology and ethnography. Researchers experience a culture and its participants differently, with a personal uniqueness applied to the process of gathering and interpreting data. The findings could be interpreted and categorised with a possible subjectivity bias (Pope, 2005; Higginbottom, Pillay and Boadu, 2013; Andreassen, Christensen, and Moller, 2019).

9.3 Contribution to knowledge

This thesis has provided a distinctive and valuable insight into SACRM strategies employed within EMS organisations. All three phases contribute knowledge for EMS organisations to understand the complexities and challenges that surround climate change, rising global temperatures and finite resources, in relation to the pressures it will have on the management of their current and future operations. Phases two and three of the study in particular, have produced an original and valuable empirical contribution for UK ASTs and the wider professional practice within them; something, which has not been previously explored, as highlighted through the phase one SLR.

9.3.1 Contribution to Sustainable Practice and Education

Phase one of the thesis has presented a comprehensive SLR of academic research publications, that scopes the relationship of global EMS delivery with climate change and sustainable practice, over a 14 year period. It offers an international perspective for EMS providers on how climate change will affect human health and how each organisation will need to consider the impact of global warming on demand, response times, resources and staff welfare. In addition, it has identified, analysed and critiqued the research evidence base around strategic policies, interventions and workforce behavioural engagement, worldwide. This knowledge forms an essential part in enabling sustainability literacy amongst the EMS professions and has specific value in understanding where gaps are in the evidence base. This information was useful in informing the second phase of this thesis.

Phase two of the thesis was a unique and original design to critically explore the role of NHS AST SACRM managers in England, and understand their experiences, perceptions, feelings, attitudes, behaviour and knowledge, when implementing initiatives through their organisational Green Plans. A qualitative, phenomenological methodology, with a purposive sample group drawn from six of the English NHS ASTs, enabled a rich understanding of the life experiences from a strategic, yet personal perspective. The findings inform the ambulance profession in the challenges, enablers and barriers for sustainable practice, offering new insights and a critical exploration of current initiatives and recommendations towards future ambitions. A major aspect of this phase incorporated the SACRM managers' perceived views that they held about the attitudes and behaviours of the workforce in adopting the strategic direction; in particular the operational workforce involved in direct patient care. The conclusions drawn from those aspects led to a more narrowed focus for exploration within Phase three.

Finally, Phase three of the thesis offers an original contribution to the empirical research evidence base, through an ethnographic exploration of SACRM behaviours within the operational workforce within two English ASTs. The findings from this research design offers a 'data-rich' and 'thick' insight into the level of awareness, willingness and commitment of operational ambulance staff with SACRM and how they followed, translated or implemented Trust organisational policies or plans. It identifies that there is a multiplicity of enablers and barriers for sustainable practice on an individual level, both within clinical practice and activities within ambulance stations. The resulting

discussion, from these foci, offers and promotes solutions, which could lead to simple interventions with resources, facilities or processes, potential cost savings, and improved carbon reduction efficiencies. These may then have transferability across other ambulance stations within the UK, as well as across other EMS settings and the wider business communities globally.

9.3.2 Contribution to Methodology

Although the validity of ethnography has been previously discussed and demonstrated in international EMS research, the use of FE does not appear to be commonplace within published UK Ambulance Service research, (Mannon, 1981; Metz, 1981; Roth, 1983; Seim, 2021). Despite an exhaustive and iterative investigation of the literature, published papers discussing a similar ethnographic approach to sustainability research within EMS services were not found. The decision to use a focussed ethnographical approach for this study offers an additional methodological understanding for consideration by ambulance professionals. Research involving pre-hospital care, undertaken by the Paramedic profession, is a relatively new field. The use of FE in this thesis, adds to the methodological literature, not only specifically for Paramedics, but also for medics and other ECPs. This study has shown that it is possible to use an alternative qualitative approach to phenomenology, for investigating a complex situation within paramedicine and pre-hospital care, using field notes to capture observation and informal discussion, moving beyond the traditional methods of phenomenological interviews. A secondary contribution may be considered, through the educational value provided to the participants, by the ethnographical methodological approach. Anecdotally, several participants

reported that the process of being observed and offering a rationale for their sustainable behaviours, facilitated personal reflection on their own practice, in a way that they did not previously consider. Although it may be argued that this is no different to participation in any other research design, the specific objectives of this phase, enabled deeper critical thinking through a participant's examination of personal thoughts and habitual practice, as well as observation of professional performance.

9.4 Implications for future practice

From the findings and discussion, within all research phases, there are numerous recommendations for future practice which can be considered by organisations, strategic managers and operational staff. These are summarised in Figures 9.1, 9.2, 9.3 and 9.4, which represent a hybrid-adapted model of AST recommendations for SACRM, using a synthesis of the NHS Sustainability Model (Institute for Innovations and Improvement, 2010). The new model represents the recommendations from the findings within this thesis, outlined within the factors labelled, Staff, Organisation and Process, with 10 further subdivisions.

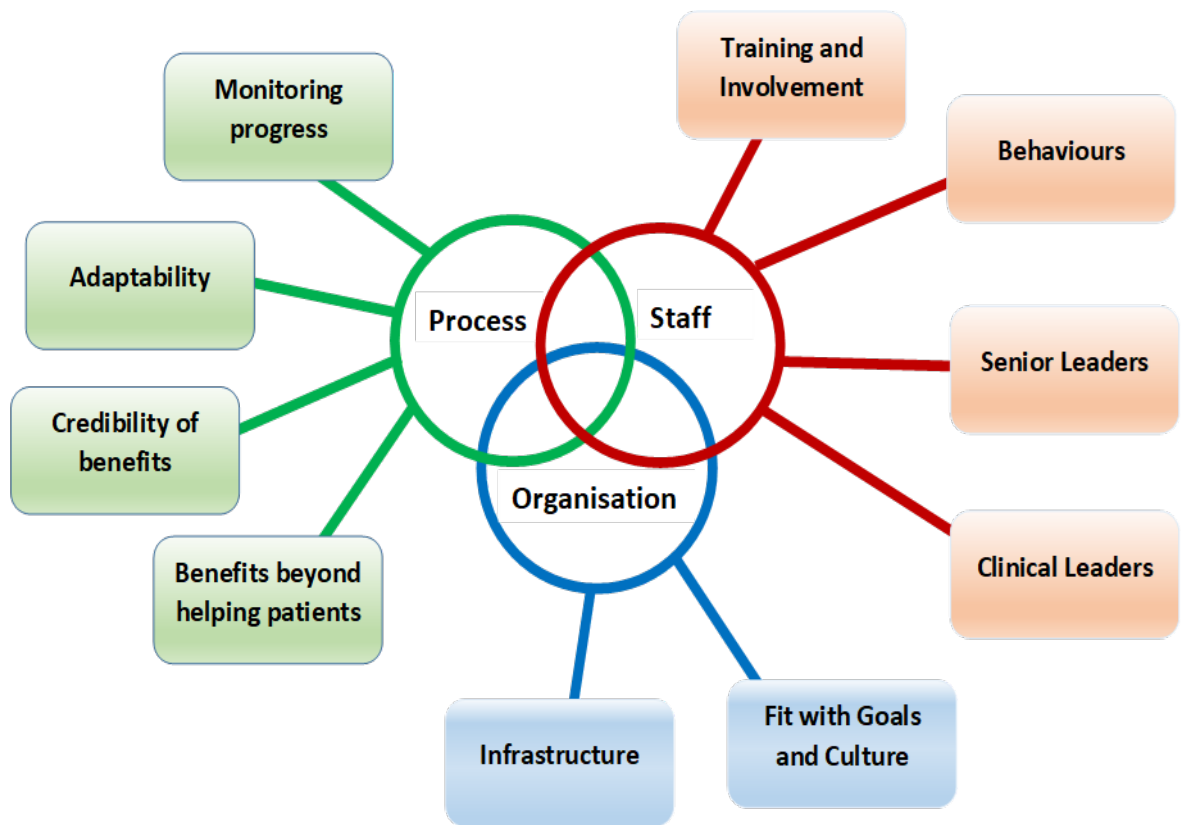


Figure 9.1 Diagram adapted from the NHS Sustainability Model (2007) adapted for AST Carbon Reduction recommendations (Institute for Innovations and Improvement, 2010)

Staff

The future recommendations concerning staff are segmented into training and involvement, behaviours, senior leaders and clinical leaders and the summary can be seen in Figure 9.2. Staff involvement and training helps to sustain an organisation's SACRM programme, as it encapsulates enabling a culture of connection to the 'green agenda'. There are several suggestions that apply to adaptations in the delivery and assessment of educational curricula, highlighting opportunities to embed a SACRM ethos into foundational and SME annual updates.

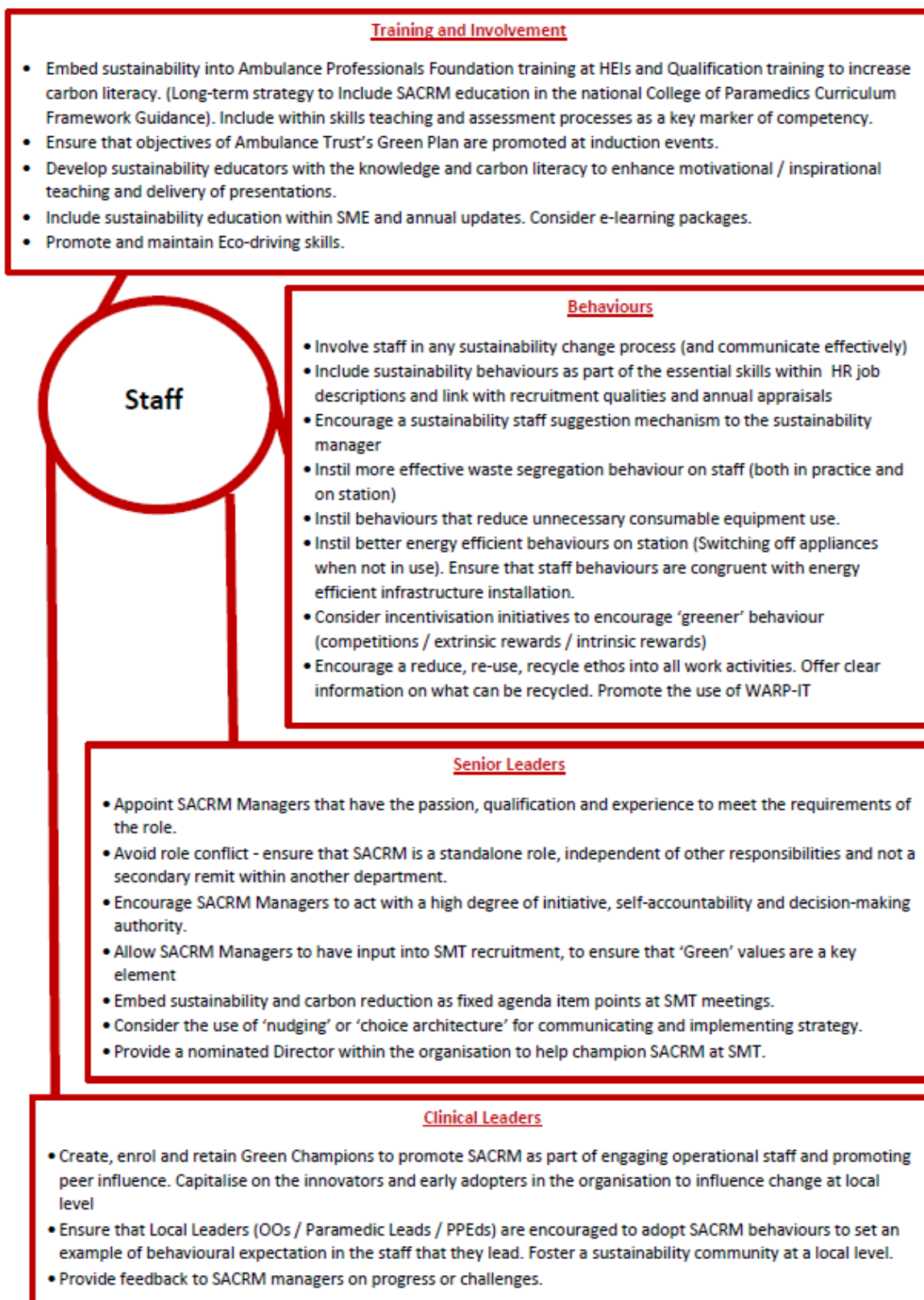


Figure 9.2 Hybrid model of SACRM recommendations for ASTs concerning Staff.

Developing the sustainability literacy of staff should be a priority for ASTs; therefore, close collaboration with HEIs, vocational training providers and professional bodies, such as the CoP, is needed to create the SACRM ideology within a future workforce.

Positive communication strategies, with mechanisms for two-way feedback between management and staff, could influence attitudes and thus behaviours within operational activities. Behavioural change strategies for operational staff are strongly recommended in areas such as waste segregation, superfluous consumable equipment use and consumption of energy on ambulance stations. These strategies could include better information and guidance alongside a blend of intrinsic and extrinsic motivational incentivisation. Senior leaders and members of AST SMTs have a powerful role with adopting SACRM into the organisational culture, both in supporting SACRM managers within their remit and to embed 'green thinking' across all strata of the workforce.

Clinical leaders are also pivotal to SACRM culture providing peer influence towards others as role models. They are also a communication link with the SACRM managers, providing a conduit for information dissemination and feedback from the workforce. Thus, strategies should be developed to create the 'GCs' network, enrol the SACRM early adopters and innovators and incentivise them to remain in the role.

Organisation

Suggestions to improve organisational features are subdivided into cultural ambitions for the organisation and necessary changes recommended for an ASTs' infrastructure. These can be seen summarised in Figure 9.3.

The cultural ambitions segment are proposals for how SACRM can be embedded into the organisations strategic aims, goals and culture. The two recommendations here involve a better promotion of the Green Plan to all staff, offering better access and awareness to the strategic aims of the Trust. These can be reinforced with dissemination of positive SACRM case studies, from either within the AST, or from adopting good practice from other organisations.

The other sub section includes the propositions towards an AST's infrastructure, with recommendations towards its Fleet Vehicles and the need to reduce fossil fuel use, alternative means of staff transport and ambulance station modifications that could save energy consumption and facilitate better waste segregation.

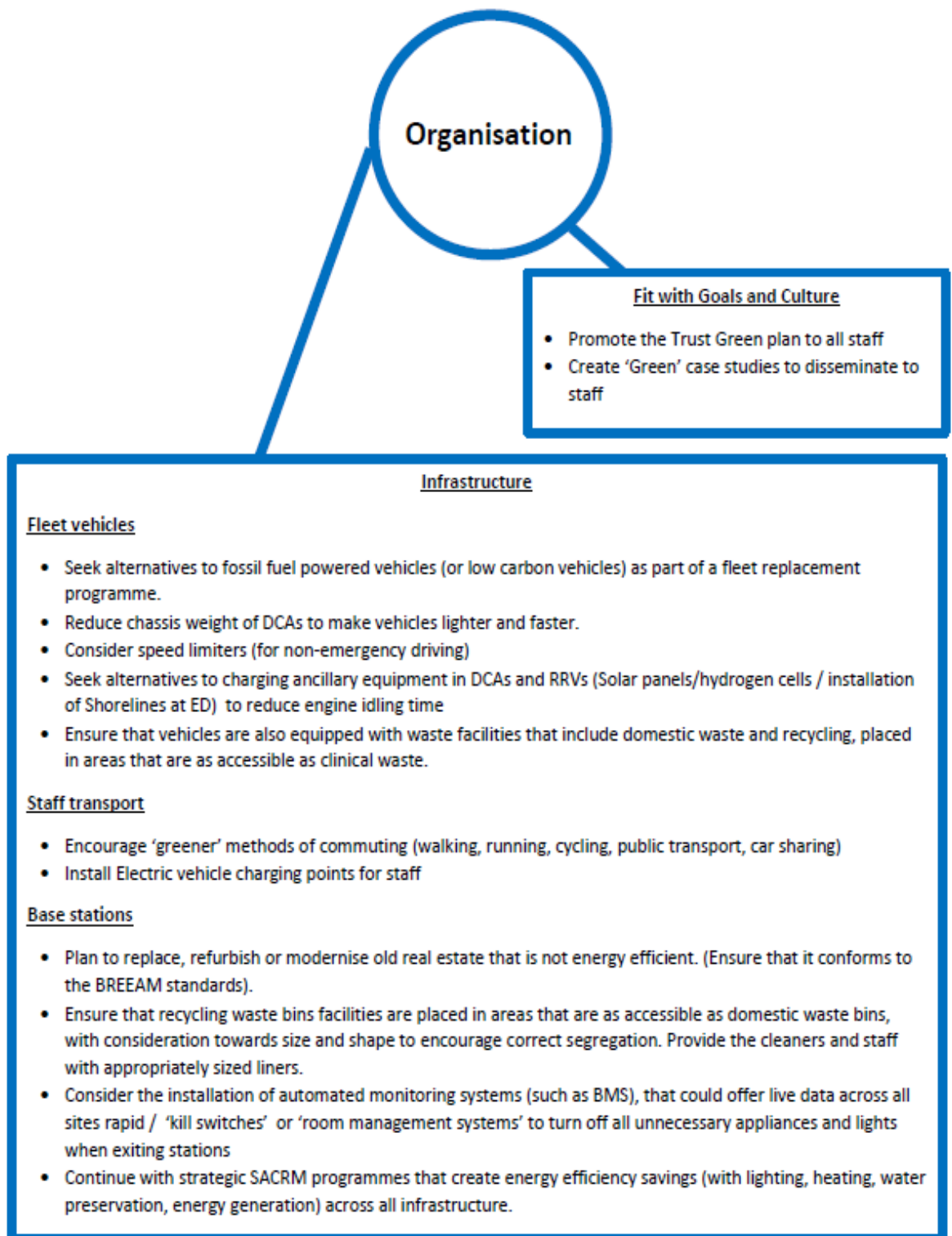


Figure 9.3 Hybrid model of SACRM recommendations for ASTs concerning Organisation.

Process

The process changes recommended for consideration are subdivided into monitoring progress, adaptability, credibility of benefits and benefits beyond helping patients. These are summarised in Figure 9.4. Monitoring progress is a vital aspect within the maintenance of SACRM policies. Measurement and communication help with continual improvement. Regular audit of equipment usage, waste management, energy consumption and fuel use are crucial to understand how effective intervention measures have been and whether targets are being achieved. Feedback should be offered at local levels, so that individual stations can chart their progress against Trust expectations. Adaptability suggestions focus on how new ideas can be adopted or collaborated with, from other external sources, as well as building in contingency planning for succession management. These aspects concern the future planning and the harnessing of innovation.

The credibility of benefits subsection has two encompassing areas. Firstly, it includes recommendations of gaining primary empirical evidence of SACRM savings, rather than estimations and forecasts, which can then be used as more robust confirmation within cost benefit analysis frameworks. Secondly, it recommends the promotion of SACRM awards, qualifications and grants, secured by a Trust. Communicating the benefits of these to the staff and to the public can be positive enhancers for influencing SACRM lifestyles.

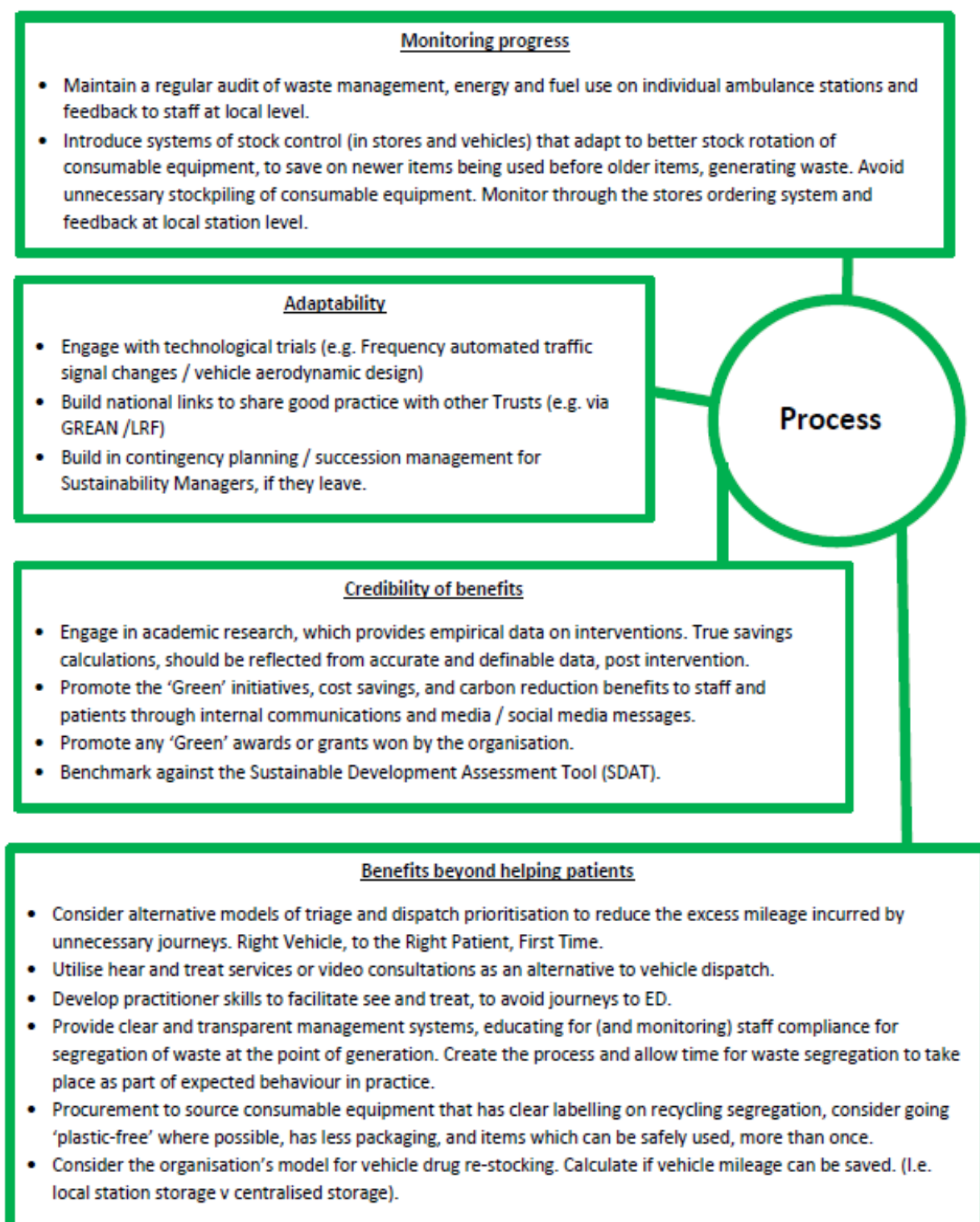


Figure 9.4 Hybrid model of SACRM recommendations for ASTs concerning Process.

Finally, there are the recommendations for process changes that suggest the exploration of different ways of working that foster SACRM principles. These involve consideration towards new models of triage and dispatch, with development of clinical services that aim to reduce fuel consumption as well as process changes to the procurement supply and waste disposal chain. These suggestions aim to change areas of duplication, waste and inefficiency.

9.5 Opportunities for future research

Future post-doctoral research could evolve from these thesis findings (Table 9.1). Adding research (1) involving a quantitative, positivist, approach with objective data analysis and a larger representative sample group, would lead to generalisability and therefore triangulate with the existing authentic picture of AST staff attitudes and behaviours (Hewitt-Taylor, 2011).

More focussed research designs, involving the operational workforce, could include a quantitative or mixed methods intervention research methodology into improving waste management (2) or for energy comparison studies (3). This could be either a randomised controlled trial or a non-randomised, quasi-experimental trial that targets waste management behaviour within certain ambulance stations and their staff. Longitudinal research methodology could be considered for studying the impact of SACRM education into ambulance service foundational curricula (4) (Hewitt-Taylor, 2011).

Table 9.1 Suggestions for Post-Doctoral Research

	Research Paradigm	Focus
(1)	Quantitative	A values-based staff survey could be designed, for the widespread participation of all UK AST staff. Questions would be based on the themes and subthemes that emerged from the Phase two and three findings, investigating the perceived values, attitudes and views towards SACRM activities within their organisation. It would provide a statistical comparison with the original findings, as part of a mixed method approach to compare against the qualitative data.
(2)	Mixed Method	A selected number of areas are audited for their waste segregation and disposal against Trust standards and then for a period of time afterwards are targeted with intense waste monitoring, educational materials, better facilities and positive motivation from line managers and 'GCs'. Follow up audits could then compare and contrast any effect that the interventions may have had and cost savings from efficient waste management could then be re-directed into other service areas.
(3)	Mixed Method	An intervention study could be implemented for energy comparison focussing on the installation of 'room management systems' into station duty rooms and static standby points.
(4)	Qualitative	A longitudinal study using either autoethnography or phenomenological methodology. Individuals could be selected and periodically evaluated on how SACRM education has influenced their understanding, attitude and behaviours over time. This would commence from the very start of their foundational education and continue beyond their gained practice qualifications and well into several years of practice experience.

9.6 Personal Reflections (what I would do differently next time)

I developed an interest in the subject of SACRM almost ten years ago. During my time as Programme Lead for the BSc (Hons) Paramedic Practitioner degree, a Nursing Professor asked me what measures ASTs were taking in response to climate change. Back then, I was not aware of any strategy, policy or educational guidance within my local AST, nor were any of my Paramedic Lecturer colleagues. I then made enquiries with Paramedics and Paramedic Educators within practice, and the response was still the same. No one in my professional contacts were aware of any advice, direction or training on SACRM. After I had been shown the various SACRM education materials that nursing and other health professions had been receiving within their curricula, it became a personal challenge to learn more, with the intention of integrating it within paramedical education. I was starting from a position of *tabula rasa*. My professorial colleague then encouraged me to formulate a PhD proposal, which led to this thesis.

I was eager for the opportunity to develop my ideas and thoughts into a PhD proposal. I had some capability concerns. Despite completing an MSc in Clinical Education at the Peninsula College of Medicine and Dentistry, I felt that both my research knowledge and experience was developing but limited. However, my supervisory team were encouraging, fostering a transformational approach to my learning. During earlier stages (from RDC 1 to RDC 2), I had concentrated on gathering subject information and planned a route of data collection. However, on reflection just before the transfer, I recognised that I was evading the crucially important philosophical component, which I found challenging to

understand and contextualise. In order to strengthen my knowledge and understanding, I attended a Masters module MSR700 Philosophical and Methodological Foundations of the Social Sciences, which added a greater understanding of the choices that I was about to make in research design. I also recognised that I was not fully conversant with statistical analysis. So to strengthen my knowledge, especially with analysing, interpreting and critiquing research from the literature review, I completed another masters module MSR703 Quantitative Analysis 1, surprising myself with a mark of 78%. This gave me a significant boost in both my confidence and my knowledge.

Following my successful transfer, from MPhil to PhD, I received encouraging feedback from the examiner, who stressed that I was most likely an academic vanguard in the Paramedic profession for SACRM, which was the catalyst to for me to commit more towards my learning. I made good progress in the next two years, completing Phase 2 and beginning the planning for the Phase 3 ethnography. It was during this period that I had some de-motivational challenges. As my PhD route was on a part-time basis and despite attempting to ring-fence one day a week in my schedule, the demands of teaching overtook my ability to commit to my study. I was also going through a lengthy process for obtaining ethical approval for the ethnographical Phase 3. I felt that this was a motivational low point and the six months spent on writing the ethical applications and waiting for approval was a moment when I could have withdrawn from the studies.

However, once ethical approval was granted and I commenced observational practice, I was re-enthused because I was embarking on a completely new methodology and methods of data gathering. Returning to practice and interacting with participants was an enormous positive mood changer. I felt that my knowledge and confidence of research and subject knowledge of SACRM was gaining in strength and depth. This was reflected in my teaching competence, especially around ethnography, where I delivered postgraduate teaching sessions on the methodology and was even requested on ethical approval panels for advice on ethnographical applications. This confidence was heightened when I was also invited to present my initial Phase Three findings at several conferences (Allum, Nichols and Carpenter, 2019b; 2019c) and was the award winner of the 'Best Oral Presentation' at a conference within the University of Brighton. (Allum, Nichols and Carpenter, 2019a).

Unfortunately, after the completion of the data gathering, I was then presented with a number of personal family issues, during and after the outbreak of COVID, which resulted in a reluctant, but necessary decision to suspend my PhD studies for 23 months. This was a huge obstacle to my progress, especially as I was entering the writing up stages; however, on the resumption of studies, I was able to fully commit with more time and enthusiasm to complete. The encouragement and support from my supervisors were invaluable. My involvement with this particular study developed my interest in ethnographical research and the philosophical approach of interpretive, social constructivism. I felt that this research approach worked well within the

prehospital environment and found it an excellent way to contextualise the observations within practice.

In retrospect, there are areas where I would have planned things differently. Firstly, I would time manage more effectively during the journey, especially in the earlier stages. I felt that I underestimated the length of time that ethical approvals, data gathering and transcribing would take, whilst studying part-time. Setting self-imposed deadlines would have generated a more concerted effort to complete the work for early review. Secondly, I should have sought funding opportunities, both to help with expenditure during the research data gathering and potentially to fund additional study time away from my working commitment. Thirdly, I would have developed my ICT skills to facilitate digital use of software programmes such as NVIVO (for managing TA), Endnote (as a reference manager) and used The Joanna Briggs Institute (JBI) systematic review programme (for managing the SLR). These may have enabled a more flexible, timesaving approach for thesis development.

Overall, despite the pressures and challenges, the doctoral journey has been a transformational process of personal development, which has allowed me to contest and adjust my personal viewpoints, explore my own philosophical perspectives in life and accept the adventure of new challenges. I believe that the whole experience on my PhD journey will allow me to continue my development as a career researcher, rather than just a Paramedic Lecturer undertaking research.

9.7 Summary

This chapter has outlined the whole journey of the thesis, exploring the role that EMS organisations and in particular, UK ASTS have in the application of SACRM strategy for meeting carbon reduction targets. At the very beginning of Chapter one, sustainability was defined as an organisation's competence for satisfying the demands of the current population, whilst still guarding the capability of future populations to meet their requirements (Quinn and Baltes, 2007). EMS organisations have a principal responsibility to provide expert patient care; but in this difficult present era, given the organisational challenges with increasing patient demand, difficulties with handover times at hospital, recovery from a pandemic, staff retention issues and fiscally shrinking budgets due to inflationary pressures, this has become increasingly difficult. A situation, which the evidence shows, will worsen as global temperatures rise.

EMS organisations, however, have a responsibility towards the stewardship of our planet and are custodians for future continuity. The obligation for resolute action on minimising contributory occupational CO₂e emissions is now upon our generation. It demands a concentrated focus on the SACRM areas within the EMS domain, which can make a difference, not only with cost effectiveness, but also with reducing its carbon footprint and saving the world's precious resources. EMS providers are prominent organisations within the healthcare system that can influence and promote the adoption of operative strategies and adjust attitudes and behaviours towards individuals playing their part. The thesis has explored and investigated the opportunities for SACRM behaviours within Paramedical and Ambulance Service practice. The findings from this thesis

provide empirical recommendations that can guide both macro, meso and micro SACRM strategy, whether that involves consideration towards process changes in how ambulances are dispatched and resourced, or the design of the fleet that they commission, or the individual behaviour that segregates their waste effectively.

The explorer Robert Swan OBE, once said, "*The greatest threat to our planet is the belief that someone else will save it.*" (Sustainability for all, 2019). Everyone employed within an EMS organisation has an active SACRM role; the smallest of individual changes can have an enormous communal effect. The gradual steps in the right direction can produce significant results.

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Appendices

Appendix 1 (Chapter 2) Overview of the Systematic Literature Review

Research Area: Investigating opportunities for sustainability and carbon reduction behaviours within Paramedic and Ambulance Service practice

Systematic Review Protocol

Aim of the Review

To explore the published literature on sustainability that relates to Emergency Medical Services (EMS) by categorising and analysing papers according to their focus on effects, strategy (policy), actions and staff feelings (psychological) and provide a critical discussion of their content.

Objective questions

- How has climate change affected practice in EMS?
- What are the challenges with implementing sustainable practices within EMS?
- What sustainability practice or interventions have been applied to reducing carbon footprint of EMS practice?
- What opportunities exist for changing attitudes and behaviours in relation to better sustainable practices in EMS delivery?

Methods

Systematic searches to be conducted via a range of healthcare related databases and citations sought from relevant reviews.

Data bases

AMED; CINAHL; Cochrane Library; EMBASE; MEDLINE(EBSCO); MEDLINE(Ovid); PsycInfo; PubMed; SOCINDEX; Web of Science;

Paramedic specific Journals

Journal of Paramedic Practice; Journal of Pre-Hospital and Disaster Medicine.

Search Terms

Focussed – sustain* OR sustainability OR sustainability behaviours OR sustainability behaviors OR sustainability attitudes OR Carbon footprint OR climate change OR waste or energy OR recycle

AND

Emergency Medical Services OR ambulance or ambulance service* OR paramedic* OR paramedic service OR pre-hospital OR out-of-hospital

Inclusion Criteria

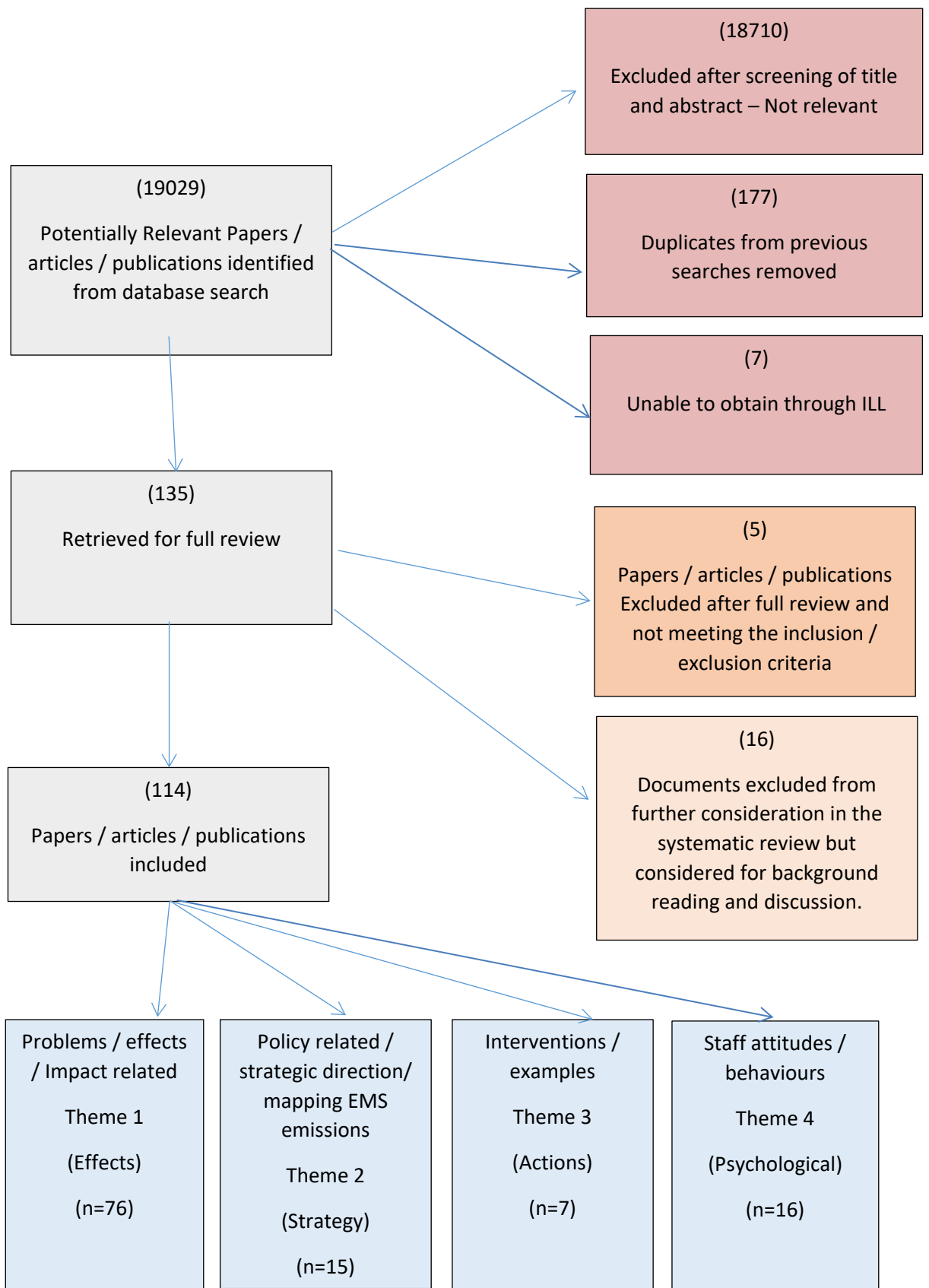
- Papers reporting impacts of climate change on sustainability in Emergency Medical Service delivery
- Papers reporting impacts of climate change on sustainability within Ambulance Services
- Papers reporting impacts of sustainability within prehospital / out of hospital care
- Papers based on analysis and discussion of sustainability in relation to leadership, education, attitudes and behaviours
- Papers discussing sustainability views, opinions or developments in relation to Emergency Medical Service delivery
- Papers that contain a cost / benefit analysis in relation to sustainability
- Policy documents relating to sustainability in EMS delivery
- Papers published in English

Exclusion Criteria

- News articles
- Papers not obtainable with an English translation
- Editorials
- Commentaries
- Papers not reporting empirical research
- Papers not published in peer reviewed journals
- Papers published before 2008 (prior to the Climate Change Act, 2008)

Filtering?

Step 1, titles and abstracts will be screened and potentially relevant papers retrieved for further scrutiny. Step 2. Retrieved papers will be assessed against the inclusion criteria. Step 3. Those meeting the inclusion criteria will be critically appraised and categorised according to publication type / focus using a CASP process.



Appendix 2 (Chapter 2) Search returns from each of the ten databases

	1 AMED	2 CINAHL	3 COCHRANE	4 EMBASE	5 MEDLINE (EBSCO)	6 MEDLINE (OVID)	7 PSYCINFO	8 PUBMED	9 SOCINDEX	10 WEB OF SCIENCE	TOTALS
Potentially Relevant Papers / articles / publications identified from database search using search terms	6	869	12	3128	2070	2512	346	5795	46	4245	19029
Excluded after screening of title and abstract - Not relevant	6	828	12	3089	2021	2463	343	5723	43	4182	18710
Duplicates from previous searches removed	0	2	0	17	32	44	2	39	2	39	177
Unable to obtain through ILL	0	4	0	2	0	0	0	1	0	0	7
Retrieved for full review	0	35	0	20	17	5	1	32	1	24	135
Papers / articles / publications Excluded after full review and not meeting the inclusion / exclusion criteria	0	0	0	0	3	0	0	2	0	0	5
Documents excluded from further consideration in the systematic review but considered for background reading and discussion.	0	6	0	3	3	1	0	3	0	0	16
Papers / articles / publications included in Lit review	0	29	0	17	11	4	1	27	1	24	114
Problems / effects / Impact related Theme 1 (Effects)	0	9	0	15	8	3	1	24	0	16	76
Policy related / strategic direction Theme 2 (Strategy)	0	9	0	0	0	0	0	2	1	3	15
Interventions / examples Theme 3 (Actions)	0	3	0	0	1	0	0	0	0	3	7
Staff attitudes / behaviours Theme 4 (Psychological)	0	8	0	2	2	1	0	0	1	2	16

Appendix 3 (Chapter 2) Table showing publications reporting impacts or effects of climate change on EMS delivery (Theme 1) (n=76)

Database Reference	Publication date	Publication Reference
PUBMED 25	2008	Linares, C. & Diaz, J. (2008) Impact of high temperatures on hospital admissions: comparative analysis with previous studies about mortality (Madrid). <i>Eur J Public Health</i> , 18, 317-22.
CINAHL 30	2009	Hess, J. J., Heilpern, K. L., Davis, T. E. & Frumkin, H. (2009) 'Climate change and emergency medicine: impacts and opportunities'. <i>Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine</i> , 16 (8). pp 782-794.
PUBMED 15	2009	Knowlton, K., Rotkin-Ellman, M., King, G., Margolis, H. G., Smith H, D., Solomon, G., Trent, R. & English, P. (2009). The 2006 California heat wave: impacts on hospitalizations and emergency department visits. <i>Environ Health Perspectives</i> 117, 61-7.
PUBMED 24	2009	Schmier, J. K. & Ebi, K. L. (2009) The impact of climate change and aeroallergens on children's health. <i>Allergy Asthma Proc</i> , 30, 229-37
Web of Science 2	2009	Bassil, K. L., Cole, D. C., Moineddin, R., Craig, A. M., Lou, W. Y., Schwartz, B. and Rea, E. (2009) 'Temporal and spatial variation of heat-related illness using 911 medical dispatch data' <i>Environmental Research: Vol 109(5)</i> , pp. 600-606
MEDLINE 12	2010	Khalaj, B., Lloyd, G., Sheppard, V. & Dear, K. (2010) 'The health impacts of heat waves in five regions of New South Wales, Australia: a case-only analysis'. <i>International Archives of Occupational and Environmental Health</i> , 83, 833-842.
PUBMED 23	2010	Mayner, L., Arbon, P. & Usher, K. (2010) Emergency department patient presentations during the 2009 heatwaves in Adelaide. <i>Collegian</i> , 17, 175-82.
CINAHL 25	2011	Bassil, K. L., Cole, D. C., Moineddin, R., Lou, W., Craig, A. M., Schwartz, B. & Rea, E. (2011) 'The relationship between temperature and ambulance response calls for heat-related illness in Toronto, Ontario, 2005'. <i>Journal Of Epidemiology And Community Health</i> , 65 (9). pp. 829-831
CINAHL 29	2011	Murray, I. R., Howie, C. R. & Biant, L. C. (2011) 'Severe weather warnings predict fracture epidemics'. <i>Injury</i> , 42 (7). pp. 687-690.
EMBASE 21	2011	Williams, S., Nitschke, M., Tucker, G. & Bi, P. (2011). Extreme heat arrangements in South Australia: an assessment of trigger temperatures. <i>Health Promotion Journal of Australia: Official Journal Of Australian Association Of Health Promotion Professionals</i> , 22 Spec No, S21-S27.
EMBASE 22	2011	Sheldon W., Busco G., Siriwardena N. & Sahota O. (2011). Fallers and the carbon footprint. <i>Age and Ageing</i> , 40(SUPPL. 2), ii56. https://doi.org/10.1093/ageing/afr099
MEDLINE 15	2011	Cusack, L., de Crespigny, C. & Athanasos, P. (2011) 'Heatwaves and their impact on people with alcohol, drug and mental health conditions: a discussion paper on clinical practice considerations'. <i>Journal of Advanced Nursing</i> , 67 (4). pp. 915-922.
PUBMED 6	2011	Alessandrini, E., Zauli Sajani, S., Scotto, F., Miglio, R., Marchesi, S. & Lauriola, P. (2011) Emergency ambulance dispatches and apparent temperature: a time series analysis in Emilia-Romagna, Italy. <i>Environ Res</i> , 111, 1192-200.
CINAHL 23	2012	Son, J. Y., Lee, J. T., Anderson, G. B. and Bell, M. L. (2012) 'The Impact of Heat Waves on Mortality in Seven Major Cities in Korea'. <i>Environmental Health Perspectives</i> ; 120 (4) p.566-571
MEDLINE OVID 5	2012	Tong, S., Wang, X. Y. & Guo, Y. (2012) 'Assessing the short-term effects of heatwaves on mortality and morbidity in Brisbane,

		Australia: comparison of case-crossover and time series analyses'. <i>Plos One</i> , 7 (5). pp e37500-e37500.
MEDLINE 13	2012	Kim, Y., Kim, H., Shin, S.-D. & Hong, Y.-C. (2012) Different influence of outdoor temperature on traumatic and nontraumatic injuries. <i>The Journal of Trauma And Acute Care Surgery</i> , 73, 944-949.
EMBASE 20	2012	Williams, S., Nitschke, M. Sullivan, T. Tucker, G. R. Weinstein, P. Pisaniello, D. L. Parton, K. A. and Bi, P. (2012). 'Heat and health in Adelaide, South Australia: Assessment of heat thresholds and temperature relationships.' <i>Science of the Total Environment</i> : 414: p. 126-133
PUBMED 14	2012	Williams, S., Nitschke, M., Weinstein, P., Pisaniello, D. L., Parton, K. A. & Bi, P. (2012) 'The impact of summer temperatures and heatwaves on mortality and morbidity in Perth, Australia 1994-2008'. <i>Environ Int</i> , 40, 33-8.
PUBMED 18	2012	Turner, L. R., Connell, D. & Tong, S. L. (2012). Exposure to hot and cold temperatures and ambulance attendances in Brisbane, Australia: a time-series study. <i>BMJ Open</i> , 2, 8.
CINAHL 18	2013	Turner, L. R., Connell, D. & Tong, S. (2013) 'The effect of heat waves on ambulance attendances in Brisbane, Australia'. <i>Prehospital and Disaster Medicine</i> , 28 (5). pp 482-487
MEDLINE 14	2013	Hartz, D. A., Brazel, A. J. & Golden, J. S. (2013) 'A comparative climate analysis of heat-related emergency 911 dispatches: Chicago, Illinois and Phoenix, Arizona USA 2003 to 2006'. <i>International Journal of Biometeorol</i> , 57, 669-78.
PUBMED 8	2013	Kue, R. C. & Dyer, K. S. (2013) The Impact of Heat Waves on Transport Volumes in an Urban Emergency Medical Services System: A Retrospective Review. <i>Prehospital and Disaster Medicine</i> , 28, 610-615.
PUBMED 19	2013	Xu, Z., Huang, C., Hu, W., Turner, L. R., Su, H. & Tong, S. (2013) Extreme temperatures and emergency department admissions for childhood asthma in Brisbane, Australia. <i>Occup Environ Med</i> , 70, 730-5.
PUBMED 20	2013	Bustanza, R., Lebel, G., Gosselin, P., Belanger, D. & Chebana, F. (2013) Health impacts of the July 2010 heat wave in Quebec, Canada. <i>BMC Public Health</i> , 13, 56.
PUBMED 30	2013	Wang, X., Lavigne, E., Ouellette-kuntz, H. and Chen, B. E. (2013) 'Acute impacts of extreme temperature exposure on emergency room admissions related to mental and behavior disorders in Toronto, Canada'. <i>Journal of Affective Disorders</i> ; Vol. 155: p.154-161
Web of Science 1	2013	Kravchenko, J., Abernethy, A. P., Fawzy, M. & Lyerly, H. K. (2013) Minimization of Heatwave Morbidity and Mortality. <i>American Journal of Preventive Medicine</i> , 44, 274-282.
CINAHL 20	2014	Thornes, J. E., Fisher, P. A., Rayment-Bishop, T. & Smith, C. (2014) 'Ambulance call-outs and response times in Birmingham and the impact of extreme weather and climate change'. <i>Emergency Medicine Journal: EMJ</i> , 31 (3). pp. 220-228.
MEDLINE OVID 3	2014	Chen, R., Li, T., Cai, J., Yan, M., Zhao, Z., Kan, H. (2014). 'Extreme temperatures and out-of-hospital coronary deaths in six large chinese cities'. <i>Journal of Epidemiology & Community Health</i> , 68, 1119-24. https://dx.doi.org/10.1136/jech-2014-204012
Web of Science 3	2014	Wolf, T., McGregor, G., & Analitis, A. (2014) 'Performance Assessment of a Heat Wave Vulnerability Index for Greater London, United Kingdom', <i>Weather, Climate, and Society</i> , 6(1), 32-46. https://journals.ametsoc.org/view/journals/wcas/6/1/wcas-d-13-00014_1.xml

PUBMED 26	2014	Kim, J., Lim, Y. and Kim, H. (2014) 'Outdoor temperature changes and emergency department visits for asthma in Seoul, Korea: A time series study.' <i>Environmental Research</i> ; 135: p. 15-20
PUBMED 28	2014	Bai, L. Cirendunzhu, Woodward, A., Dawa, Xiraoruodeng, and Liu, Q. (2014) 'Temperature and mortality on the roof of the world: A time-series analysis in three Tibetan counties, China.' <i>The Science of the Total Environment</i> , 2014-07-01, Vol.485-486, p.41-48
PUBMED 29	2014	Bai, L., Cirendunzhu, Woodward, A., Dawa, Zhaxisangmu, Chen, B. and Liu, Q. (2014) Temperature, hospital admissions and emergency room visits in Lhasa, Tibet: A time-series analysis. <i>Science of the Total Environment</i> , Vol.490, p.838-848
PUBMED 31	2014	Lee, S., Lee, E., Park, M.S., Kwon, B.Y., Kim, H., Jung, D.H., Jo, K.H., Jeong, M.H. & Seung-Woon Rha (2014) , "Short-Term Effect of Temperature on Daily Emergency Visits for Acute Myocardial Infarction with Threshold Temperatures", <i>PLoS One</i> , vol. 9, no. 4.
EMBASE 1	2015	Li, M., Gu, S., Bi, P., Yang, J. and Liu, Q. (2015) 'Heat Waves and Morbidity: Current Knowledge and Further Direction-A Comprehensive Literature Review'. <i>International Journal of Environmental Research and Public Health</i> ; p. 5256-5283 doi:10.3390/ijerph120505256
PUBMED 12	2015	Wang, X. Y., Guo, Y., FitzGerald, G., Aitken, P., Tippet, V., Chen, D., Wang, X., & Tong, S. (2015). 'The Impacts of Heatwaves on Mortality Differ with Different Study Periods: A Multi-City Time Series Investigation'. <i>PloS one</i> , 10(7), e0134233. https://doi.org/10.1371/journal.pone.0134233
PUBMED 27	2015	Uejio, C.K., Tamerius, J. D., Vredenburg, J., Asaeda, G., Isaacs, D.A. Braun, J. Quinn, A. and Freese, J.P. (2015) 'Summer indoor heat exposure and respiratory and cardiovascular distress calls in New York City, NY, U.S.' <i>Indoor Air</i> ; p. 1-11
PUBMED 32	2015	Toloo, G., Hu, W., Fitzgerald, G., Aitken, P., & Tong, S. (2015). Projecting excess emergency department visits and associated costs in Brisbane, Australia, under population growth and climate change scenarios. <i>Scientific Reports (Nature Publisher Group)</i> , 5, 12860. doi: https://doi-org.plymouth.idm.oclc.org/10.1038/srep12860
Web of Science 4	2015	Bishop-Williams, K.E., Berke, O., Pearl, D.L. and Kelton, D. F. (2015) 'A spatial analysis of heat stress related emergency room visits in rural Southern Ontario during heat waves'. <i>BMC Emerg Med</i> 15, 17 https://doi.org/10.1186/s12873-015-0043-4
EMBASE 16	2016	Kang S.-H., Oh I.-Y., Heo J., Lee H., Kim J., Lim W.-H., et al (2016). Heat, heat waves, and out-of-hospital cardiac arrest. <i>International Journal of Cardiology</i> , 221, 232-237. https://doi.org/10.1016/j.ijcard.2016.07.071
EMBASE 17	2016	Calkins M.M., Isaksen T.B., Stubbs B.A., Yost M.G. & Fenske R.A. (2016). Impacts of extreme heat on emergency medical service calls in King County, Washington, 2007-2012: Relative risk and time series analyses of basic and advanced life support. <i>Environmental Health: A Global Access Science Source</i> , 15(1), no pagination. https://doi.org/10.1186/s12940-016-0109-0
EMBASE 18	2016	Cheng J., Xu Z., Zhao D., Xie M., Yang H., Wen L., et al. (2016). Impacts of temperature change on ambulance dispatches and seasonal effect modification. <i>International journal of biometeorology</i> , 60(12), 1863-1871. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed17&NEWS=N&AN=615598369 .
PUBMED 4	2016	Onozuka, D., & Hagihara, A. (2016) 'Spatial and temporal variation in emergency transport during periods of extreme heat in Japan: A nationwide study'. <i>The Science of the total environment</i> , 544, 220–229. https://doi.org/10.1016/j.scitotenv.2015.11.098

Web of Science 5	2016	Winqvist, A., Grundstein, A. Chang, H., Hess., J and Ebelt-Sarnat, S. (2016) 'Warm season temperatures and emergency department visits in Atlanta, Georgia'. <i>Environmental Research</i> Volume 147, Pages 314-323
MEDLINE 3	2017	DeVine, A. C., Vu, P. T., Yost, M. G., Seto, E. Y. W., & Busch Isaksen, T. M. (2017). 'A Geographical Analysis of Emergency Medical Service Calls and Extreme Heat in King County, WA, USA (2007-2012)'. <i>International Journal of Environmental Research and Public Health</i> , 14(8). https://doi.org/10.3390/ijerph14080937
MEDLINE 10	2017	Graham, D. A., Vanos, J. K., Kenny, N. A., & Brown, R. D. (2017). 'Modelling the Effects of Urban Design on Emergency Medical Response Calls during Extreme Heat Events in Toronto, Canada'. <i>International Journal of Environmental Research and Public Health</i> , 14(7). https://doi.org/10.3390/ijerph14070778
Web of Science 6	2017	Mahmood, M., Thornes, J., Pope, F., Fisher, P. and Vardoulakis, S., (2017) 'Impact of Air Temperature on London Ambulance Call-Out Incidents and Response Times'.. <i>Climate</i> , [online] 5(3), p.61. https://doi.org/10.3390/cli5030061 .
Web of Science 7	2017	Ponjoan, A. Blanch, J. Alves-Cabratos, L. Martí-Lluch, R, Comas-Cufí, M. Parramon, D. del Mar Garcia-Gil, M. Ramos, R and Petersen, I. (2017) 'Effects of extreme temperatures on cardiovascular emergency hospitalizations in a Mediterranean region: a self-controlled case series study'. <i>Environ Health</i> 16, 32. https://doi.org/10.1186/s12940-017-0238-0
EMBASE 14	2018	Xu Z., Cheng J., Hu W. & Tong S. (2018). Heatwave and health events: A systematic evaluation of different temperature indicators, heatwave intensities and durations. <i>Science of the Total Environment</i> , 630, 679-689. https://doi.org/10.1016/j.scitotenv.2018.02.268
Web of Science 8	2018	Riley, K., Wilhalme, H., Delp, L. and Eisenman, D., (2018) 'Mortality and Morbidity during Extreme Heat Events and Prevalence of Outdoor Work: An Analysis of Community-Level Data from Los Angeles County, California'. <i>International Journal of Environmental Research and Public Health</i> , [online] 15(4), p.580. https://doi.org/10.3390/ijerph15040580 .
EMBASE 13	2019	Onozuka D., Gasparrini A., Sera F., Hashizume M. & Honda Y. (2019). Future projections of temperature-related excess out-of-hospital cardiac arrest under climate change scenarios in Japan. <i>Science of the Total Environment</i> , 682, 333-339. https://doi.org/10.1016/j.scitotenv.2019.05.196
MEDLINE 5	2019	Cheng, J., Xu, Z., Bambrick, H., Prescott, V., Wang, N., Zhang, Y., Su, H., Tong, S., & Hu, W. (2019). 'Cardiorespiratory effects of heatwaves: A systematic review and meta-analysis of global epidemiological evidence'. <i>Environmental Research</i> , 177, 108610. https://doi.org/10.1016/j.envres.2019.108610
PUBMED 3	2019	Wondmagegn, B. Y., Xiang, J., Williams, S., Pisaniello, D., & Bi, P. (2019). 'What do we know about the healthcare costs of extreme heat exposure? A comprehensive literature review'. <i>The Science of the total environment</i> , 657, 608–618. https://doi.org/10.1016/j.scitotenv.2018.11.479
PUBMED 11	2019	van der Linden, N., Longden, T., Richards, J. R., Khursheed, M., Goddijn, W., van Veelen, M. J., Khan, U. R., & van der Linden, M. C. (2019) 'The use of an 'acclimatisation' heatwave measure to compare temperature-related demand for emergency services in Australia, Botswana, Netherlands, Pakistan, and USA'. <i>PloS one</i> , 14(3), e0214242. https://doi.org/10.1371/journal.pone.0214242
PUBMED 13	2019	Borg, M., Nitschke, M., Williams, S., McDonald, S., Nairn, J., & Bi, P. (2019). 'Using the excess heat factor to indicate heatwave-related urinary disease: a case study in Adelaide, South Australia'.

		<i>International journal of biometeorology</i> , 63(4), 435–447. https://doi.org/10.1007/s00484-019-01674-5
Web of Science 11	2019	Patel, D., Jian, L. Xiao, J., Yun, G. Lin, T. and Robertson, A. (2019) 'Joint effects of heatwaves and air quality on ambulance services for vulnerable populations in Perth, western Australia'. <i>Environmental Pollution</i> . 252 p. 532-542
Web of Science 12	2019	Pourshaikhiana, M. Moghadamnia , M. Yekaninejad, M. S. Ghanbari, A., Rashti, A. S. Afraz kamachlie, S. (2019) 'The effects of meteorological variables on ambulance attendance for cardiovascular diseases in Rasht, Iran'. <i>Journal of Thermal Biology</i> 83 p. 150-156
Web of Science 13	2019	Varghese, B.M., Hansen, A. Nitschke, M. Nairn, J. Hanson, S., Peng Bi, E. and Pisaniello, D. (2019) 'Heatwave and work-related injuries and illnesses in Adelaide, Australia: a case crossover analysis using the Excess Heat Factor (EHF) as a universal heatwave index'. <i>International Archives of Occupational and Environmental Health</i> ,; 92(2):263-272
CINAHL 1	2020	Williams, A. A., Allen, J.G., Catalano, P.J., Buonocore, J. D. and Spengler, J. D. (2020) 'The Influence of Heat on Daily Police, Medical, and Fire Dispatches in Boston, Massachusetts: Relative Risk and Time-Series Analyses'. <i>American Journal of Public Health</i> : 110: p.662–668.
EMBASE 10	2020	Sangkharat K., Mahmood M.A., Thornes J.E., Fisher P.A. & Pope F.D. (2020). Impact of extreme temperatures on ambulance dispatches in London, UK. <i>Environmental Research</i> , 182, no pagination. https://doi.org/10.1016/j.envres.2019.109100
EMBASE 11	2020	Kloot K., Obst H., Hewson E. & Baker T. (2020). An observational study of the carbon footprint of rural interhospital patient transfer. <i>Emergency Medicine Australasia</i> , 32(Supplement 1), 55-56. https://doi.org/10.1111/1742-6723.13475
PUBMED 2	2020	Sorensen, C. J., Salas, R. N., Rublee, C., Hill, K., Bartlett, E. S., Charlton, P., Dyamond, C., Fockele, C., Harper, R., Barot, S., Calvello-Hynes, E., Hess, J., & Lemery, J. (2020). 'Clinical Implications of Climate Change on US Emergency Medicine: Challenges and Opportunities'. <i>Annals of emergency medicine</i> , 76(2), 168–178. https://doi.org/10.1016/j.annemergmed.2020.03.010
PSYCINFO 1	2020	Tham, S., Thompson, R., Landeg, O., Murray, K. A., & Waite, T. (2020). 'Indoor temperature and health: A global systematic review'. <i>Public Health</i> , 179, 9-17. doi: http://dx.doi.org/10.1016/j.puhe.2019.09.005
CINAHL 5	2021	Ranadive, N., Desai, J., Sathish, L. M., Knowlton, K., Dutta, P., Tiwari, A., Ganguly, P., Jaiswal, A., Shah, T., Solanki, B., Mavalankar, D. and Hess, J.J. (2020) 'Climate Change Adaptation: Prehospital Data Facilitate the Detection of Acute Heat Illness in India'. <i>Western Journal of Emergency Medicine</i> ; 22 (3):p. 739-749
CINAHL 8	2021	Kranc, H., Novack, V., Shtein, A., Sherman, R. and Novack, L. (2021) 'Extreme temperature and out-of-hospital cardiac-arrest. Nationwide study in a hot climate country'. <i>Environmental Health</i> ; 20:38 p.1-13
EMBASE 3	2021	Kegel, F., Luo, O. D., & Richer, S. (2021). The Impact of Extreme Heat Events on Emergency Departments in Canadian Hospitals. <i>Wilderness & environmental medicine</i> , 32(4), 433–440. https://doi-org.plymouth.idm.oclc.org/10.1016/j.wem.2021.05.004
EMBASE 4	2021	Campbell, S. L., Remenyi, T., Williamson, G. J., Rollins, D., White, C. J., & Johnston, F. H. (2021). Ambulance dispatches and heatwaves in Tasmania, Australia: A case-crossover analysis. <i>Environmental research</i> , 202, 111655. https://doi-org.plymouth.idm.oclc.org/10.1016/j.envres.2021.111655

EMBASE 5	2021	Doan T.N., Wilson D., Rashford S. & Bosley E. (2021). Ambient temperatures, heatwaves and out-of-hospital cardiac arrest in Brisbane, Australia. <i>Occupational and Environmental Medicine</i> , 78(5), 349-354. https://doi.org/10.1136/oemed-2020-107018
EMBASE 7	2021	Wu W., Chen B., Wu G., Wan Y., Zhou Q., Zhang H., et al (2021). Increased susceptibility to temperature variation for non-accidental emergency ambulance dispatches in Shenzhen, China. <i>Environmental science and pollution research international</i> , 28(24), 32046-32056. https://doi.org/10.1007/s11356-021-12942-6
MEDLINE 2	2021	Wang, Q., He, Y., Hajat, S., Cheng, J., Xu, Z., Hu, W., Ma, W., & Huang, C. (2021). 'Temperature-sensitive morbidity indicator: consequence from the increased ambulance dispatches associated with heat and cold exposure'. <i>International Journal of Biometeorology</i> , 65(11), 1871–1880. https://doi.org/10.1007/s00484-021-02143-8
MEDLINE OVID 1	2021	Kubo, R., Ueda, K., Seposo, X., Honda, A., Takano, H. (2021). 'Association between ambient temperature and intentional injuries: a case-crossover analysis using ambulance transport records in Japan'. <i>Science of the Total Environment</i> , 774, 145511. https://dx.doi.org/10.1016/j.scitotenv.2021.145511
PUBMED 16	2021	Yoo, E. H., Eum, Y., Roberts, J. E., Gao, Q., & Chen, K. (2021). 'Association between extreme temperatures and emergency room visits related to mental disorders: A multi-region time-series study in New York, USA'. <i>The Science of the total environment</i> , 792, 148246. https://doi.org/10.1016/j.scitotenv.2021.148246
Web of Science 14	2021	Ghada, W., Estrella, N., Pfoerringer, D., Kanz, K., Bogner-Flatz, V., Ankerst, D. P. and Menzel, A. (2021) 'Effects of weather, air pollution and Oktoberfest on ambulance-transported emergency department admissions in Munich, Germany'. <i>The science of the total environment Vol 755 (2) 143772</i>
Web of Science 15	2021	He Y. L., Deng S.Z., Chak, H. H., Wang H.B.; Chen Y., Hajat, S., Ren C., Zhou B.Q., Cheng J., Wenbiao H., Ma W.J. and Huang C. (2021) 'The half-degree matters for heat-related health impacts under the 1.5 degrees C and 2 degrees C warming scenarios: Evidence from ambulance data in Shenzhen, China'. <i>Advances in Climate Change Research</i> 12; p. 628-637
Web of Science 16	2021	Li, Y. H., Ye, D. X., Liu, Y., Li, N., Meng, C. S., Wang, Y., Wang, Y., Jin, X., Bi, P., Tong, S., Cheng Y. B. and Yao, X.Y. (2021) 'Association of heat exposure and emergency ambulance calls: A multi-city study'. <i>Advances in Climate Change Research</i> ; 12(5): p.619-627
Web of Science 9	2022	Wondmagegn BY, Xiang J, Dear K, Williams, S., Hansen, A, Pisaniello, D, Nitschke, M, Nairn, J., Scalley, B., Xiao, A., Jian, L, Tong, M, Bambrick, H, Karnon, J. and Bi, P. (2022) 'Understanding current and projected emergency department presentations and associated healthcare costs in a changing thermal climate in Adelaide, South Australia'. <i>Occupational and Environmental Medicine</i> ; 79: p. 421-426.
Web of Science 10	2022	Packer, S., Loveridge, P., Soriano, A., Morbey, R., Todkill, D., Thompson, R., Rayment-Bishop, T., James, C., Pillin, H., Smith, G. and Elliot, A.J., (2022) 'The Utility of Ambulance Dispatch Call Syndromic Surveillance for Detecting and Assessing the Health Impact of Extreme Weather Events in England'. <i>International Journal of Environmental Research and Public Health</i> , [online] 19(7), p.3876. https://doi.org/10.3390/ijerph19073876

Appendix 4 (Chapter 2) Table showing publications reporting sustainability strategy or policy for EMS delivery (Theme 2) (n=15)

Database Reference	Publication date	Publication Reference
CINAHL 21	2009	Blanchard, I. & Brown, L. H. (2009) 'Carbon footprinting of emergency medical services systems: a proof-of-concept study'. <i>Prehospital Emergency Care: Official Journal of the National Association Of EMS Physicians And The National Association Of State EMS Directors</i> , 13 (4). pp. 546-549.
CINAHL 15	2011	Zander, A., Niggebrugge, A., Pencheon, D. & Lyratzopoulos, G. (2011) Changes in travel-related carbon emissions associated with modernization of services for patients with acute myocardial infarction: a case study. <i>Journal of Public Health (Oxford, England)</i> , 33, 272-279.
CINAHL 28	2011	Blanchard, I. E. & Brown, L. H. (2011) 'Carbon footprinting of North American emergency medical services systems'. <i>Prehospital Emergency Care: Official Journal of the National Association Of EMS Physicians And The National Association Of State EMS Directors</i> , 15 (1). pp. 23-29.
Socindex 1	2011	Hess, J., Bednarz, D., Bae, J. and Pierce, J. (2011) 'Petroleum and Health Care: Evaluating and Managing Health Care's Vulnerability to Petroleum Supply Shifts'. <i>American Journal of Public Health</i> : 101 (9): p. 1568-1579
Web of Science 19	2011	Hess, J. J. and Greenberg, L. A. (2011) Fuel Use in a Large Dynamically Deployed Emergency Medical Services System. <i>Prehospital and Disaster Medicine</i> , 26.
CINAHL 13	2012	Brown, L. H., Canyon, D. V., Buettner, P. G., Crawford, J. M. & Judd, J. (2012) 'The carbon footprint of Australian ambulance operations'. <i>Emergency Medicine Australasia</i> , 24 (6). pp 657-662.
Web of Science 17	2012	Brown, L., Buettner, P. G., Canyon, D. V. Crawford, J. M. and Judd, J. (2012) 'Estimating the life cycle greenhouse gas emissions of Australian ambulance services'. <i>Journal of Cleaner Production</i> : 37; p.136-141
Web of Science 18	2012	Brown, L. and Blanchard, I. (2012) 'Energy, Emissions and Emergency Medical Services: Policy Matters'. <i>Energy Policy</i> : 46; p. 586-593
CINAHL 19	2013	Brown, L. H., Chaiechi, T., Buettner, P. G., Canyon, D. V., Crawford, J. M. & Judd, J. (2013) 'Higher energy prices are associated with diminished resources, performance and safety in Australian ambulance systems'. <i>Australian and New Zealand Journal of Public Health</i> , 37 (1). pp. 83-89.
CINAHL 14	2015	Brown, L. and Blanchard, I. (2015) 'Sustainable emergency medical service systems: how much energy do we need?' <i>American Journal of Emergency Medicine</i> ; 33(2): 190-196.
CINAHL 16	2015	Nichols, A. and Allum, P. (2015) 'Emergency medical services (EMS) and waste: a review of the literature on sustainable EMS waste management'. <i>Journal of Paramedic Practice</i> ; 7 (11): p.568-571
CINAHL 7	2019	Percival, A. (2019) 'How to turn the blue lights green'. <i>British Journal of Healthcare Management</i> ; 25(5): 184-186.
CINAHL 3	2020	Linstadt, H., Collins, A., Slutzman, J. E., Kimball, E., Lemery, J., Sorensen, C., Winstead-Derlega, C., Evans, K. and Auerbach, P. S. (2020) 'The Climate-Smart Emergency Department: A Primer'. <i>Annals of Emergency Medicine</i> ; 76 (2); p. 156-167
PUBMED 7	2020	Bali, T., and Flesher, W. (2020) 'BET 1: The clinical impact of policies aimed at reducing the carbon footprint of emergency

		departments'. <i>Emergency Medicine Journal</i> ; 37(3): p.170–171. https://doi.org/10.1136/emered-2020-209507.1
PUBMED 1	2021	Nicholas, P. K., Breakey, S., McKinnon, S., Eddy, E. Z., Fanuele, J., & Starodub, R. (2021) 'A CLIMATE: A Tool for Assessment of Climate-Change-Related Health Consequences in the Emergency Department'. <i>Journal of emergency nursing</i> , 47(4), 532–542.e1. https://doi.org/10.1016/j.jen.2020.10.002

Appendix 5 (Chapter 2) Table showing publications reporting interventions (actions) to reduce carbon emissions (Theme 3) (n=7)

Database Reference	Publication date	Publication Reference
MEDLINE 11	2008	Hawkins, S. (2008) 'the Green Machine: Development of a high efficiency, low pollution EMS response vehicle'. <i>Journal of Emergency Medical Services</i> . 33 (7): pp108-120.
CINAHL 36	2013	Baker, W., Mansfield, N., Storer, I. and Hignett, S. (2013) 'Future electric vehicles for ambulances (FEVA)' <i>Journal of Paramedic Practice</i> ; 5 (2): p. 77-82 DOI:10.12968/jpar.2013.5.2.77
Web of Science 22	2013	Siddique, A. R. M., Zafar, N. B., Rahman, S. M. S. and Kaiser, S. (2013) 'Solar-Based Rickshaw Ambulance for the Remote Areas of Developing Countries,' <i>1st International Conference on Artificial Intelligence, Modelling and Simulation</i> , pp. 381-384, doi: 10.1109/AIMS.2013.70.
Web of Science 20	2015	Shankar, V., Gautham, G. and Ashvarma, V. (2015) 'Automated traffic signal for hassle free movement of ambulance,' <i>2015 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT)</i> , pp. 1-5, doi: 10.1109/ICECCT.2015.7226114.
Web of Science 21	2016	Tarek, R. Anjum, A., Hoque, M. A. and Azad, A. (2016) 'Solar Electric Ambulance Van Unfolding Medical Emergencies of Rural Bangladesh'. <i>2016 IEEE Global Humanitarian Technology Conference (GHTC)</i> p.514-519
CINAHL 11	2018	Harmer, L. and Hignett, S. (2018) 'Smaller, lighter, faster? Reducing the carbon footprint of ambulances'. <i>Journal of Paramedic Practice</i> ; 10 (3): p. 112-117
CINAHL 35	2019	Sheldon, A. and Hill, L. (2019) 'Scoping ambulance emissions: recommendations for reducing engine idling time'. <i>Journal of Paramedic Practice</i> ; 11(7): p.305-312

Appendix 6 (Chapter 2) Table showing publications reporting staff attitudes and behaviour with sustainability (Psychological) (Theme 4) (n=16)

Database Reference	Publication date	Publication Reference
EMBASE 24	2009	Gupta, S., Boojh, R., Mishra, A. & Chandra, H. (2009) Rules and management of biomedical waste at Vivekananda Polyclinic: a case study. <i>Waste Management</i> (New York, N.Y.), 29, 812-819.
CINAHL 33	2010	Shafee, M., Kasturwar, N. & Nirupama, N. (2010). Study of Knowledge, Attitude and Practices Regarding Biomedical Waste among Paramedical Workers. <i>Indian Journal Of Community Medicine: Official Publication Of Indian Association Of Preventive & Social Medicine</i> , 35, 369-370.
EMBASE 23	2010	Sumi N. (2010) Study of biomedical waste management practices in a private hospital and evaluation of the benefits after implementing remedial measures for the same. <i>The Journal of Communicable Diseases</i> , 42, 39-44.
MEDLINE4	2014	Pereira, M. S., Alves, S. B., Silva e Souza, A. C., Tipple, A. F. V., de Rezende, F. R. & Rodrigues, E. G. (2013) 'Waste management in non-hospital emergency units'. <i>Revista Latino-Americana De Enfermagem</i> , 21 Spec No pp. 259-266.
CINAHL 27	2015	Anåker, A., Nilsson, M., Holmner, Å. and Elf, M. (2015) 'Nurses' perceptions of climate and environmental issues: a qualitative study'. <i>Journal of Advanced Nursing</i> ; 71(8); p.1883-1891
CINAHL 39	2015	Singh, M., Sood, A. and Bhardwaj, A. K. (2015) 'A Study to assess the knowledge about the bio medical waste (Management & Handling) Rules 2011 among the Paramedics and laboratory technicians of a tertiary care hospital in North West India'. <i>Journal of Evolution of Medical and Dental Services</i> ; 4 (50): p. 8661-8667
CINAHL 40	2015	Ahmad, T., Komal, T., Mustafa, M. and Anjum, S. (2015) "Hospital waste management awareness, attitude and practices in twin cities of Pakistan". <i>International Journal of Pharma and Bio Sciences</i> ; 6 (2): p. 503-512
CINAHL 41	2015	Kumar, R. Somrongthong, R. and Shaikh, B. T. (2015) 'Effectiveness of intensive healthcare waste management training model among health professionals at teaching hospitals of Pakistan: a quasi-experimental study'. <i>BMC Health Services Research</i> ; 15:81 DOI 10.1186/s12913-015-0758-7
CINAHL 2	2016	Richardson, J; Allum, P; Grose, J. (2016) 'Changing undergraduate paramedic students' attitudes towards sustainability and climate change'. <i>Journal of Paramedic Practice</i> ; 8 (3): p. 130-136
MEDLINE 8	2016	Kumar, R., Somrongthong, R., & Ahmed, J. (2016) 'Effect Of Medical Waste Management Trainings On Behavior Change Among Doctors Versus Nurses And Paramedical Staff In Pakistan'. <i>Journal of Ayub Medical College, Abbottabad</i> : 28(3): p. 493–496.
Web of Science 23	2018	Kumar, R., Somrongthong, R., Ahmed, J. and Almarabheh, A. J. (2018) 'Correlates of Knowledge, Attitude and Practices about Health Care Waste Management among Hospital Workers of Pakistan'. <i>Journal of the Liaquat University of Medical and Health Sciences</i> ; 17(1), p.1-7
MEDLINE OVID 2	2019	Hallihan, G., Caird, J. K., Blanchard, I., Wiley, K., Martel, J., Wilkins, M., Thorkelson, B., Plato, M., Lazarenko, G. (2019) 'The evaluation of an ambulance rear compartment using patient

		simulation: issues of safety and efficiency during the delivery of patient care'. <i>Applied Ergonomics</i> , 81, 102872. https://dx.doi.org/10.1016/j.apergo.2019.06.003
PUBMED 5	2019	Church, R., Briggs, D., & Tran, V. (2019) 'Climate emergency: Towards a greener emergency department'. <i>Emergency Medicine Australasia</i> : 31(2): p. 274–275. https://doi.org/10.1111/1742-6723.13269
CINAHL 4	2020	Schwerdtle, P.N., Maxwell, J., Horton, G. and Bonnamy, J. (2020) '12 tips for teaching environmental sustainability to health professionals'. <i>Medical Teacher</i> , 42:2: p. 150-155,
CINAHL 12	2020	Kalia, M., Goel, N.K., Rohilla, R., Walia, D. and Singh, N. (2020) 'Biomedical Waste Management Practices in Health Centers in Chandigarh, India'. <i>International archives of health sciences</i> ; 7(4); p.165-169
Web of Science 24	2021	Alvi, A. S., Manj, Y.N., Riaz, A., Alam, M. and Ghafoor, B. (2021) 'Knowledge, attitude and practices of hospital staff regarding hospital waste management in public hospitals of district Gujranwala, Pakistan'. <i>Rawal medical journal</i> ; Vol.46(4), p.914-918

Appendix 7 (Chapter 4) Sample interview questions

Title: A critical evaluation of the sustainability initiatives that encourage the reduction of carbon emissions, within the NHS Ambulance Service Trusts in England

- What do you understand when people talk about sustainability in organisations?
- How important to you is the subject of sustainability?
- Do you feel that your organisational Sustainability Development Management Plan (SDMP) meets your expectations for reducing carbon emission reduction targets? What could be improved?
- What do you understand your particular role is, in meeting carbon emission reduction targets?
- What initiatives has your organisation implemented that help meet carbon emission reduction targets?
- Do you have any particular focus that you feel will have a major impact?
- How do you measure the impact of your initiatives on carbon emission reduction targets?
- How confident do you feel those measures are? Could they be improved in accuracy?
- What future initiatives do you have that will help meet carbon emission reduction targets?
- What links do you have for monitoring developments in sustainability within organisations....both locally and nationally?
- How do your employees feel about the sustainability agenda within your organisation, especially operational paramedics?
- How do you monitor their effectiveness with the reduce, reuse and recycle philosophy? Do you offer employees any incentives to adopt the philosophy?
- What form of educational guidance has been given to employees to enable their participation in meeting the objectives of your
- Could you see any benefit for gaining more development and education within this topic area?

..... Can you expand a bit more about that?
.....you used the word (****). Can you expand on that?
.....it would be really helpful for me for you to explain.....
.....what do you mean by that term?

Appendix 8 (Chapter 4) Participant Information Pages (PIPs) (Phase Two)

Version 1 [19/08/15]

Emergency Medical Services and Carbon Emission Reduction

Title: A critical evaluation of the sustainability initiatives that encourage the reduction of carbon emissions, within the NHS Ambulance Service Trusts in England

We would like to invite you to participate in a qualitative research study with the aim of exploring and critically evaluating the current position and future ambition of NHS Ambulance Service Trusts in England within their efforts to reduce carbon emissions.

Before you decide whether or not to participate, it is important for you to understand why the research is being done and what it will involve. This information sheet explains the background and aims of the study. Please take time to read it carefully and discuss it with your colleagues if you wish. If there is anything that is unclear, or if you would like more information, please ask us. Your participation in this study is entirely voluntary.

The study gauges the current sustainability initiatives being employed by each NHS Ambulance Service Trusts in England and explores the longer term aspirations and strategic impetus towards meeting carbon deduction targets.

Why have I been chosen?

This project is designed to be from the perspective of NHS (and NHS Foundation) Trusts Ambulance Service Strategic Managers who have involvement with the Trust's Sustainability Development Management Plan (SDMP).

What is the purpose of the study?

Sustainability and reducing the carbon footprint of NHS organisations has become an increasing priority for the Department of Health. Ambulance Trusts can significantly help towards meeting NHS targets. Through the implementation of corporate SDMPs, strategies are being developed to monitor, audit and make changes in areas such as sustainable (low carbon) procurement and transportation; diminutions of energy, fuel, water consumption; and improved waste disposal with greater emphasis on recycling.

However, despite the recommendations of a handful of international research, there has been a dearth of empirical research into sustainability activities within the UK connected to ambulance service activities, leaving a void in information about the EMS contribution towards reducing the carbon footprint of the NHS. This research intends to map and identify those gaps and contribute towards future intervention strategies. The overall intention is to disseminate good practice from the findings.

What will be involved if I agree to take part in the study?

The study is concerned with the initiatives employed for the reduction of carbon emissions and data is obtained through qualitative interviews with Ambulance Service Managers involved in the development and evaluation of SDMPs. After completion of the consent form, you will be individually interviewed on a one-to-one basis face to face or through a telephone / video conference media. Participation in this study is entirely voluntary.

It is anticipated that your interview would approximately last up to an hour, where the interviewer will ask some questions which will help you to talk spontaneously on the subject. The interviewer will be audio recording the interview to allow optimal capture of information. However if you have objections to this method, please inform the interviewer prior to commencing the interview.

Will any expenses be paid?

No. This research does not have external funding.

Can I withdraw from the study at any time?

Yes, you are free to refuse to participate and can withdraw at any time, without providing a reason and without detriment to your relationship with the research team or your employer. You may also choose not to discuss certain issues, if participating.

When will the interviews take place?

It is anticipated that the interviews will take place from March to September 2016, but the interviewer will give you at least 2 weeks' notice to ensure that it is scheduled at your convenience. The interview will be undertaken at your convenience. This can be either in work time or during a time of your choosing (to be mutually agreed).

What other information will be collected in the study?

None

Will the information obtained in this study be confidential?

Anything you say will be treated in absolute confidence, no names will be mentioned in any of the reports from the study and care will be taken, so that individuals and organisations cannot be identified from details in reports of the results of the study. Any raw data (including transcripts and copies) collected, will be destroyed upon completion of the study. All information will be stored electronically on a computer which is password protected, in a document file that is also password protected.

Your name (which we need in order to match the interview schedule) will be stored separately from the other information you supply during the survey. This information will be destroyed at the end of the study. All information will be handled in compliance with the Data Protection Act (1998).

Please note – Whilst this study is discussing sustainability strategies only, any explicit disclosure of unethical or unlawful behaviour which has or may put

others at serious risk, may result in the interviewer having to inform the interviewee of his responsibilities under the HCPC Standards of Conduct Performance & Ethics and termination of the interview. To this end, only general information and opinion will be discussed.

What are the possible benefits of taking part in this study?

We hope that being involved in the research will be of interest to you. Sometimes individuals may gain knowledge and insight into research methods by participating in studies like this. Ultimately the benefit will be to disseminate good practice within primary research.

What are the possible disadvantages of taking part in this study?

Asking you questions that relate to awareness of a topic may lead to feelings of frustration. Following the interview, if you want to talk through some of the issues that were raised then you might like to contact another member of the research team (see details below). If you want to stop the interview, you can do so at any time.

Can I complain about the way the study has been conducted?

If you have any cause to complain about any aspect of the way in which you have been approached or treated during the course of this study, please contact the project principal supervisor Professor Janet Richardson or supervisor Dr. Andy Nichols (details below). Otherwise you can use the normal University of Plymouth complaints procedure.

Who is organising the study?

The research is organised by Mr. Peter Allum (MSc Clin Ed.; Paramedic; MCPara) on behalf of the Sustainability and Health Research Group. This research forms part of a wider PhD thesis for the Chief Investigator and is supervised by Professor Janet Richardson and Dr. Andrew Nichols (both Nurses and Health Research Academics in the School of Nursing and Midwifery at Plymouth University).

Who has reviewed this research study?

The study has been reviewed by Plymouth University and given ethical approval.

How will I hear about the results of the study?

We anticipate that it will take approximately 9 months for all of the information from the interviews to be analysed and written up. After each interview has been transcribed, we will organise for you to review the transcript for approval. In addition we will write a report that will hopefully be published in a scientific journal. You can be assured that you will not be personally identifiable in any report or publication

Your rights

Your participation in this study is entirely voluntary. You may withdraw at any time.

And Finally,

If there are any further questions that you would like to ask, then please feel free to contact the Chief Investigator or supervisors, whereupon you can discuss any aspect of the study.

Contact Details

Peter Allum (Chief Investigator)
Programme Lead for MSc Pre-Hospital Critical Care – Retrieval and Transfer
Lecturer for BSc (Hons) Paramedic Practitioner / Health Studies
Room SF34
Peninsula Allied Health Centre
School of Health Professions
Faculty of Health and Human Science
Plymouth University
Derriford Road
Plymouth PL6 8BH

Professor Janet Richardson (Principal Supervisor)
Professor of Health Service Research
Faculty of Health and Human Sciences
Plymouth University
8 Portland Villas, Drake Circus
Plymouth PL4 8AA

Dr. Andrew Nichols (Supervisor)
Faculty of Health and Human Sciences
University of Plymouth
Drake Circus
Plymouth PL4 8AA

Appendix 9 (Chapter 4) Research Consent Form (Phase Two)

Title: A critical evaluation of the sustainability initiatives that encourage the reduction of carbon emissions, within the NHS Ambulance Service Trusts in England

The study is concerned with the initiatives employed for the reduction of carbon emissions and data is obtained through qualitative interviews with Ambulance Service Managers involved in the development and evaluation of SDMPs.

The participants should each complete the whole of this sheet themselves.

Have you read the information sheet?
Version [1] dated [19/08/15] Yes / No

Have you had the opportunity to consider the information,
ask questions and discuss general aspects of the study? Yes / No

Have you received a satisfactory answer to your questions? Yes / No

Have you received enough information about the study? Yes / No

Who have you spoken to?

Do you understand that the information collected during this study (audio and notes) will remain strictly confidential and accessible only to appropriate members of the research team?

Yes / No

Do you understand that you are free to withdraw from this study?

At any time Yes / No

Without giving any reason Yes / No

Without affecting your legal rights or employment Yes / No

Do you agree to take part in this study? Yes / No

Name of participant: _____ Date: _____ Signature: _____

Name of researcher: _____ Date: _____ Signature: _____

When complete – 1 copy for interviewee: 1 copy for the researcher site file **Version 1** [19/08/15]

Appendix 10 (Chapter 4) Introductory Talk at Interview (Phase Two)

Hello and thank you for agreeing to participate in this study. For the purpose of the interview, I am a researcher and, therefore, while I will guide you through the interview by using conversational questions, I will have very little participation in the dialogue.

The purpose of the interview is to gain information and your perceptions about your organisation's initiatives employed for the reduction of carbon emissions. You have experience as an Ambulance Service Manager involved in the development and evaluation of your Sustainability Development Management Plan and I would like to know your experiences, views and opinions on what your organisation does, and plans to do, for meeting reduction targets in carbon emissions – whether they are either positive or negative. There are no right or wrong answers. Please do not worry about what I think. I would like to know and gain insight into your understanding and perceptions of the subject.

I will be taking notes during the session, and please note that the discussion is being taped to ensure accuracy and objectivity of my reporting and to ensure that I get all the points noted to aid analysis, after which they will be destroyed. **All data will be treated as confidential.**

Any participant or organisational names on the tape will automatically be deleted to ensure that nobody can be identified. You will be given the opportunity to review the transcripts of this discussion. **You may request that the interview is not taped if you so wish or you may wish to withdraw from this study now or at any stage of the process.**

Please speak up, feel free to give examples or stories to explain a point. Please say what you think. However, when describing or discussing specific situations which emphasise certain points that you wish to make, please ensure that you do not identify any persons' name, location or specific identifiable information.

Also important to note is the fact that this study is discussing sustainability issues only. Any specific disclosure of unethical or unlawful behaviour which has put others at serious risk and which may result in a conflict with the interviewers HCPC Standards of Conduct Performance & Ethics and will cause a termination of the interview. To this end, please ensure that only general information and opinion is discussed.

I have identified some areas for discussion with some prepared questions, but may wish to explore and expand on some relevant points that you make. If there is any subject area which you are not willing to discuss, please say so.

The interview may last approximately up to an hour, but if you should require a break at any point then we shall temporarily suspend the interview and recommence when convenient.
Do you have any questions?

Version 1 [19/08/15]

Appendix 11 (Chapter 4) Sample of Ethical Approvals (Phase Two)
Faculty Research Ethics Approval

**RESEARCH
WITH
PLYMOUTH
UNIVERSITY**

4th November 2015

CONFIDENTIAL

Peter Allum
Room SF34 Peninsula Allied Health Centre
School of Health Professions
Faculty of Health and Human Science
Plymouth University
Derriford Road
Plymouth
PL6 8BH

Dear Peter

Application for Approval by Faculty Research Ethics Committee

Reference Number: 15/16-481

**Application Title: Sustainability initiatives in Ambulance Services
(A critical evaluation of the sustainability initiatives that encourage the
reduction of carbon emissions, within the NHS Ambulance Service Trusts in
England)**

I am pleased to inform you that the Committee has granted approval to you to conduct this research.

Please note that this approval is for three years, after which you will be required to seek extension of existing approval.

Please note that should any MAJOR changes to your research design occur which effect the ethics of procedures involved you must inform the Committee. Please contact Sarah Jones (email sarah.c.jones@plymouth.ac.uk).

Yours sincerely

Professor Michael Sheppard, PhD, FAcSS
Chair, Research Ethics Committee -
Faculty of Health & Human Sciences and
Peninsula Schools of Medicine & Dentistry

Faculty of Health & Human Sciences
Plymouth University
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Professor Michael Sheppard
CQSW BSc MA PhD FAcSS
Chair, Faculty Research Ethics
Committee

Health Research Authority (HRA) confirmation that NHS Research Ethics Committee (REC) not needed.



Do I need NHS REC approval?

🖨️ To print your result with title and IRAS Project ID please enter your details below:

Title of your research:

Sustainability Initiatives in Ambulance Services
Sustainability Initiatives in Ambulance Services



IRAS Project ID (if available):

182560

Your answers to the following questions indicate that you do not need NHS REC approval for sites in England. However, you may need other approvals.

You have answered 'YES' to: Is your study research?

You answered 'NO' to all of these questions:

Question Set 1

- Is your study a clinical trial of an investigational medicinal product?
- Is your study one or more of the following: A non-CE marked medical device, or a device which has been modified or is being used outside of its CE mark, intended purpose, and the study is conducted by or with the support of the manufacturer or another commercial company (including university spin-out company) to provide data for CE marking purposes?
- Does your study involve exposure to any ionising radiation?
- Does your study involve the processing of disclosable protected information on the Register of the Human Fertilisation and Embryology Authority by researchers, without consent?
- Is your study a clinical trial involving the participation of practising midwives?

Question Set 2

- Will your study involve research participants identified from, or because of their past or present use of services (adult and children's healthcare within the NHS and adult social care), for which the UK health departments are responsible (including services provided under contract with the private or voluntary sectors), including participants recruited through these services as 'healthy controls'?
- Will your research involve collection of tissue or information from any users of these services (adult and children's healthcare within the NHS and adult social care)? This may include users who have died within the last 100 years.
- Will your research involve the use of previously collected tissue or information from which the research team could identify individual past or present users of these services (adult and children's healthcare within the NHS and adult social care), either directly from that tissue or information, or from its combination with other tissue or information likely to come into their possession?
- Will your research involve research participants identified because of their status as relatives or carers of past or present users of these services (adult and children's healthcare within the NHS and adult social care)?

Question Set 3

- Will your research involve the storage of relevant material from the living or deceased on premises in the UK, but not Scotland, without an appropriate licence from the Human Tissue Authority (HTA)? This includes storage of imported material.
- Will your research involve storage or use of relevant material from the living, collected on or after 1st September 2000, and the research is not within the terms of consent from the donors, and the research does not come under another NHS REC approval?
- Will your research involve the analysis of DNA from bodily material, collected on or after 1st September 2000, and this analysis is not within the terms of consent for research from the donor?

Question Set 4

- Will your research involve at any stage intrusive procedures with adults who lack capacity to consent for themselves, including participants retained in study following the loss of capacity?
- Is your research health-related and involving prisoners?
- Does your research involve xenotransplantation?
- Is your research a social care project funded by the Department of Health?

If your research extends beyond England find out if you need NHS REC approval by selecting the 'OTHER UK COUNTRIES' button below.

OTHER UK COUNTRIES


If, after visiting all relevant UK countries, this decision tool suggests that you do not require NHS REC approval follow this link for final confirmation and further information.

[Print This Page](#)

NOTE: If using Internet Explorer please use browser print function.

Sample NHS Ambulance Trust's Research and Development (R&D) department Approval



[REDACTED] Ambulance Service 
NHS Trust

[REDACTED]

Mr Peter Allum
Lecturer in Paramedic Studies
Programme Lead for MSc Pre-hospital Critical Care- Retrieval and Transfer
School of Health Professions
Plymouth University
Derriford Road
Plymouth
PL6 8BH

30/09/2015

Dear Peter

Project Title: Investigating opportunities for sustainability behaviours within Paramedic and Ambulance Service practice.

Chief Investigator: Peter Allum

Sponsor: Plymouth University

I am pleased to inform you that NHS permission has been granted for the above named project on the basis of the information provided in the application form, protocol and supporting documentation.

The following documents were reviewed:

Document Title	Version Number	Date
Project Outline	V1.	20/08/2015
Information Sheet to Participants	V1.	19/08/2015
Research Consent Form	V1.	19/08/2015
CI CV		
Insurance Certificate		14/08/2015
NHS R&D Form	V5.0.0	Signed 20/08/2015
NHS SSI Form 300125 (IRAS Project ID: 182560)	V5.0.0	

Permission is granted on the understanding that the study is conducted in accordance with the Research Governance Framework, ICH GCP if applicable, the [REDACTED] policies and procedures and is subject to the following conditions:

Favourable ethical opinion and local approvals

This permission is subject to the favourable opinion of *Plymouth University ethics committee* and all other related regulatory approvals (if appropriate).



Legislation

You must adhere at all times to the principles and standards of the Department of Health's *Research Governance Framework*. You are also reminded of your obligation to collect, use, store and protect all research data in accordance with the Data Protection Act 1998, the Human Rights Act 1998 and all other legislation that applies to your project.

Circumstances to notify to the Clinical Governance, Audit and Research office

You must inform the Clinical Governance, Audit and Research office immediately:

- If your research deviates from that laid out in the approved protocol/proposal for any reason, at any time.
- Of any adverse incidents or near misses arising from the project. These will be dealt with according to current [redacted] policies and procedures.

Adverse Events

- You should ensure that incidents are reported in accordance with the Trust's current Untoward Incident Reporting Policy.
- You should notify all regulatory authorities including the REC and MHRA (where applicable) using the processes and templates set out by these authorities.
- You should also comply with the reporting processes for adverse events set out by your sponsor.
- The research sponsor or the Chief Investigator, or the local Principal Investigator at a research site, may take appropriate urgent safety measures in order to protect research participants against any immediate hazard to their health or safety. The R&D office should be notified that such measures have been taken. The notification should also include the reasons why the measures were taken and the plan for further action. The R&D Office should be notified within the same time frame of notifying the REC and any other regulatory bodies

Amendments

You should inform the Clinical Governance, Audit and Research office of any changes to the protocol before implementing the changes locally. You should do this by forwarding the amendment correspondence with the REC to the Research & Development Administrator. You should also inform the Research & Development Administrator if there are any changes to the membership of the research team or changes to the project status. Any amendments should be submitted in accordance with the guidance in IRAS.

Monitoring and Auditing

Please note that the [redacted] is required to monitor research to ensure compliance with the Research Governance Framework and other legal and regulatory requirements. This is achieved by random audit of research. You are required to comply with the Trust's monitoring arrangements. You should also ensure that you send copies of any interim and final reports to the Research & Development Administrator.

Sponsorship and Supervision

The sponsor for the research is *Plymouth University* and they have confirmed in writing that they will fulfil their responsibilities under the Research Governance Framework.

Your [redacted] supervisor is Anne Spaight. The supervisor responsible for the day to day supervision of the research and should be contacted in the first instance should you require any advice or assistance.



Ambulance Service



NHS Trust

Finally, we would like to wish you every success with the project and look forward to seeing the results.

Yours sincerely



Head of Clinical Governance, Audit and Research

Cc Chief investigator
Sponsor

Appendix 12 (Chapter 5) Additional supporting quotations (Phase Two)

5.1 Theme 1: The Essential Leadership Contribution for Sustainability Change

5.1.1 Taking Charge

Length of time in the role (p.173)

“I’ve been in the NHS for about 2 years. Before that, the role didn’t exist, so it’s a new role for when I turned up.” (1)

“My role is ...Environmental Sustainability Manager...well it was a new role when I joined the Trust...that started in 2014...so just under two years.” (5)

Range of Previous Experience and Qualification (p.175)

“I fell into sustainability....so I found that when I started this job role, I got interviewed as a Carbon Management Specialist and I was like “what the hell is that? Who knows what one of those job roles is? And coming from a consultancy field ... it was predominantly about oil, gas, water and contaminated land clean-up” (4)

“Um, I’m not quite sure of what, I guess they wanted. They had spent a lot of time developing the job description and had all sorts of different Departments involved in in putting it together. I guess my expectation was it would be similar to what I did before.... to go and put in place Sustainability Programmes in line with the Trust Strategy.” (5)

Benefits of Background, Experience and Competence (p.177)

The responsibility and accountability offered by the titled posts;

“Prior to me turning up....no one had done the role. There was an environmental working group....however; looking at the minutes.....nothing really ever was actually achieved. That is probably a dreadful thing to say, but I don’t think it really was. It was just a talking shop...and they knew that they needed a sustainable management plan, or a Carbon Management Plan, but realistically, no one had ever had the time. It wasn’t anyone’s job to do, basically.” (1)

“... they had a Sustainable Development Management Plan and they had key targets they wanted to go and achieve ... but I guess it sort of lacked the structure side of it. So I would go and develop an Environmental Management System and have a base line so we had somewhere to go and measure from.” (5)

The experience of knowing what works effectively;

“...it hasn't been much different here than I've done at other places.[The] main focus is obviously looking at the energy base and seeing where we can save energy and reduce the carbon footprints. I mean that is basically my brief, which is, reduce the footprints of the property portfolio, reduce carbon energy and save money.” (3)

“Previously I worked quite heavily on energy and sustainable procurement and I developed Energy Management Systems in the past and worked on Environmental Management Systems...all applied to measurable standards. So I think that's definitely helped. I'm quite process driven to make sure everything's done properly...and it's very transparent as well, so you can track all your actions and understand legal compliance. The whole lot, should be in there.” (5)

5.1.2 National Links (p.179)

Inter-agency and multidisciplinary working appears to enable more than just information exchange. Being a leading role for SACRM within an organisation can be isolating,

“I think a lot of environmental managers like me feel that you actually work in a silo...and actually having network groups makes you feel that you work in a broader environmental team....and almost lightens the load I think.” (1)

(Interviewer) “Do you find the role of sustainability development managers isolated?”

(Participant) “Yes...very much so.” (3)

(Interviewer) “Does that impact on the way you feel about it and feel about the role?”

(Participant) “Er well yeah...come the end of the year when they put all the statistics together, it's a massive amount of work and you're just expected to produce it. Nobody ever challenges the picture and challenges or checks the figures. So I could just write anything really.” (3)

Green Environmental Ambulance Network (p.180)

Participants viewed GrEAN as vital;

"We email each other regularly with initiatives with things that are going on, update each other with what each Trust is doing so that is very, important and reassuring to know...and it's reassuring to know that on my own, in that respect...and I think there's a common theme there as well." (3)

"...for example there's current funding that's been made available by the Government for vehicles, so we're looking at doing a project together. So instead of us having a solo approach to it, we're all hopefully going to be able to work together. You get a bit more out of it that way." (5)

Success of GrEAN was due to (p.181)

"[The Chair] seems to have got herself into a lot of high profile areas really. I think it'll be good for us all to get into that and support them." (3)

Access to AACE allows a direct voice to the decision-making managers (p.181)

"[AACE] have all the information...and they feed everything back down to the Chief Execs down to the Finance Directors and there's an element of "Why are you doing that, we're not?"....so all that communication feeds back to all the other Sustainability Managers well." (4)

The Sustainable Development Unit (SDU) (p.182)

Value of SDU conferences (p.183)

"The NHS SDU conferences, they normally hold two a year... [they are] very informative to tell us how they're getting on,...they come up with some very good initiatives and recommendations and how to go about things ...and we also as a group [need to] make sure that they are aware of the Ambulance Service. The NHS is not aware of the Ambulance Service when it comes to Sustainability and Carbon footprint, and I know that might sound strange but they're not. Because, for example we went to the Road Show they had in June or July er in Nottingham and they've got all their glossy reports and in there is a carbon foot printing [report] okay.... and for love nor money we could neither of us find anything relating to the Ambulance Services." (6)

Other collaborations (p.183)

"I sat in a meeting last week with the infrastructure team for [Water Utility Company] and the [Private Organisation].... and we all went ..."We want you, as the Government, to write this down that it is a legal obligation, because otherwise we're not going to get it passed, we won't get the investment and we won't get any thinking forwards about how we do it." We don't mind writing the report but we want [the] higher powers that be ...and within our Organisations to buy into it, because they won't otherwise." (4)

One participant expressed their frustrations when not supported by other Trust colleagues in their endeavours to promote sustainability.

(Participant) "...I've worked with quite a lot of [external groups]...they've had a lot of really interesting people [with] a lot of environment agency interaction. The problem is I go to these meetings... but my resilience team won't come with me, my business continuity team won't come with me and they're the ones that should be integrating [sustainability] a lot more into their strategies." (4)

(Interviewer) Why do you think that is?

(Participant) "...it's an element of "I don't think it's our problem".... they're also responsive rather than proactive. It's one of the big issues of the NHS and specifically within the ambulance service...we just respond to things...we're not very good at forward planning." (4)

5.1.3 Personal Drive and Motivation (p.184)

Restrictions (p.184)

A secondary responsibility, in their job description, to the primary managerial role within which they were appointed

"The only bad thing about my role is that other places that have a Sustainability Manager...has a single stand-alone role... where at the moment I'm doing a dual role. Obviously, the frustration for me is getting that balance right because it predominantly seems to be [Primary Role] management with sustainability as and when I can fit it in...which doesn't seem right to me. If I could get enough time to spend more on the sustainability, I'm sure I'd be able to save a lot more money." (3)

"My time seems to be focused more on [Primary Role] business with a bolt on of sustainability... where perhaps I could spend more time on sustainability I could get more into that side of things, directing and educating people." (3)

“...and that’s purely not because I haven’t wanted to it’s purely because I haven’t got the time to do it. I could focus more on saving energy, saving money and I’m confident that I could easily reduce it a lot more and a lot quicker than I have been doing.” (3)

(Participant) “I’m based in the Estates Section, which sits under Logistics. I think probably the best area to be in because you’ve got Estates, you’ve got your ‘make ready guys’ and you’ve got your Fleet Department so they’re some of the key areas to work across. It’s based in the Headquarters so you have free reign to go and speak to everyone.” (5)

(Interviewer) “Does having that definitive role make a greater impact, than if they hadn’t employed someone within that role?”

(Participant) “, I think so yes.” (5)

Organisational culture and the bureaucracy of the NHS (p.185)

“I think the ambulance service needs a real ‘kick up the bum’ to get things moving...because we’re not moving as fast as we should. The NHS can be very bureaucratic...and that’s one of the major challenges of getting anything done...everything has to be ‘signed off’ at every single bloody level [sighs].” (4)

“Because of the NHS and the, the parameters around them... that sort of holds us back a bit, I think.” (3)

“The bureaucracy within the NHS hinders so much stuff ... the fact that it can take three months to get something ‘signed off’....and it can be a year before you can make another financial decision.... is a really hindrance. We’re a public organisation and we need to be accountable for things, but it can hinder so much progress which could have happened. Seven years ago I could have changed the entire fleet [of vehicles]. With seven years on and I’m just about changing little bits of the fleet.” (4)

“If you want to change something... it can be a battle and I don’t need a battle I just want integration. I just want stuff sorting.” (4)

Partly, this was due to the novelty of the new role, which meant that continual self-promotion amongst the SMT was paramount.(p.185)

“...it’s probably influenced by the fact that it is a new role in the Trust and so you have to create that awareness. So it’s about training and educating Senior Management as to why sustainability is important.” (5)

“If you’re just a one man band...you’re obviously going to be quite stretched initially ...and yeah I do think you have the scope to go and change things in your own organisation as well it just takes time.” (5)

The dichotomy of cost savings through sustainability investments

“If you want to...get stuff changed, then save the money...and then staff can have their pay rise. It’s one of those things that it’s very simplistic but it can be just such a battle sometimes though.” (4)

Passion for the Role (p.186)

Just a strategist who cared about making small organisational changes (p.186)

“[Sustainability]...is a relatively new concept even though it’s been around such a long time... and getting away from the ‘tree-hugger’ aspect has been very, very difficult. Because I’m not a ‘tree-hugger’ I’m an environmentalist. I’m not one of the fluffy people. I see it on a black and white spreadsheet type of situation...because you have to. I like the environment, love the environment...um... my mind set is there, but in order to make it work in the business setting, it has to be that.” (4)

“[Sustainability issues]...it’s personal and I’m happy to bring my experience to this role as well. We’ve got obvious problems with the plans at the minute and I’m very much into climate change and reducing carbon emissions... so to do anything we can....recycle, anything we can...can only help our future generations.” (3)

5.1.4 Leadership tactics employed for engaging staff (p.187)

Importance of winning external awards (p.188)

(Interviewer) “Do you think that external profile that’s raised from those awards.....does that work within the Trust? Does that make people pay attention?”

(Participant) “Absolutely...yes. It’s worked so well.... It’s made them pay attention. I think we’re pushing 10, 15 awards...and I’ve predominantly entered ones which are free...and they are not always NHS orientated. [Sustainability]...should be ingrained in people’s psyche, through communication, that they can... and should... maybe invest just that little bit more. It might cost that little bit more, but at the same time you’ve got longer term savings. So yeah... it can be challenge but...awards are a benefit.” (4)

Leading through communication (p.189)

Choice of wording and language code of the press statements (p.190)

“...what I call sustainability agenda...I like to share with staff. [It is] key to make sure that we get it right, because, I think it always has to be concise” (2)

“I think that it does help as people kind of go “I didn’t realise that’s what it was about....that kind of makes more sense” rather than it being random objectives, with targets attached that read so corporate that no one really understands why it’s part of their job.” (1)

Contextual advice on how individuals could contribute (p. 190)

“I do a [Named Trust] newsletter on a monthly basisit goes through all the different things we’re doing in the Trust, but also what’s going on around the rest of the world [such as] ‘what is your carbon footprint of a particular thing’. So this month I’ve got ironing I hate ironing [both laugh...so if you iron five shirts a week it’s the same as travelling ten miles in a car. It’s a visual aspect of a carbon footprint rather than.... er, this is how much.” (4)

The ‘red tape’ of the communications department (p.192)

“One of my major challenges has been communications and the comms team. You’ll get this for every single ambulance service, every single NHS Trust. [The] comms Team are scared. They are scared of their public....um...they’re scared of the people that work with them as well, so they’re a very careful with the way.... The wording they put out... and they don’t want to put any imagery out that’s not corporate or compliant with what their message is. So I think 6 months in, I was still a bit green around the gills, about the way we deal with stuffand they didn’t quite understand what I wanted to do....so it was a very difficult one to contend with. So I managed to get some stuff out with some posters, my Carbon Champions helped... so...I just overrode them. That’s probably not a very good way of doing it but I basically said “Right, I’m sending an email out.... um I’m sending posters out and I’m sending everything else to the people that need to know about it!” (4)

“I needed to get information out and I had to bypass Corporate Comms ...because I couldn’t go through their process every month because they were taking nearly three to four weeks to come back with “oh I just changed this”. I needed to send it out two weeks ago.” (4)

“We’ve got a lot of initiatives in consulting with staff and patients and the wider community. We would like them to push the sustainability a bit more in those communications, tell people what we’re doing and see if we can get any sort of reaction and any good suggestions coming back to us really.. .but they haven’t really been proactive in communicating

sustainability across the Trust. We do tend to have to go to them and say we've done this good work and will you put that out.” (3)

“I've got my own Twitter account which I, I don't use the [Named Trust] one. But because they're wanting to have one compliant message which is fair enough, but I wanted to have a green [Named Trust] one... I'm moving with the times but they're just about catching up, which is an interesting challenge I have to say.” (4)

Engagement of Green Champions (GCs) (p.193)

Humanising work environments can help individuals reconnect (p.194)

“...lot of them said “well if we're having fruit trees could we possibly turn our area into an allotment?” So [on one] station we've got the most beautiful allotment I've ever seen.” (4)

Strategic recruitment input for green thinking protagonists (p.195)

“I have tried...on numerous fronts...to see if I could get an input on our HR aspect to say “well we're already agreeing viewpoints.” (4)

5.2 Theme 2: The willingness of the workforce in creating and adopting sustainable practices with a carbon reduction ethos. (p.196)

5.2.1 The Senior Management Team (SMT) (p.196)

Willingness of the SMT to engage in the 'green' ethos (p.197)

Getting access to meetings and membership of committees was challenging (p.197)

“I had to try and cross all of those various bridges that became, very, very, very difficult. There's a mind-set within the organisation in those years where everything needed to be done in the way it's always been done.... um there were very few people, there were some, but there were very few people that would look outside the box to actually say “well hang on a moment, we could spend that much money and it's only 10% more than what we want to spend and that could then save us more in

two years, three years' time and help the environment" and they didn't look at it like that... so it's looking outside that box and it wasn't happening." (6)

"[Initial experiences were] hit and miss to be honest ...but it is changing for the better, I've got to say. A lot of people are coming on board ... through the work we're trying to achieve and that the energy saving technology that I've put in recently, they are starting to sort of grasp it now...but it was hard work at first..." (3)

"It is still very difficult I have to say...to change people's attitude to a more environmental approach to investment. I'm never invited to any of the area Manager's meetings. The only one I was invited to was the Estates one...and I found it not helpful, it was almost a hindrance as if to say 'well why are you here?'...you know...'who are you?'" (6)

A personalised approach to individual managers gave opportunity to gauge a true interest in sustainability (p.198)

"As you go round talking to people...one-on-one...and make them aware of it...you get a bit of more buy in." (6)

Having a senior finance person as a collaborator helped participants to find various grant funding schemes (p.198)

"...you've got to have a representative in finance...he's very keen on Environmental issues. So if there's grants available, if we can get them approved and there's a business case for something...then he'll fully support it and also help you with the information too." (5)

The advantage of having a proactive CEO, or senior Directors, within a Trust (p.198)

"I just go straight to the CEO or I go to the Finance Director. That's it." (6)

"...what's the point of having a [Green Plan] if it's agreed by the Board and Departments are not carrying it out?" (6)

Financial savings were the prevalent incentives that drew managers to adopt sustainability initiatives (p. 199)

"...I mean...when our surge kicked in, it was...it's helped us to kind of drive things forward because, as you see in this room we've got LED

light panels. When I first started the T5, going from T12's to T5's was the way forward so we did all the upgrades and that they paid for themselves. Faster than we anticipated. They're supposed to be nearly a two year pay back it was about six months... so we've now been able to kind of reinvest. The Estates Team saw the benefit from that because their budgets have been cut anyway. So they had to come up with a new strategy on what they needed to do to cut it even more, so going from, for example, the T5's to these LED panels they've cut their electricity bill by another 60%....so that proved it straight off. I can then go back and measure the carbon reduction that goes with it through the electric, electricity and gas um consumption of the buildings um so yeah the finance aspect is the driving force predominantly... but I think having proving it has helped a lot as well.” (4)

Once a reputation for enabling financial savings had been established (p.199)

“I had a meeting with him [the Finance Director] last week and he said “oh what can we do? How can I help you and support you?” So the support network is there now, whereas before it was “well we've got to do this for patient care, we've got to deliver this, we've got to hit our eight minute targets, and we've got to hit our nineteen minute targets. How do we do that? Green stuff's not going to really help... but then suddenly when the financial constraints kicked in... um.... it really has helped a lot” (4)

“I mean it's changed over the past few years because in the first few years it was a bit of an add on....a brilliant tick box exercise. Then [we] had a change in Management for our Finance Director...he sees it from the financial aspect and he challenged me to kind of come up with... “Well we need to save 20 million pounds, how do we do it? You've got five years... what can you save in that time?” (4)

Resistance of the SMT to conform to the 'green' ethos (p.200)

Preliminary exploration of carbon reduction initiatives by the sustainability managers had met with antagonism (p.200)

“I think they're using the one tool that they can use and that's austerity. I think that is a big, a big stick, and they're frightened to go outside of a realm they're quite happy with” (6)

“My focus would be to reduce energy and save carbon emissions but when you talk to somebody in finance, they're only objective is to save money. So there is that conflict going on as well” (3)

“...in total honesty I don't think it's [carbon reduction] their highest priority. I think there are other priorities, I think finance is probably one and probably

um obviously response times, so performance really, performance and finance and then.....they're the key issues so really every, everything to those things comes second.” (3)

Investment that would require greater sums than initial rewards in the short term, but would be of enormous financial and environmental benefit in the future (p.200)

“[Resistance] it's getting less.....though. Initially, er six, seven years ago it was like well “why do we want to put solar panels on? its going to cost us a stupid amount of money. Why do we want to save fuel?” and then suddenly austerity kicked in and budget cuts kicked in and “oh..... [sustainability manager name] could you possibly... you know... sort out all the green stuff because I know it's going to make a saving?” “Yes... yes I can! (4)

Financial savings were the prevalent incentives that drew managers to adopt sustainability initiatives (p.200)

“...the knock on effect would benefit patient care but the investment needs to be done in the first place...it needs to be seen as a benefit rather than “oh God I've got to do green stuff again.” (4)

“I really wanted to get buy-in through making savings...as I knew that would be the ‘hook-in’. In the [Green] Plan we identified £10.6 million worth of savings, up to 2020...so that basically got them on board. Writing a [Green Plan] straight off, I don't think would have necessarily got them on board because we wouldn't have got that ‘hook-in’ of savings” (1)

Trust's organisational culture would involve all managers to have responsibility within the green agenda (p.202)

“...it has to be something that's incorporated within an Organisation, really, for it to actually umactually make a difference.” (4)

“You need to make sure that um sustainability is embedded within the Trust Policies...they tend to let their Policies just drift a bit. Well that's unacceptable. The [Green Plan] has to be kept up to date and Managers' input needs to be in there.” (6)

5.2.2 The Operational Staff (p.203)

Staff Resistance to adopt sustainability change (p.205)

Staff morale (p.205)

"We have quite a big divide in our organisation between north and south [of the Trust]. The north tends to be far more progressive thinking...whereas in the south, you go and speak to some Paramedics...that'll think it's all about cost saving" (1)

"...going back to when the Trust [merged]...I think we inherited [another] Ambulance Service and I think that they felt...that they had been kind of forgotten about...so I think it's a history thing. Obviously there is a lot of new blood that's come in that doesn't think like that...but you speak to the older Paramedics and its "oh...we are always given a bit of a disservice"... I think that it's all wound up together." (1)

Engagement to date has predominantly been at a local level as I got round to meeting some Operational staff and OMs so I can get the word out that way, but there have been some good press in our weekly bulletin on energy, in the work we trying to achieve." (3)

"I think we're past the early innovators.... we're riding up to the top of the curve..." (4)

"...we've had mixed views about them [electric cars]. People don't like change...they don't like the fact that we've gone from diesel to electric, because they are worried about long distance driving...and I think that there are still teething issues that people are not quite confident in them as they would be. But in a year's time they will be in totally a different place. It will just be kind of part of...be part of the furniture I would imagine." (1)

"There's been an attitude where it's been them and us. It seems to be this divide" (6)

"Yeah well at the minute all our waste bins will be removed from the office and we'll just have centralised bins for recycling in general. There's been an initial reluctance to have their bins taken away, because they'll have to walk down the corridor with any waste. It's educating them on which bin they need to put stuff in because they haven't got a clue which bin at all. Either that or they're just not bothering, just throwing it in the wrong bin." (3)

Station culture a barrier (p.205)

"...a lot of stations you go to, it's more like a little family on site um and they treat it as their sort of second home, I guess and it's sort of all decorated and they've got personal items on site and they set up their own initiatives so it's, er you're sort of tapping into that." (5)

Dogmatism to retain paradigm practice (p.205)

"I think a lot of people are on board with it and a lot of people are obviously are into it at home because it's getting pushed all the time.... but there are staff out there that ...you just get the feeling they are just not interested." (3)

Participants also highlighted that staff resistance to such measures met with acts of overt hostility (p.206)

I had to get the Director to issue a notice to say we consider this very seriously.... and potentially it's gross misconduct, as its respect of energy at the end of the day.... and its Ambulance and the Trust Property." (3)

"They're not very keen on light sensors, because they can't turn the light off if they want to and the light comes on especially at night time. If they're on a night shift, there were incidents where people taping the sensor up so the lights stay off." (3)

Communication needed to be two way process of implementing strategic objectives and listening to feedback from staff on their experiences (p.207)

"I would like somebody coming back this way saying "I think we are wasting this energy...and this is what I think we could do to save money." So a bit of two way traffic rather than [top down directives]. Sometimes you do get the impression that you're telling people what to do all the time." (1)

Incentivisation to adopt Green Plan strategies (p.208)

Few incentives that could be offered to the individual or the station fraternity (p.208)

"We have got some really keen individuals, but as a whole they are not as engaged.....and I didn't expect that really. (1)

"We haven't done it by individual site. I would like to do that...if I did...it's an incentive then, isn't it? (3)

Communication needed to be two way process of implementing strategic objectives (p.208)

“There’s a two way communication aspect which I think for quite a long time it was a... ‘This is us here at Headquarters and there’s you out on stations’. Whereas now it’s, ‘you out in stations have the input into how Headquarters and can change things’. (4)

Promote competition amongst stations to perform even better (p.209)

“Well, finance do actually produce that...as they look over what projects we’ve run, such as putting solar PV on etc. however, it currently doesn’t go down to a station budget....so it’s not something that we send out to the stations...but it is something that we could do.” (1)

Reinvestment of cost savings (p.209)

“We’re predicting two hundred thousand pounds savings every year. That would be nice to ring fence that and re-invest that into phase two really. As it stands there’s no capital left to do a phase two so what I’m trying to do now is get external funding for phase two to go about the efficiencies that we’ve already achieved.” (1)

The Education and Training of operational staff in sustainability and carbon reduction management (p.211)

Sustainability updates during SME days (p.211)

“I did have three quarters of an hour some years ago in induction [to] get the message across. I was booted out two years ago because they wanted to reduce from three days to one and a half days and they could only cram so much in one and a half days that’s a retrograde step.” (6)

“I remember when I first joined, there was someone [operational person] said “why do we need someone like you in our Trust?” There hasn’t been that sort of education as to what it actually means to an ambulance service. So I think that link, that’s one of the things I guess I’m trying to overcome and I think that also starts at the top of the Organisation as well so I need them to go and support it” (5)

“...how do we get this message across? Well the only way you can do it is by education but they’re not letting me do it.” (6)

“[An education session] was...until I went off....in the Statutory Mandatory Training Workbook. There would be a chunk about carbon management, the sum total of three questions.... like ‘what’s our carbon footprint? How do we manage it? What do we do? Do we have solar panels?’in very basic multiple-choice rubbish! When I came back, it’s

been taken out of this year's...so I need to kind of go back and hassle them. I think with most people it's a, let's ignore that." (4)

The uniqueness of the EMS environment (p.213)

"You have to understand the constraints they work through. So even as you see there's some recycling materials in general waste, you should understand that it's because of the conditions they work under. So that when they have time, they tend to recycle properly" (2)

5.3 Theme 3 – Targeted Successes (p.214)

5.3.1 Reduction in energy consumption (p.215)

Quick fix wins (p.215)

"I know there's a couple of sites which would be really quick wins we just need to replace the windows, fill in those cavity walls and er put some um maybe some LED lightings, lighting up. There are some really easy things to go and do but it's er yeah it's, I guess it's just a challenge, it's a lot of things to do and by a small number of people." (5)

Early identification of carbon inefficient infrastructure was seen as a priority.

(p.215)

"So....when I first started, I went around every station and tried to get to grips with how we run the stations. I went through the good housekeeping measures of; Are the stations insulated? Have you got double glazing? Is there a roof space that we could put a solar PV on? What state were the boilers in? We spent 2 years going through each one...so we are nearly three quarters of the way through the programme of putting LED lights into all of our buildings. We've got a boiler replacement plan. We are now looking at if we have to replace the boiler, whether that goes to renewable. We've recently put an air source heat pump in at one of our bigger ambulance stations. If that goes well over the heating season, that's going to be the blue print for going forward...as we don't have a gas bill there at all now." (1)

The change to BMS was not always well received by the staff at the location (p.218)

“So that was one of the first projects that we did and I was quite surprised that when I turned up, people were allowed to turn it up whenever they wanted, whereas I’d come from an organisation where our buildings were slightly bigger so there were BMSs so everything was set up automatically. But we’ve created good savings because of that.” (1)

Challenges of real estate (p.220)

Concern with how old the inherited real estate and assets were within their Trusts; (p.220)

“We need refurbishment of all our Estate...when that happens must take into account sustainability.” (6)

“[The issue with] lots of stations is [that]they are old buildings and with a lot of them, it’ll be quite nice to go and steam roll over them and rebuild a nice new shiny building there which can be efficient and you know, have excellent ratings.” (5)

The challenges for fossil fuel use reduction in the ASTs’ mobile fleet, was not felt to be as simple as those solutions for the static real estate (p.223)

“Fleet is 75% of our carbon footprint as a Trust. The investor save projects that you can roll out...there are not as many of them, or as easy as they are for those with Estates. You can’t just stick a solar panel on a vehicle. You can do that on one building and it makes a massive impact...but it’s not quite the same with Fleet.” (1)

5.3.2 Reduction in Fleet fuel use (p.223)

Reducing fuel consumption (p.223)

“We’ve had AdBlue tanks installed across most of our sites. That’s to basically clean your emissions coming out of your vehicle. We have

made some improvements but it's actually the vehicle itself where we need to work together to re-design an ambulance.” (5)

Moving away from DCA designs, which have excessive chassis weights.

(p.224)

“At the moment [the vehicles] are all diesel. It's a real challenge to get more efficient diesels, especially since the base vehicle has a load more weight put on top of it” (4)

The potential, though, was to engage AST Driving Tutors to incorporate the eco-knowledge into their core driver training

“...it made a lot of people think differently about the way that they were teaching...but also teaching the paramedics, [they] were also thinking about how they do it differently. It's still continuing now six years later.” (4)

Shoreline use (p.226)

When they are out operationally they get it to 'Runlock' which is more efficient than leaving the vehicles run, running full blast.” (2)

“We have what is called a shoreline set up to the ambulance when they're at the station. That avoids them being on 'Runlock', so when they are stationary, they have the checking point plugged in. When they are out operationally they get it to 'Runlock' which is more efficient than leaving the vehicles run, running full blast.” (2)

“The policy is that...if the vehicles stay stationary on station it has to be plugged into a charging unit and the engine turned off. They're only allowed to used 'Runlock' if they're actually at a call on site and they have to leave it running. So when it's not operational it's not allowed to be kept ticking over, it has to be turned off.” (3)

There was a noted enthusiasm from all participants to explore EVs (p.228)

“The issue with having electric vehicles are who finances them, the provision of charging units? Who pays for the electricity? Who pays for setting up? Again, it's all in our plans. I think there's a National policy in draft at the minute.” (3)

"We haven't tried any electric operational vehicles I know other places have tried them and our FLEET Manager's been in touch with other, other places." (3)

"I want an electric vehicle that's what I want. And I think the, the organisation should supply one or get the sponsor to supply one" (6)

Staff requesting EV charging points (p.228)

"I'm looking at the infrastructure of how we do that for our own vehicles but also how we get the infrastructure in place for lease vehicles, and for anybody who's using a private vehicle... just to kind of get the motion going for them." (4)

However, some participants were sceptical on how the staff would adopt and embrace the change in technology (p.229)

"I don't think they'd like them [electric vehicles], even if we change a make and model of a vehicle, they tend to 'kick off' and you know they seem to like Mercedes rather than the other ones...we have Fiats or whatever. Whether it's a status thing I don't know what [but] it's been proven that Mercedes are no better than the Fiats but you get this perception that they want to drive a Mercedes and not a Fiat." (3)

"We have done some trials on electric vehicles for our patient transport. Works wonderfully. They really enjoyed it. I just couldn't get buy in from the top to say". (4)

"There's a wariness with the Estate Managers across the whole of the UK...about people plugging in and using electricity that the Trust has got to pay for...rather than thinking "but actually we just need to have greener vehicles on the road." (4)

There was also, however, a feeling amongst the participants that electric vehicles were not quite yet at the technological level (p.230)

"I think the personal perception is that it's not a viable option at the minute. No doubt in time technology will change and they may become viable, but at the moment they're not. We are keeping our eye on the market you know and... as and when we feel that it might be of benefit." (3)

"It is the direction I think we're looking at going in. I guess we're waiting also for technology, for vehicles to get a little bit better." (5)

Hybrids offer the reassurance that range and refuelling was no longer an issue

"...hybrid vehicles, based in all inner city areas, a must that's for the future. Yeah within the next five years." (6)

"Hybrids work in certain parts of the organisation. I've just had to sign off an approval for some plug in hybrid electric vehicles." (4)

"We don't [use hybrids] but... it probably would be worthwhile trialling hybrids on PTS vehicles, not so sure about the operational vehicles. That will take a lot of work to convince people that they're effective at the minute." (3)

Eco-driving (p.232)

Influencing driver behaviour was felt by some participants to be a key factor in reducing fuel consumption (p.232)

"We are starting to utilise driver behaviour training...because realistically 97% of the [operational shift] time, about half of that 97% they are idling which is another issue altogether. But the rest of the time they are just normal driving." (1)

"You see lots in the press about how much it [eco-driving] saves. If you can get a 10-12% saving on fuel through driver behaviour...that would be amazing." (1)

"With our vehicles, I think 10 or 15% of the time is when they're doing [emergency] response times...so 85% of the time they're just driving somewhere else at a normal speed. I wanted to tackle that 85% because we could save an awful lot through ECO driving." (4)

More empirical research is needed before a financial commitment is made

(p.234)

"There's been a sort of a trial for solar panels on top of RRVs...that is only been a trial and potentially we could go and roll that out and we're just looking at the results now ...it's for the equipment on board otherwise it just, I guess it drains the batteries and continually having to go and charge everything up again." (5)

"We've just recently been looking at solar charging units for vehicles. I believe they're on trial...somewhere at the minute.... so we'll wait to see

what the effects of that trial are ...and then we'll perhaps try some ourselves." (3)

5.3.3 Procurement and waste disposal (p.235)

Waste management by operational staff (p.235)

Historically, contracts appeared to have been costly, disparate and under supervised (p.235)

"We've centralised all our contracts because they used to be spread out with separate contracts all over the region. So we've centralised the contracts to get efficiencies there" (3)

"Initially there were thirteen [waste] contractors, which I've now got down to one, which is where I want it to be, so it's more controlled. It also starting to give us some data of how much waste we're creating, be it general waste or recycled waste and general waste." (6)

"When I joined there were numerous waste contractors, we had well over twenty covering the whole Trust and there was no recycling in part of the Trust as well .We've got a lot of little sites but when you add it all up it all counts. So we put together a Waste Tender and now we have one contractor covering the whole Trust." (5)

"When I turned up here at [Named Trust], I looked through a lot of the waste management files and found that we had numerous waste contractors, with various prices, serving huge amounts of our stations. We've 65 stations and we must have had about 20 waste contractors, so there wasn't any kind of guidance on price. What I was really concerned about was the fact that we weren't following our duty of care...that you cannot waste manage, if you don't really know what is going out of any of our stations, which we didn't." (1)

Participants expressed that when waste segregation was done correctly, savings could be realised from reducing the costly waste streams (p.236)

"We've done education campaigns, we've done newsletters, briefing documents, and we've labelled bins. We've really gone back to basics on it...we made them do a weekly audit...because we were at completely non-compliance. We had [clinical waste] bins ...yellow bags and orange bags filled with costa [coffee] cups etc. and it was just ridiculous." So we've done a lot of training in regards to that. But I'll be honest....it

wasn't great... I thought the clinical side of things would be fine...but actually they just weren't being educated in the right way. If no one tells you to do it in the right way, you're not going to do it are you? (1)

"I think the difficult bit is educating people to put the right thing in the right bin. They constantly put things in the wrong bag, putting non-clinical things in clinical bins, or the odd clinical waste item in general waste." (3)

Contemporary vehicle design was not compatible with the space available for different types of waste bins (p.238)

"There's only clinical waste bags on an ambulance. They have now installed black waste bags, in the front cab, as they can't have them in the back." (6)

"There's just one bin I think. I think it is clinical waste and sharps ...and general waste has to go in the cab ... and there isn't a bin in the front." (4)

"At one point they were talking about having six different bins on an ambulance. Where's the space for that? It's getting the constraints of your vehicle to contain something like that. It has to be integrated, it has to be the right size...you have to have a bag that fits within that space." (4)

Recycling (p.238)

Selling or swapping items seem to be a theme between three of the participants (p.239)

"We've also started to look at setting up an eBay shop to sell off really decent, high value...normally IT...and stuff that is getting to its end of life. I don't really think that we should be disposing of something that can easily be used by someone else." (1)

"We are also looking at a system called 'WARP-IT'. It's like an online asset management database that you can.....it's like swap shop essentially....and you link up with various NHS organisations and councils. It reduces your procurement costs and also reduces your disposal costs. A lot of the other stuff that we are disposing of, certainly furniture, is not really at the end of its life...it's just that we didn't have anything else to do with it." (1)

"We now use an Organisation called 'WARP-IT for... reusing furniture and stationery, so that...I can say "right we've paid this subscription fee but actually we've saved over double that." (5)

Procurement issues (p.239)

“...so sustainable procurement that’s going to be a big area as well. We’re making sure we work with our suppliers, on the disposal routes, so we can reduce the cost of paying for it to be got rid of elsewhere...and if they have a take back scheme or refill scheme.” (5)

5.3.4 Confidence in the measurement of initiatives with carbon emissions and carbon savings (p.241)

“The [Green] Plan initially identified that our carbon footprint was about 12,000 tonnes. The following year I redid it and worked out that it was about, about 16,000 tonnes. The problem being that the Carbon Trust Scheme um and spreadsheet that we had didn’t account for ambulances because it was either small vehicles or HG Vehicles and most of our ambulances are in the ‘in between’ bit and there’s nothing that’s out there for commercial vehicles and commercial vehicles do not report their carbon output at all ...there’s no grams per kilometre. It’s only just starting to come in now seven years later so.... the detail’s not been there as to what the fuel consumption reality wasum so yeah that’s where I’ve come from.” (4)

5.4 Theme 4 Future Ambitions (p.242)

How operational staff translate and adopt corporate plans (p.244)

“Because at the minute [my evidence] is just hearsay. So, it would be really interesting to kind of see how that [geographical divide]...why it’s so different....why and what areas think so progressively, whereas in the other they are really against it and think it’s just about cost savings. It would be interesting to see what commonality was out there and so what is best practice and then I’d like to see what the suggestions are for improvement.” (3)

Appendix 13 (Chapter 7) Sample of Ethical Approvals (Phase Three)

Confirmation of Faculty Research Ethics Approval



2nd July 2018

CONFIDENTIAL

Peter Allum
Room SF34
Peninsula Allied Health Centre
Faculty of Health and Human Science
Plymouth University
Derriford Road
Plymouth PL6 8BH

Dear Peter,

Application for Approval by Faculty Research Ethics and Integrity Committee

Reference Number: 17/18-958
IRAS Reference number: 236324
Application Title: An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff

I am pleased to inform you that the Committee has granted approval to you to conduct this research.

Please note that this approval is for the duration of the project as stated on the applications form (until 31st January 2019), after which you will be required to seek extension of existing approval.

Please note that should any MAJOR changes to your research design occur which effect the ethics of procedures involved you must inform the Committee. Please contact the Faculty Research Administrator, Maurice Bottomley (email hhsethics@plymouth.ac.uk).

Yours sincerely

Professor Paul H Artes, PhD MCOptom
Professor of Eye and Vision Sciences
Co-Chair, Research Ethics and Integrity Committee -
Faculty of Health & Human Sciences and
Faculty of Medicine & Dentistry

Professor Paul H Artes, PhD Co-Chair, Faculty of Health & Human Sciences Research Ethics and Integrity Committee,
4th Floor Rolle Building, University of Plymouth, Drake Circus, Devon PL4 8AA
T +44(0)1752 586992 E hhsethics@plymouth.ac.uk W www.plymouth.ac.uk

Confirmation of HRA Research Ethics Approval



Mr Peter Allum
Pathway Lead for Prehospital Critical Care - Retrieval and Transfer
University of Plymouth
Room SF34 PAHC School of Health Professions
Derriford Road
Plymouth
PL6 8BH

Email: hra.approval@nhs.net
Research-permissions@wales.nhs.uk

25 June 2018

Dear Mr Allum

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title:	An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff
IRAS project ID:	236324
Protocol number:	FHHS-236324-PA-199
REC reference:	18/NW/0356
Sponsor	University of Plymouth

I am pleased to confirm that [HRA and Health and Care Research Wales \(HCRW\) Approval](#) has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

How should I continue to work with participating NHS organisations in England and Wales?
You should now provide a copy of this letter to all participating NHS organisations in England and Wales, as well as any documentation that has been updated as a result of the assessment.

Participating NHS organisations in England and Wales **will not** be required to formally confirm capacity and capability before you may commence research activity at site. As such, you may commence the research at each organisation 35 days following sponsor provision to the site of the local information pack, so long as:

- You have contacted participating NHS organisations (see below for details)
- The NHS organisation has not provided a reason as to why they cannot participate
- The NHS organisation has not requested additional time to confirm.

You may start the research prior to the above deadline if the site positively confirms that the research may proceed.

Confirmation of Ethical Approval from Trust A R&D (email sent 27/06/18)

Dear Peter,

Re: Investigating opportunities for sustainability behaviours within Paramedic and Ambulance Service practice PHASE 3; [REDACTED] RD82; IRAS Ref 236324

Please find attached the agreed statement of activities for your project, as **[REDACTED]** Ambulance Service NHS Trust are not required to confirm participation (as per HRA approval email), please take this email as agreement for you to undertake this phase of your project within **[REDACTED]**.

I have copied in **[REDACTED]**, the **[REDACTED]** Environmental & Sustainability Manager who I believe you would need as your Gatekeeper for information, and also **[REDACTED]** as our research paramedic who can assist with **[REDACTED]** in identifying suitable sites.

When you are ready to organise your placements please can I ask that you contact the **[REDACTED]** placements team on **[REDACTED]** to obtain the paperwork that you will be required to complete. Please note however that there is currently a backlog in applications for placements with the **[REDACTED]** Ambulance Service and therefore please bear this in mind when requesting dates for placements.

As we discussed we will not be able to allow you undertake your research until we have issued you with a Letter of Access for Research, rather than an Honorary contract. In order to proceed with this please can you send your signed research passport.

Best Wishes,

[REDACTED] Research and Development Manager

[REDACTED] Ambulance Service NHS Trust

Email: **[REDACTED]**

Confirmation of Ethical Approval from Trust B R&D (sent 23/07/18)



Peter Allum
University of Plymouth
Room SF34 PAHC School of Health Professions
University of Plymouth
Derriford Road
Plymouth
PL6 8BH

[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]
Tel: [Redacted]
Fax: [Redacted]
Website: [Redacted]

23 July 2018

Dear Pete

Re: An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff.
Trust Ref: 18-011

I am writing to advise you that your student project proposal, named above, was considered by the Research and Development Team on 11th April 2018.

I am pleased to inform you that, on the Trust's behalf, we approve that the study go ahead as proposed, and confirm our capacity and capability to support your study.

I look forward to receiving updates on the progress of your study and wish you every success with it.

If I can be of any further assistance please do not hesitate to let me know.

Yours sincerely

[Redacted Signature]

[Redacted Name]

Research & Audit Manager

Appendix 14 (Chapter 7) Invitation Letter to Station Operations Manager

SF34 Peninsula Allied Health Centre
School of Health Professions
Faculty of Health and Human Science
University of Plymouth
Derriford Road
Plymouth
PL6 8BH

[Insert Name]

[Insert Address]

[Insert Date]

REFERENCE: An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff

Dear [insert name]

Following ethical approval, your station at [insert location] has been nominated by your Trust Senior Management Team as being ideal for conducting a period of observational ethnographical research.

This project forms part of a larger PhD thesis started in 2014. I have attached a Participant Information Page which outlines what the study is about and also what it entails. Essentially, I would be joining this nominated station for up to 5 x 12 hour shifts, observing activity relating to sustainability behaviour, both on station and in the peripatetic (patient) environment. If you were to agree to this taking place on your station, your individual involvement would only be needed in the initial study set up, involving;

- An initial meeting with me (at your convenience) to explain the research protocol and to agree attendance process
- Providing advance notification and promotion of the project to the station (approximately 1 month) in order to ascertain which shifts would be most agreeable with participation. This would involve distribution of the Patient Information Sheets and Consent Sheets.
- Confirming with me which shifts would be best and agreeing my attendance.
- Being a point of contact, should the need arise with any professional issues.

I would then attend the station at the agreed times and verify the consent with each participant. The participants would then be observed in their day to day activities with minimal interruption. As a researcher, I will be making field notes of the observations and also audio recording informal interviews to elaborate on aspects of their practice in relation to their observed behaviour.

At the end of the data gathering period of the 5 shifts, we would then meet to have a general debrief around the time spent on the station.

The only information that I will be gathering is about sustainable issues. This study is not concerned with evaluating any one person's individual performance or the clinical care they are providing. This study is about an EMS service evaluation, canvassing a cultural perspective on sustainability within the operational workforce. The aim of which is to understand if there are 'green' initiatives taking place within current EMS practice.

Any observation made or anything that is discussed will be treated in absolute confidence, no names will be mentioned in any of the reports from the study and care will be taken, so that individuals and organisations cannot be identified from details in reports of the results of the study.

If you are agreeable for this research to take place on your station, please could you email me on

Peter.allum@plymouth.ac.uk

Thank you for your time and consideration with this research project.

Yours sincerely

Peter Allum

Peter Allum (Chief Investigator)

Programme Lead for MSc Pre-Hospital Critical Care – Retrieval and Transfer

Lecturer for BSc (Hons) Paramedic Practitioner / Health Studies

Plymouth University

Derriford Road

Plymouth PL6 8BH

Tel +44(0)1752 586505

peter.allum@plymouth.ac.uk

ATTACHEMENTS

Participant Information Pages

Patient Information Sheet

Consent Form

Version 1 (23/04/18)

Participant Information Pages

IRAS PROJECT ID 236324

Study Title: An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff

I would like to invite you to participate in a research study that aims to explore and evaluate sustainability issues within your NHS Ambulance Service Trust. Please find below some information about the study and what is required for your participation in it.

Before you decide whether or not to participate, it is important for you to understand why the research is being done and what it will involve. This information sheet explains the general aims of the study. Please take time to read it carefully and discuss it with your colleagues, Operations Manager or Trust Research Department if you wish. If there is anything that is unclear, or if you would like more information, please ask us. Your participation in this study is entirely voluntary.

The study aims to find out about the current sustainability activity in NHS Ambulance Service Trusts in England, thus gaining a first-hand understanding of sustainability behaviours and its nuances in different contexts of ambulance stations and operational ambulances in the field.

These are some of the frequently asked questions;

Why have I been chosen?

This project is designed to focus on the perspective of NHS (and NHS Foundation) Trusts operational ambulance service staff. Your station has been selected to host this phase of the research. The researcher has been in discussion with your Operations Manager (OM) who will have passed this information on for general dissemination on your ambulance station.

What is the purpose of the study?

Sustainability and reducing the carbon footprint of NHS organisations has become an increasing priority for the Department of Health. Ambulance Trusts can significantly help towards meeting NHS targets with carbon reduction.

Despite the recommendations of a handful of international research, there has been a dearth of empirical research into sustainability activities within the UK connected to ambulance service activities, leaving a void in information about the EMS contribution towards reducing the carbon footprint of the NHS. This research intends to map and identify those gaps and contribute towards future intervention strategies.

The overall intention is to disseminate good practice from the findings.

Who is conducting the research?

The researcher is currently employed as a Lecturer at the University of Plymouth undertaking this project as part of his PhD thesis. He is a qualified; HCPC registered Paramedic and has extensive experience of operating within ambulance service delivery.

What will be involved if I agree to take part in the study?

The researcher will come to your station on up to five occasions (approximately 12 hours on each occasion) over a six month period in order to observe you and your colleagues within the general day to day activities that you undertake. The researcher will be making field notes based on your working environment and how you accommodate sustainability practices. This may involve observation of activities within your ambulance station, or during emergency / operational call outs.

The researcher may also wish to further explore your experiences with sustainability and ask you to participate in an informal discussion. This may be within a group context or on an individual basis. These discussions are usually digitally recorded on audio devices, purely for the purposes of capturing your comments. However if you have objections to this method, please inform the researcher and he will take field notes instead. These discussions will only be completed when it is convenient for you and when service duties permit.

Participation in this study is entirely voluntary. If you are agreeable to participating, then the researcher will ask you to sign a consent form.

Will any expenses be paid?

No. This research does not have external funding.

Can I withdraw from the study at any time?

Yes, you are free to refuse to participate and can withdraw at any time, without providing a reason and without detriment to your relationship with the research team, Plymouth University, or your employer. You may also choose not to discuss certain issues, if participating.

When will the interviews take place?

It is anticipated that the station visits will take place between March to September 2018, however the researcher will give the Operations Manager at least 2 weeks' notice to ensure that the station is ready to accommodate the research at that time.

What other information will be collected in the study?

The only information that the researcher is gathering is about sustainable issues. This study is not concerned with evaluating any one person's individual

performance or the clinical care they are providing. This study is about an EMS service evaluation, canvassing a cultural perspective on sustainability within the operational workforce. The aim of which is to understand if there are 'green' initiatives taking place within current EMS practice.

Will the information obtained in this study be confidential?

Any observation made or anything you discuss will be treated in absolute confidence, no names will be mentioned in any of the reports from the study and care will be taken, so that individuals and organisations cannot be identified from details in reports of the results of the study. Transcription of audio recorded data will only be conducted by the researcher. Any raw data (including transcripts and copies) collected, will be destroyed 3 years after the completion of the study (abiding with the University of Plymouth Research Data Management policy). All data collected will be held securely and confidentially. It will not be made available to anybody outside of the study team without your consent.

Your name (which we need in order to match the consent sheet) will be stored separately from the other data gained during the survey. All information will be handled in compliance with the Data Protection Act (1998).

Please note – Whilst this study is discussing sustainability strategies only, it should be noted that as a HCPC registered professional, the researcher has a responsibility to report any observation or explicit disclosure of unethical or unlawful behaviour which has or may put others at serious risk. This may result in reporting this to the participant's line manager, the researcher having to inform the participant(s) of their responsibilities under the HCPC Standards of Conduct Performance & Ethics and termination of the observation. To this end, only general information and opinion should be discussed.

The University of Plymouth is the sponsor for this study based in the United Kingdom. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. The University of Plymouth will keep identifiable information about you for 10 years after the study has finished. Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained. To safeguard your rights, we will use the minimum personally identifiable information possible. You can find out more about how we use your information at <https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/data-protection-and-information-governance/gdpr-guidance/>

What are the possible benefits of taking part in this study?

We hope that being involved in the research will be of interest to you. Sometimes individuals may gain knowledge and insight into research methods

by participating in studies like this. Ultimately the benefit will be to disseminate good practice within the EMS community.

What are the possible disadvantages of taking part in this study?

Asking you informal questions that relate to awareness of a topic may lead to feelings of frustration. Following any informal discussion, if you want to talk through some of the issues that were raised then you might like to contact another member of the research team (see details below). If you want to withdraw from the research study, you can do so at any time.

Can I complain about the way the study has been conducted?

If you have any cause to complain about any aspect of the way in which you have been approached or treated during the course of this study, please contact the project principal supervisor Dr. Andy Nichols or supervisor Professor Janet Richardson (details below). Otherwise you can use the normal University of Plymouth complaints procedure.

Who is organising the study?

The research is organised by Mr. Peter Allum (MSc Clin Ed.; Paramedic; MCPara) on behalf of the Sustainability and Health Research Group. This research forms part of a wider PhD thesis for the Chief Investigator and is supervised by Professor Janet Richardson and Dr. Andrew Nichols (both Nurses and Health Research Academics in the School of Nursing and Midwifery at Plymouth University).

Who has reviewed this research study?

The study has been reviewed by the University of Plymouth and given ethical approval. Your Trust has also been involved in the ethical approval.

How will I hear about the results of the study?

The final thesis will be completed by 2020. In addition the thesis will be used to write an article that will hopefully be published in a scientific journal. You can be assured that you will not be personally identifiable in any report or publication. When any article from this research is accepted for publication, your Trust will be informed and a copy will be disseminated to you upon request.

Your rights

Your participation in this study is entirely voluntary. You may withdraw at any time.

And Finally,

If there are any further questions that you would like to ask, then please feel free to contact the Chief Investigator or supervisors, whereupon you can

discuss any aspect of the study. Thank you for taking the time to read this information sheet and for your cooperation with this study.

Contact Details

Peter Allum (Chief Investigator)
Programme Lead for MSc Pre-Hospital Critical Care – Retrieval and Transfer
Lecturer for BSc (Hons) Paramedic Practitioner / Health Studies
Room SF34
Peninsula Allied Health Centre
School of Health Professions
Faculty of Health and Human Science
Plymouth University
Derriford Road
Plymouth PL6 8BH

Professor Janet Richardson (Principal Supervisor)
Professor of Health Service Research
Faculty of Health and Human Sciences
Plymouth University
8 Portland Villas, Drake Circus
Plymouth PL4 8AA

Dr. Andrew Nichols (Supervisor)
Faculty of Health and Human Sciences
University of Plymouth
Drake Circus
Plymouth PL4 8AA

Version 2 [25/06/18]

Appendix 16 Consent Sheet for Participants (Phase Three)

IRAS ID: 236324

Centre Number:

Study Number:

Participant Identification Number for this trial:

CONSENT SHEET

Title of Project: An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff

Name of Researcher: Peter Allum

Please initial
box

1. I confirm that I have read the information sheet dated.....
(version.....) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected or without detriment to my relationship with the research team, the University of Plymouth, or my employer.
3. (If appropriate) I understand that the information collected during the study (audio and notes) will remain strictly confidential, may be used to support other research in the future, and may be shared anonymously with other researchers.
4. I agree to take part in the above study.

Name of Participant Date Signature

Name of Person Date Signature
taking consent

When completed: 1 for participant; 1 for researcher site file
Version 1 23/04/18

**Appendix 17 (Chapter 7) Information Sheet for Patients
(Phase Three)**

PATIENT INFORMATION SHEET (2018)

IRAS Project Number 236324

Title of Project: An ethnographical study of sustainability attitudes and behaviour amongst NHS Ambulance staff

I would like to inform you about a research study that is taking place with the Paramedics who are treating you. This information sheet explains the background and aims of the study. Please take time to read it and discuss it with others if you wish. If there is anything that is unclear, or if you would like more information, please ask me.

What is the overall aim of the study?

The aim of this research is to observe the current sustainability activity being undertaken by NHS Ambulance Service Trusts in England, thus gaining a first-hand understanding of sustainability behaviours in different contexts of ambulance stations and operational ambulances in the field. The purpose of this study is to investigate ways to improve the processes of ambulance care and the experience of all those who use the services.

Do I have to do anything?

If you verbally agree that observation can take place whilst you are being treated, you do not need to do anything else. You may occasionally see a member of the research team talking with staff or making notes. You as a patient or carer or relative are not involved in this study at all. The researcher is only interested in the actions of the ambulance staff and the way that equipment is utilised.

Who is doing the observational research?

The researcher is a qualified Paramedic and is registered with the Health and Care Professionals Council (HCPC). He is currently employed by the University of Plymouth as a Lecturer for Paramedical Studies. This research forms part of a wider PhD thesis for the Chief Investigator

Who has reviewed this research study?

The study has been reviewed by the University of Plymouth and given ethical approval. The Ambulance Service Trust has also been involved in the ethical approval.

Will the data collected be confidential?

No information about your condition or treatment will be recorded. You will not be identifiable in any of the field notes.

All information collected about the paramedics during the study observations will be held confidentially. All information will be stored electronically in a password protected document file contained within a password protected computer. This computer will be stored within a locked office. All information will be handled in compliance with the Data Protection Act (1998).

What if I don't agree to the observer being present?

You have the right to refuse the researcher being present during your assessment and treatment. You are free to ask the researcher to remove themselves from the immediate environment, without providing a reason and without detriment to your

treatment, relationship with the paramedic crew. You may also choose not to discuss certain issues, if participating.

What if I want to make a complaint?

The Patient Advice and Liaison Service (PALS) offers confidential advice, support and information on health-related matters. They provide a point of contact for patients, their families and their carers and can be a method of making a complaint if appropriate.

You can find officers from PALS in your local area.

<https://www.nhs.uk/chq/Pages/1082.aspx?CategoryID=68>

Contact for further information

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Thank you for taking the time to read this information sheet.

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Appendix 18

**(Chapter 7) Sample of observational activity log
(Phase Three)**

Activity Log (Ethnography) Phase III

Date	Region	Station location	Participant number	Time	Activity

Appendix 19 (Chapter 8) Additional supporting quotations (Phase Three)

8.1.1 Staff Compliance to waste segregation during patient encounters

(p.303)

Clinical Care provision within a Patient's Residence or Workplace (p.303)

Others felt that either it was not appropriate to ask the patient to take their waste, or that they did not have the time for segregation due to the patient's condition (p.304)

"We are constantly pushed for time. Waste segregation, to me is secondary to patient care...my patient is my priority rather than cleaning up rubbish." (51)

"I didn't feel comfortable to ask the patient [to use their domestic bins] as they were so ill." (46)

Asked the patients if it was agreeable for them to use their home bins (p.304)

"...there is nothing nasty in this pile, so is it ok to put this in your home bin?" (20)

"This is just all plastic and papers, so is it ok if I put this in your bin?" (37)

Clinical Care Provision within the rear of an ambulance or RRV (p.305)

When observing the same clinical practice with similar patient conditions, but taking place in the rear of an ambulance or RRV. (p.305)

"Anything taken and used from inside this ambulance goes in the clinical waste bin. On most ambulances, that's the only place that we can dispose of waste." (26)

"...everything goes into the yellow bag and mixes with sort of blood contamination, vomit contamination, faeces contamination.....it will all get bunged into one bag and disposed of. I think it's ease with a lot of people...yeah I do." (2)

"...it [waste] all goes into a clinical waste bag, which I guess is the issue with the space. We don't even have a domestic waste bag on here [the ambulance]." (65).

"...hang on...we don't carry a black bin liner on here do we? So all our waste is going in that [clinical waste] bin. If I see a bin in the patient's house, I'll put general rubbish in there, but if not, it all goes into the yellow [clinical waste] bin" (49)

Nearly all accepted that they knew that this was inappropriate, but justified their actions through (p.306)

"I know that most of the things that I put in that clinical waste bin, when I'm in the back of the ambulance, aren't actually clinical waste, but there is no other bag available to put it in" (participant 57)

"We don't actually have access on the vehicles to a domestic waste bag. For example, people will quite often stick a tiger bag in the cab and throw the crisp packets, bottles, and things in that. That then ends up in the offensive waste bin, and it won't have a single piece of offensive waste in. It's been in the front of the vehicle. It might have a couple of pairs of gloves in, but that's it. Everything else would be crisp packets that could have gone in a clear or black bag." (10)

"I've never known people to put rubbish in there [designated domestic bin cupboard]. It's probably us just being lazy." (48)

"I think it's all about ease...because that's all you want in your job." (54)

"You've got enough to do without segregating all your rubbish." (49)

Some defended their actions by arguing that black bin liners were not available from the equipment stores on station (p.306)

"They [black bin liners] are kept in the cleaner's cupboard and we don't go in there. " (49)

"I did go and look...but we do not have small domestic waste bin bags or transparent bags on the station. The only ones accessible to us are the clinical waste bags." (52)

"I've never known any black bin bags kept on an ambulance vehicle. You could get them from the cleaner's cupboard if it's left unlocked, but it's not built into the system to regularly have them." (26)

Some later models of ambulances did have cupboards for bins dedicated to general waste and were clearly labelled as such, but they were noted to be in relatively inaccessible locations, or being used for something else (p.307)

"I think on the new ones [vehicles] there is a domestic waste bin, but no one uses it....I don't know why, but that seems to be the way that everyone operates" (60)

"Yes there is a black standard bin liner...or bin receptacle in there for your general waste [on the ambulance]. Normally in the...there is a little...large drawer underneath where all the cannulas are kept...and things like that...but not a lot of people are aware it is there actually (laughs). I think the yellow ones get used for coffee cups and you know...your Costas and your wrappings and stuff." (6)

"To be honest, I forgot about that bin. I knew it was there, but I couldn't be bothered to use it." (26)

"I know where the domestic waste bin is on here [the ambulance], it's, in that drawer but we don't use it...because it's in the drawer. I don't want to get all the way down there to use it." (65)

Why they disposed of their general waste within the clinical waste stream, they simply explained it was due to traditionally taught methods and habitual practice (p.309)

"It's convenience isn't it. If that bin [domestic waste] was right next to that bin [clinical waste] then I think it might make a difference. You'd probably open a packet of something and then think actually that could straight into the normal waste rather than the yellow bin." (48)

When the operational staff were asked if they have had guidance or training on waste segregation (p.310)

"I've never even looked for, or considered any recycling labelling on [consumable] equipment." (31)

"I think I would segregate, because quite frankly, it's not hard. Most of the stuff we have could go in the domestic bin, or be recycled. if the bins were more accessible, you'd probably use it." (54)

"The Trust should provide a bit more awareness of the fact that this stuff is recyclable. And when someone points it out to you...of course that's the case. It's not touched a patient, it's partially sterile...it's been exposed to the outside world but is no more unsanitary than you've bought from the shop and you've had in your bag." (10)

“The recycling labelling on the [consumable] equipment packaging is confusing or non-existent. We would need changes in the labels and some better instruction from the managers on what we can put into recycling and what we can’t.” (33)

“It’s knowing what can go in there, and when to put it in there. You need more guidance. ” (65)

“Sometimes you have to look at the actual packaging as to what is actually recyclable and what’s not. Maybe it comes back to manufacturers to offer better guidance on what can be recycled. But to take the time to have to read something is not going to work. So I think that domestic waste segregation is the best that you’re going to get from us. It just comes down to time pressures. Recycling is the last thing on your mind” (54)

Frequently, phrases that encompassed the fact of being “Time starved”, “space starved” and “patient focused” were given as justification for recycling segregation not to take place (p.311)

“If I’ve got time to think about it...I would do it [recycle], but there are more important things going on with the patient, then I’m not. I get it, but I’m here to do a job, not do rubbish collection. If I had the right bins in there [the ambulance] then I might look at it, but everything we do has to be quick” (49)

“Is there really time to recycle at the point of care? I don’t believe so. I’ve never seen a recycling bin on an ambulance. I don’t think there’s enough room to be honest” (31)

“I don’t think realistically, people would do it [recycle]. The vehicles are quite limited for space” (32)

In an ideal world, yes there is scope for recycling, but when it’s a working job, you just pick up that rubbish and go, so then you are just bagging it up in a clinical waste bag. You would need some time allocated at the end of the job to segregate it safely. (65)

8.1.2 Staff Compliance to waste segregation on base stations (p.313)

When later asked about the facilities, most staff confirmed that any effort to recycle items was heavily influenced by their time available to do so and the accessibility of the available facilities (p.315)

“ I think because the [recycling waste] bins have a lid on, people have to push the foot thing down to open them...and half the time they are broken, so people don’t like using that. Because the general waste bins don’t have a lid on, we just chuck everything in there. (7)

On smaller sized ambulance stations, which did not employ domestic cleaners, it was noted that on several occasions, the recycling bins were used as an overflow for the general waste bins, because no one had emptied and changed the full black bin liner (p.316)

“...people put their cardboard and their tins in the domestic waste bin in the kitchen...because they are too lazy to put it into the recycling bin in the garage area. Our big red recycling bin we have in the garage...and it goes out every Monday...and it’s filled with all our boxes from the stores, plastic bottles and coffee cups etc. (65)

“I think the recycling here [on station] doesn’t get recycled as no one does it right. If you go and have a look in the recycle bins now, you would find tea bags and food bits in them.” (7)

8.1.3 Staff attitudes to recycling at home and at work (p.318)

Despite the majority of operational staff members admitting, during conversations, that they recycle at home and adopt a generally ‘green’ attitude, many did not feel that it was a priority at work, insisting that their work environment provides limited opportunities to recycle during their clinical work. (p.318)

“I would probably recycle, as long as it’s like an easy option to do so, but I probably wouldn’t go above and beyond to recycle something. It is definitely not so important as long as you’ve got something easy and lazy” (6)

“Culturally, we don’t talk about it [recycling] it’s not flagged up, it’s not a KPI [key performance indicator] or anything like that...it’s just not in the culture at all.” (27)

“I’ve a definitely different mindset [to recycling] at work, than I do at home.” (26)

“I do tend to try and make a difference ...but you do feel sometimes that its bit of an uphill struggle at work.” (2)

“I feel that there are a lot of items which are designed with lots of unnecessary packaging to be just thrown away. It is such a waste. I have to admit, I’m not very aware of items that can be recycled at work, and what could be reused...but at home I am.” (32)

“Most of us at home are recycling...we have the means at home. On station, we have a recycling bin and a domestic waste bin, so I just can’t see why we can’t have the same on here [the ambulance]. It just needs the means to do it. (54)

"I only think about it at work, when someone else mentions it, otherwise it's a forgotten activity." (38)

"Carbon reduction does mean a lot, it's quite important to me, but I do lose a lot of that at work. I think at home, I do a lot to try and recycle and try and create less waste, but at work that goes out the window as I don't really feel that the options are there. Sometimes I feel it would be detrimental to patient care." (7)

8.2 Theme 2- Equipment Use - Auspicious and Judicious practice (p.324)

8.2.1 Consumable equipment (p.325)

When participants were asked about their views on judicious equipment use, it was often discussed as a professional and ethical obligation to treat the patient first and foremost, with concerns over costs and items used being non-existent (p.325)

"I'm quite frugal...I don't like opening stuff unless I'm going to use it. If I am going to use it, I am not going to think about how much it costs. There are other people that I've seen that use a lot more equipment unnecessarily. Mind you I am terrible with stocking up on gloves and throwing them away unused." (7)

"We shouldn't be all that concerned about money when it comes to treating our patients. Obviously, I am concerned about saving money for my Trust. Saving money, saving resources...you know...that worries me less than when they talk about patients not receiving their care." (10)

For some, judicious use of equipment was not a consideration because they did not see any direct benefit to potential savings created (p.326)

"We don't actually think about the cost of...the equipment and the drugs we might use on our patient and something you open and don't use...which is just thrown away...and I guess equally we don't see the benefits of saving money either. So when you do save a little bit because you've not panicked and opened up a 100% [oxygen] mask, when you didn't really need it...we don't directly see those benefits." (10)

8.3 Theme 3 - Utility Use - Switching on to better housekeeping (p.332)

8.3.2 Behaviour and attitudes towards energy use (p.333)

On one station, where the duty room had a motion sensor main light, staff preferred not to use it. (p.333)

“The sensor in the crew room, used to be a pain in the arse when we were trying to rest [at night], so we use the little lamp.” (49)

It was observed that all operational staff members were pre-occupied with other station tasks, but the television continued to remain on, with no attempt to turn it off (p.335)

“The tele is always on, but it’s such a busy station that there is always someone there.” (7)

“The remote control button is not working, so it needs to be turned off at the plug, but no one wants to reach down there” (44)

8.4 Theme 4 - Fuel Consumption - Reductions and alternatives (p.337)

The Fiat replacement programme, tended to favour rural ambulance stations, targeting areas where the smaller design better suited narrow lanes (p.339)

“A lot of them are going down to [other counties] because of the smaller, narrower streets...whereas the larger Mercedes vans...aren’t really suitable for going down those narrow ‘biscuit tin lid’ lanes that you see.” (2)

Opportunities to attach to ‘Shoreline’ when parked at an ambulance station were occasionally missed. (p.341)

“My blood sugar levels are more important than plugging the vehicle in for a charge.” (39)

8.4.2 The challenges of meeting response times (p.343)

They would turn around or alter route and drive back in the opposite direction, only to be later stood down and reallocated to the original Category 2 or 3 dispatch. (p.343)

“We seem to be a lot of times...chasing times, for the sake of chasing times. For example, today, we have gone to two category 1 [calls] that were completely inappropriate. We knew they were inappropriate from the second that we read the screen to the time that we got to the patient...and they are not...well they are absolutely fine...and we knew that. And that feels like we are just trying to meet a target.” (10)

8.4.3 Alternative fuel sources as a choice (p.345)

Participants regularly monitored levels and filled the AdBlue tank when necessary, but were not always certain in their knowledge of why they were doing it. (p.345)

“A lot of the newer vehicles have AdBlue, which is an additive that gets put into the engine...and forgive me if I’m wrong...and don’t quote me on this...it crystallises the exhaust emissions and prevents them from going airborne I think. So keeps it at ground level.....but whether that contaminates water courses I don’t know...but I think it sort of adds to the emissions.” (2)

Most participants in discussion were openly willing to trial alternative fueled vehicles, but were unconvinced over their current dependability (p.346)

“Oh definitely I’d be up for trialing one. I can imagine a Tesla ambulance. I can see it now... it would be very nice...but they are already quite a ‘weighty’ thing anyway. I mean they are about five and a half tonnes fully loaded, so with battery cells as well...even with technology moving at the pace it is, with cell technology, I think it would just be such a weight to carry.....and a lack of charge stations and things like that. It might be a bit of a difficulty, and there’s no guarantee that you’re ever going to get back to a certain charge point as well during the day...but it would be something to consider I suppose.” (2)

Some participants also mentioned abandoning cycling to work for safety reasons due to either injuries at work or a commuting accident, or a near miss (p.346)

“I drive. I did used to cycle but then due to a back injury...that put that to bed. We’ve got a cycle track literally from my front door straight to [redacted] station which is great. But I drive now.” (2)

8.5 Theme 5 - Sustainability Education - Knowledge is power! (p.347)

8.5.1 Extent of sustainability education in ambulance curricula (p.348)

A frequent retort tended to be that sustainability had either never been included or had been a very limited focus within their foundational training and education (p.349)

The only time that I ever heard about it in my career [now 14 months as a qualified Paramedic] was at the student paramedic conference in 2015, where someone was talking about sustainability. [This was the actually the researcher].” (27)

“Sustainability? They taught us nothing [in the university] (Participant 54)

“I don’t even think we talked about waste streams at all at Uni. We did in the induction for [redacted – stated Trust] as it was back then...but we didn’t have any at the University at all.” (Participant 10)

“I was a direct entry tech [EMT] and then did my foundation degree qualification through the Open University. I don’t think I’ve had any education from the Trust, unless there is anything at the bottom of emails, but I don’t read those, unless you really need to.” (Participant 65)

“ I can’t recall any education on ambulance sustainability [at University]. I’ve not really had anything at work. It’s quite big in the media though. (Participant 7)

Participants in both Trusts mentioned that they had been issued with a sustainability workbook to complete as part of their SME training (p.350)

“The only mandatory training we get [in sustainability] is...have you seen that mandatory work book thing? There was a lot of stuff in there about recycling and whatnot. But other than that we don’t get much on it.” (54)

“I do a lot of station training, so it is something that I do...deliver the spiel to people to quite a lot. But a lot of people are too busy with other things. We are under a lot of pressure. We are often finishing late so that’s what you think of. You are signing off and straight out the door.” (53)

8.5.2 Eco-Driver training (p.351)

“We did...I think it was the C1 [DVLA qualification]...when we did about Eco-driving...but the course was very much more about speed and control than Eco-driving. (10)

“Driving on emergency conditions...efficient driving is quite far at the back of your mind really. It’s not something you really think about when you are responding.” (10)

8.5.3 Peer influence and Green Champions (p.352)

Others, however, believed that there were personalities within their station complement, who could be highly influential in creating positive sustainability cultures (p.352)

“Having someone on the station and do some little things about it [sustainability] to raise awareness. That would be good, even just as a conversation.” (53)

“I am six years in and quite well known and I’m not shy about speaking my mind on these stations. I can imagine when I was new...that would have been very different. I wouldn’t wanted to kind of...you know...you didn’t want to get your name known too quickly when you are new....but I don’t have any problem now.” (10)

Paramedic Educators (PPEds) and mentors were considered as ideal role models (p.353)

“There used to be a green champion on station on [named station and person] he used to be a green champion I’m talking about five years ago...but I think its just died out. He encouraged us a lot on station to be green, he put signage out and made some notices so people knew what to do. I never heard any negative comments...always had positive comments.” (26)

“Education needs to come from the top down, from government to the organisation to the management then the staff, and it also needs to come from the bottom up, from the young ‘uns.” (65)

8.6 Theme 6 - Communication issues - Getting the message to stick (p.356)

8.6.1 Awareness of the Trusts Green Plan (p.357)

When asked if they would read (the Green Plan) if it were available, some participants said that they would through personal interest, but the majority were disinclined, citing information overload or too busy within their clinical work (p.357)

“No...I’ve not heard about it...only somethings I’ve seen in the media...but it doesn’t ring a bell. Certainly not been brought to my attention. I probably would read it, but it would have to be truncated I suppose, as I imagine it is a pretty big document...as most of these things are. (10)

8.6.2 Observations and perceptions of how management communicate with staff (p.357)

Staff were highly aware of 'passive-aggressive' messages from management about what they should be doing and what they shouldn't be doing (p.359)

"The only thing I've seen about waste, is a back-stabbing message of a kebab box, pinned to the notice board, saying "this isn't clinical waste...we [the OOs] are bored of finding these in the clinical waste!" I don't think that made a difference, because that would just have annoyed people...it wasn't very positive." (7)

"I think that sometimes there is just an anti-corporate view of things. It does feel a bit like you are being told what to do." (10)

Several participants commented on how adopting sustainable practice was problematic due to some geographical areas being distinctly 'militant' stations with a high degree of resistance to change (p.359)

"Some people just don't like to be told what to do." (49)

"Changing behaviour on stations is difficult at 'Militant' stations. The militancy is very much influenced by who the manager is and their style." (34)

"Any awards [won at] ceremonies, just go to HQ, so why should staff bother?" (60)

"Enthusiasm for the job role has definitely been affected by poor working conditions and little recognition of our work. Good will is being withdrawn by the day." (28)