



# *A CRITICAL EVALUATION OF THE NOISE APP*

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Science in Environmental Health

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## Abstract

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*The Noise App (TNA)* is a smartphone application (app) allowing complainants to record and send recordings of nuisance noise directly to subscribing investigators, a service which a number of local authorities (LAs) currently use.

Noise complaints contribute significantly to LA workloads requiring time and resources to investigate, with studies showing complaints are rising whilst LA funding is reducing. This study aims to critically evaluate the use of *TNA* in LA noise complaint investigations. With no existing independent studies into it, identifying current noise trends and the extent to which *TNA* could benefit investigations, LAs could profit from the study's findings.

Using a mixed-method approach, both quantitative and qualitative data was collected through questionnaires to UK LAs as well as an eight-week trial of *TNA* by Moray Council (MC), which also investigated complainant experiences of the app. This was supported by a review of key literature relating to noise complaints, case law, similar apps and case studies. The study found an increase in noise complaints since lockdown measures were introduced in response to the COVID-19 pandemic amongst responding LAs, who reported *TNA* to be an effective triage tool offering additional benefits over 'traditional' investigative methods. Limitations were also identified including contradicting views on the evidential value of *TNA* recordings in formal interventions.

The study concludes that the improved triage capability *TNA* provides could help LAs better deploy finite resources and provide a better customer experience, particularly during the societal issues caused by the ongoing COVID-19 pandemic. The study further concludes that *TNA* would benefit MC and could deliver efficiency savings justifying the cost of subscription.

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## Abbreviations

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BBC – British Broadcasting Corporation

CIEH – Chartered Institute of Environmental Health

COPFS – Crown Office and Procurator Fiscal Service

dB – Decibel

Defra – Department for Environment, Food and Rural Affairs

EPA 1990 – Environmental Protection Act 1990

LA – Local Authority

MC – Moray Council

MCO(s) – Moray Council Officer(s)

NME - Noise monitoring equipment

REHIS – Royal Environmental Health Institute of Scotland

SLMA – Sound level meter app

SM – Survey Monkey

SN – Statutory nuisance

*TNA – The Noise App*



# Chapter 1 – Introduction

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## 1.1 – Background

‘Noise’, defined as unwanted sound, emanates from sources including industry, transportation, construction and domestic activities (World Health Organisation, 1999), chronic exposure to which significantly impacts physical and mental health and wellbeing (European Environment Agency, 2020). Studies link noise to a range of specific health issues including stress, anxiety, depression, impaired cognition, sleep disturbance and increased risk of coronary and cardiometabolic diseases (Clark *et al.*, 2020; Münzel *et al.*, 2018a; Münzel *et al.*, 2018b; Park, 2018). Furthermore, Hänninen *et al.*, 2014 found noise was responsible for 400–1,500 disability adjusted life years per million population in Europe annually, though the authors acknowledge this is likely an underestimate as the study did not consider annoyance or impaired cognition.

Reducing environmental noise is therefore an important public health task, with UK governments transposing the European Noise Directive into domestic legislation, (Scotland’s Environment, 2020), and regulation falling to a number of public bodies including LAs. Noise is the largest area of complaint reported to UK LAs (Chief Medical Officer (CMO), 2017), with investigations utilising complainant diary sheets and noise monitoring carried out by LA officers or noise monitoring equipment (NME) as described within noise management guides published by Defra (2006) and the Scottish Government (2004). This can be time and resource intensive, with the Chartered Institute of Environmental Health (CIEH) (2020a) reporting that LAs allocated 0.2 full-time equivalent professionals to investigate noise complaints per 10,000 population. Furthermore, a Defra report (2012) estimated that individual noise complaints took an average of 3.52-7.05 hours to resolve and could cost LAs £50-£7,430. The impact of these costs is further exacerbated by reduced funding for LAs who UK wide have faced a £16 billion reduction in core funding over the last decade (Local Government Association, 2018) with Scottish LAs seeing Scottish Government revenue funding fall 6% (Davidson, 2019).

## 1.2 – Rationale for study

Introduced in 2015, *TNA* is a smartphone application which records alleged noise disturbance and sends recordings directly to subscribing investigating authorities through “a cloud case

management platform” (Williams, 2018) in real time. This could offer advantages to LAs and help to streamline the investigation process delivering efficiency savings. This study seeks to redress the lack of independent critical evaluation of using *TNA* in LA noise complaint investigations, despite it being used by 108 LAs in England and Wales as of 2020 (RHE Global, 2020). With a statutory duty to investigate noise, those LAs not already utilising it could particularly benefit from this evaluation. Much existing literature comes from *TNA*’s developer RHE Global, including a bold claim that it “replaces the need to use noise meters in almost all noise nuisance cases” (RHE Global, 2020). With no existing independent study to corroborate this, such claims are worthy of investigation and the findings could re-determine LAs’ investment in NME, which incur expense to procure and maintain and are a finite resource in high demand.

Previous studies looking at smartphone sound level meter applications (SLMAs) for noise monitoring purposes have been conducted and will be investigated further in Chapter 2, though none have investigated *TNA* specifically, which is unique in sending recordings of alleged nuisance noise to the appropriate investigating authority and therefore cannot be directly compared to SLMAs. This study will therefore build on those mentioned by evaluating not only the recordings captured by *TNA*, but their *usefulness* to investigating authorities and arising benefits as no studies have evaluated this previously. Nor have any evaluated the benefits of such an app to those experiencing and reporting nuisance noise compared to existing investigative techniques such as diary sheets.

Case studies provided by the app developer show a number of councils and housing associations in England have even successfully used *TNA* as evidence in court. No such data exists for Scotland, most likely as only one Scottish LA used it prior to 2020. A Scottish based study will therefore also be able to evaluate the use of *TNA* in the Scottish legal system. As a Scottish LA that does not currently use *TNA*, Moray Council (MC) would therefore be suitable for this study. Furthermore, whereas figures from Churchill Home Insurance (2018) show that between August 2016 and July 2017 41 noise complaints were made to Scottish LAs per 10,000 people, interrogation of MC figures show that in Moray it was 48 per 10,000 people, above the Scottish average thus further justifying a trial in Moray. The findings of the study will further be used to make recommendations to MC on continued use of *TNA*, which could

be especially pertinent if financial savings can be quantified considering the LA funding difficulties described in **1.1**.

This study also comes at a time where the current COVID-19 pandemic has hampered existing investigative techniques as many LAs including MC are not conducting visits to complainants' properties due to health and safety concerns. This problem is compounded by figures obtained by the BBC (2020) who contacted 103 UK councils to enquire if they had seen a rise in noise complaints, finding that 44 of 51 respondents had seen an increase since the UK went into lockdown, which *TNA* could offer a safe solution to. Furthermore, if useful *TNA* could assist LA Digital Transformation programmes, which seek to develop digital solutions to transform local public services in a range of national programmes including Public Health (Local Government Association, no date). Whilst this study cannot make recommendations to all LAs regarding value for money, which is inherently subjective, a critical evaluation into *TNA* will assist organisations to determine their own view.

### 1.3 – Aim and objectives

The aim of this study is to critically evaluate the use of *TNA* in LA noise complaint investigations.

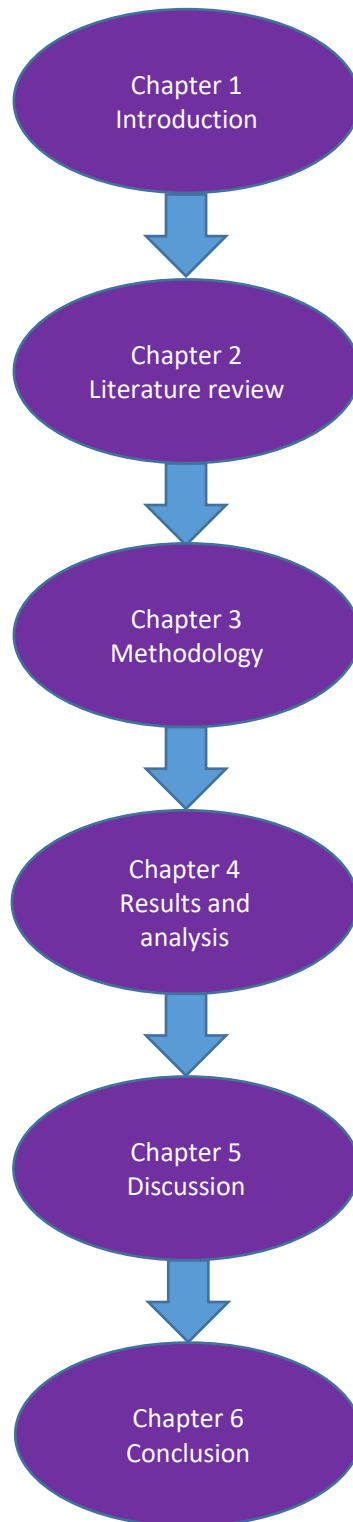
The objectives are as follows:

1. Critically review the law and trends in regards to noise complaints and evaluate current investigative methodology.
2. Evaluate the complainant's experience of *TNA* during investigation into their complaint.
3. Identify and evaluate the benefits of *TNA* in LA noise investigations.
4. Make recommendations on the suitability of *TNA* to Moray Council for use in noise investigations.

### 1.4 – Structure of study

This study is presented in six chapters, as illustrated in *Figure 1* over page:

Figure 1.1 - Structure of study



## Chapter 2 – Literature review

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As previously described no independent evaluation of *TNA* has been previously conducted, though literature is available from the developer. This chapter will therefore initially consider the trends, current investigation methods and case law regarding noise complaints in pursuance of Objective 1. Whilst a range of interventions are available to LAs under other legislation for nuisance noise, for brevity's sake this chapter will focus on statutory nuisance (SN)<sup>1</sup>. Though acknowledged as a limitation, SN is widely used and available to all UK LAs despite varying legal jurisdictions. In regard to all remaining objectives, it will consider studies into similar smartphone apps and developer literature, with review of these key studies allowing for initial evaluation of use of *TNA* in LA noise complaint investigations, and identification of data gaps for the study to pursue.

### 2.1 - Noise trends and cost to LAs

Building on **1.1**, this section will cover noise trends in the UK, assessing the scale of 'the problem' to which *TNA* could be applied which is vital to the study's aim. Figures obtained by Churchill Home Insurance (2018) through a freedom of information request to UK LAs, highlights the large scale of the nuisance noise problem in the UK to which *TNA* could be useful. Achieving an excellent 328 responses, a response rate of 85% allowing generalisations to be drawn (Fincham, 2008), the figures show that between August 2016 and July 2017 LAs received 277,230 SN noise complaints, equivalent to 32 every hour and averaging 845 per LA. Analysis of these figures by the Royal Environmental Health Institute of Scotland (REHIS) (2017) shows 22,403 of these pertained to Scotland. Though likely an underestimate as the figures pertain specifically to SN, which may not capture complaints recorded as tenancy issues or antisocial behaviour investigated under separate legislation, these figures are almost identical to the more recent CIEH noise survey of Wales (2020c) in showing the large volume of noise complaints to LAs.

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<sup>1</sup> SN is defined by Section 79 of the Environmental Protection Act (EPA) 1990, requiring LAs "to take such steps as are reasonably practicable to investigate" "noise emitted from premises so as to be prejudicial to health or a nuisance."

Achieving similarly robust data with a 100% response rate from the 22 Welsh LAs, the survey reported 18,567 noise complaints in Wales for the year 2018/19, an average of 844 per LA and equivalent to 59 complaints per 10,000 population (CIEH, 2020c). The CIEH English Noise Survey (2020b) reported even higher figures with 143 English LAs recording 143,054 noise complaints, an average of 1,000 complaints per LA, equivalent to 61 complaints for every 10,000 population for the same year. Though broadly similar, the differences between England and Wales could be a result of more large urban areas in England, with high population densities tending to have a higher noise complaint rate (CIEH, 2020b; Tong and Kang, 2020), with the English results further prone to response bias with a response rate of only 45%. The noise complaint figures from both CIEH (2020b; 2020c) are presented in *Figure 2.1*, along with the number of notices served and prosecutions undertaken in relation to these, showing that formal interventions are rarely undertaken:

*Figure 2.1 – CIEH Noise survey (2020b; 2020c) data, including interventions*

Country	Total noise complaints	Notices served		Prosecutions	
		Number	As % of overall complaints	Number	As % of overall complaints
England	143,054	2,543	1.8%	101	0.07%
Wales	18,567	446	2.4%	23	0.12%

Though little evidence is available to determine the reasons for such low formal intervention rates, it could be indicative of successful informal approaches, that interventions are taken under different legislation or that LAs struggle to sufficiently evidence nuisance to warrant formal action. Indeed, considering that residential noise, the prevalence of which will be considered in the next paragraph, receives little attention from policy-makers and regulators because it is difficult to “objectively” measure the problem (Weinhold, 2015), anything which assists complainants to do so, such as *TNA*, could be beneficial.

Further to the Churchill figures, the CIEH (2020b; 2020c) surveys provide a sector breakdown of noise complaints received, showing that ‘residential’ noise pertaining to shouting, music, parties DIY etc., was reported most as illustrated in *Figure 2.2* and *Figure 2.3* over page. This is significant as further to the health impacts of noise covered in **1.1**, studies show residential noise, though under-researched, specifically constitutes a source of stress and has been linked to negative health outcomes (Weinhold, 2015). Furthermore, Neimann *et al.* (2006)

also found that the annoyance potential was high, as it consists of high information sounds including language and music, to which humans naturally have their attention drawn.

Figure 3.2 –Noise complaints by sector for England from CIEH noise survey (2020b)

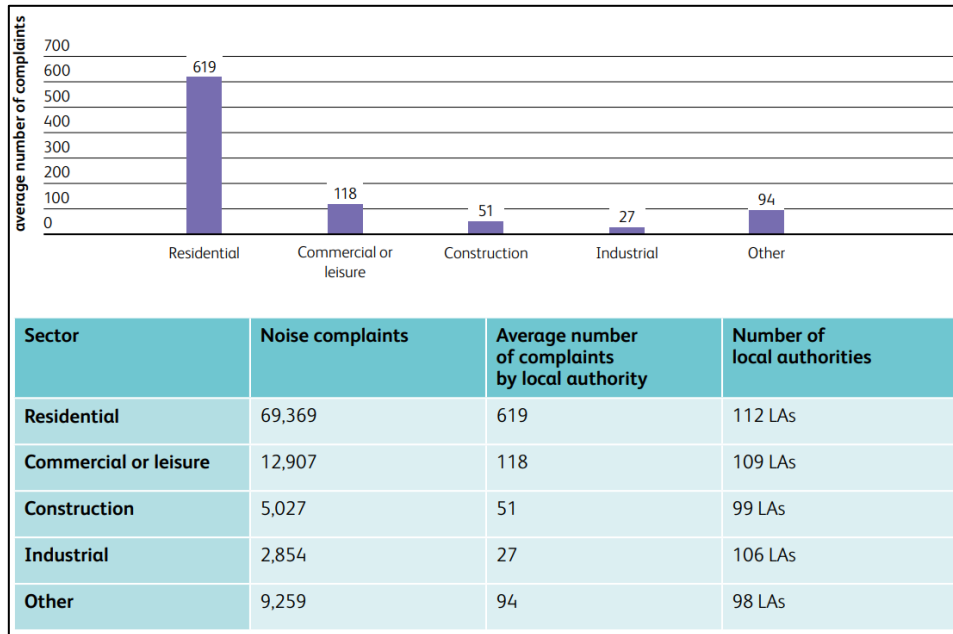
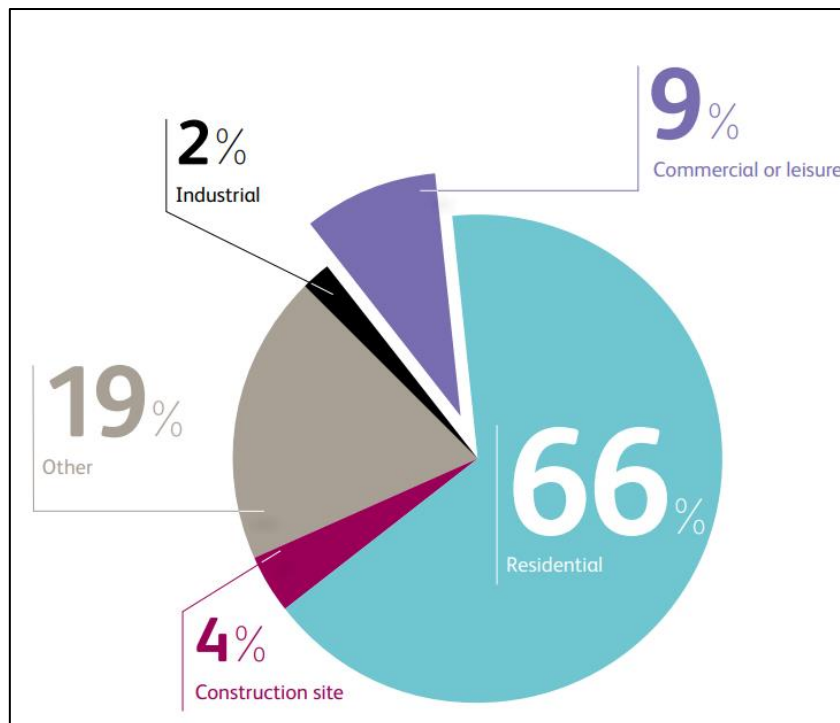


Figure 4.3 – Noise complaints by sector for Wales from CIEH noise survey (2020c)



Though these noise studies are robust, no data on noise complaints by type is available for Scotland, a gap this study will seek to redress. Furthermore, it is historic and does not account for the profound effect on society that the COVID-19 pandemic has had (Holmes *et al*, 2020; Van Bavel *et al*, 2020). Lockdown measures introduced in response are “a complex social phenomenon that provokes different behavioural responses” (Kim *et al.*, 2020), with studies showing increases in both alcohol consumption (Finlay and Gilmore, 2020; Health Europa, 2020) and stress and anxiety (Panchal *et al.*, 2021; Salari *et al.*, 2020) amongst the population. Studies have also shown that anthropogenic noise fell between 20-60% during lockdown as a result of reduced road and air transport and lessening of industrial output noise levels as a result of reduced travel noise (Basu *et al.*, 2021; British Geological Survey, 2020; Cornwell, 2020). Although there is evidence that noise complaints were rising pre-COVID-19, with the CIEH noise surveys (2020b, 2020c) finding a 9% rise in noise complaints compared to 2015/2016 across 65 LAs who participated in both studies, the 240 LAs and housing associations currently subscribed to *TNA* have reported an average 48% rise in noise complaints (RHE Global, 2020). The behavioural and environmental changes arising from COVID-19 are indicative of significant increases of noise complaints to LAs, as corroborated by the BBC (2020), which could result in new emerging noise trends, something this study will seek to explore through Objective 1. Furthermore, anything that could help mitigate the burgeoning workload would be of particular benefit to LAs as per Objectives 3 and 4.

This is especially pertinent considering a Defra commissioned report (2012) found the majority of the time and cost involved with a complaint relates to collecting evidence. Although now dated and utilising modelled data, which limits the depth of analysis provided and can therefore only be used superficially (Kim *et al*, 2017), the report (2012) allowed assessment of the cost of noise complaints to LAs to be made. Notable findings include that the time to deal with complaints ranged from 1.00-134.5 hours, averaging 3.52-7.05 hours and that rural areas had a higher cost than urban ones due to increased size and associated time for travel. Using wage estimates, the report (2012) estimated that the cost of a noise complaint to a LA could range from £50-£7,340 depending on how complicated the scenario was. Despite the limitations of the data used in this report, when applying the Defra averages to the average number of complaints reported by Churchill (2018) and the CIEH (2020b; 2020c) insights into the impact of noise complaints on LAs can be made. The combined 165



LAs would have expended an estimated 568,905-1,139,428 hours on noise complaints, at significant cost. This has particular significance considering the impact of COVID-19 on LA funding, which had already been reducing as discussed in 1.1. Prior to the increase in COVID-19 cases seen over the winter of 2020/21, Grant Thornton LLP UK (2020) found that some councils in England would need to make “large scale reductions” in services to set budgets covering funding shortfalls of £bns. Indeed, Croydon Council has already issued Section 114 notices, declaring effective bankruptcy, and 12 other LAs are considering similar action (Peters, 2021). Therefore, if TNA delivers greater efficiency to LA noise investigations through streamlining the evidence gathering process significant savings could be realised, helping mitigate the current financial challenges.

## 2.2 - Noise investigation and case law

This section will briefly evaluate current investigative techniques and consider the impact of case law on the use of TNA. As seen in 2.1, noise reported as SN constitutes the significant majority of cases. Whilst investigations may vary by organisation, they usually utilise the methods described in 1.1. Using nuisance diaries appears to be common practice and they are referenced on multiple LA websites, an example of which can be seen in Appendix C.

Whilst they can be useful as evidence in proving a SN, they may not provide sufficient evidence on their own as they can be discredited through claims of inaccuracy or exaggeration and do not identify the noise source (Defra, 2006). They are therefore best used for screening complaints as illustrated by *Figure 2.4*:

*Figure 5.4 – Usefulness of diary sheets from Defra noise management guide (2006)*

<p>4.2.3.8</p> <ul style="list-style-type: none"><li>• it is worthwhile programming visits to maximise the probability of witnessing the noise;</li><li>• it is likely that environmental health staff will ever witness the noise;</li><li>• the diary sheets could corroborate evidence from enforcement officers or other witnesses that the noise they have witnessed as a nuisance occurs frequently and/or for an extended period of time; and</li><li>• the noise is due to unreasonable behaviour or poor sound insulation.</li></ul>	<p>The main usefulness of diary sheets therefore lies in providing information to the enforcement officer so that judgements can be made on whether:</p>
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Usually filled out over a course of weeks, diary sheets are subject to time delays. Similarly, the officer attendance prescribed in *Figure 2.4* to ‘witness’ the noise may incur fluctuating waiting times and has been hampered by the ongoing COVID-19 pandemic restrictions. Lockdown has prevented access to properties with many LAs unable to conduct internal site visits to undertake observations or to install NME. Furthermore, such visits may not always be suitable for evidence as shown by the case of *Southampton City Council v Odysseas (OP Co) Ltd* [2017] EWHC 2783 (Admin), where an appeal against legal action taken by the LA was upheld. Whilst key to the failure was the limited investigation conducted, the LA’s evidence would have been more credible if proper scientific assessment, involving taking and analysing recordings, had been undertaken (Horrocks and Pointing, 2018). This case has parallels with a domestic case, where a homeowner successfully challenged an abatement notice served by Westminster Council. As reported by *Environmental Health News* (2018), the appellant called an Acoustic Consultant as an expert witness who argued LAs should take advantage of technology and use NME to help them “present noise evidence that could prove or disprove an allegation.” Furthermore, whilst the judge acknowledged it is not a requirement under the EPA 1990, he commented:

*Common sense would dictate if you have the technology to help you then why not use it? That’s somewhat at odds with our scientific world.*

These cases raise the question on whether NME, which can be used by LAs to investigate/evidence noise complaints, should be used routinely across noise complaints (Coyne, 2018), with the judges in both cases advocating a more scientific approach. Given the volume of complaints discussed in **2.1**, routine use of NME is unrealistic as the high demand for what are likely to be a finite resource, owing to the expense to procure and maintain them, will result in lengthy waiting times for complainants. NME comes in a range of models from nuisance noise recorders that obtain recordings of the alleged noise, through to fully calibrated sound level meters capable of accurate noise measurements. Whilst accuracy is beneficial, it is not necessarily required to evidence SN cases as illustrated by the case of *R (London Borough of Hackney) v Moshe Rottenberg* (2007). The Divisional Court confirmed that there is “no prescribed standard of what is and is not a permissible level of noise from neighbouring property” (Wolf and Stanley, 2014). In dismissing the LA’s case,

which relied on officer witness evidence, the judge ruled that whether the noise was a SN was not for an expert, however experienced, to decide but a subjective decision for the Court based on the evidence presented (Hardwicke, 2007). Indeed, courts may not always understand such readings, as illustrated by the judge in the case of *Dennis & Anor v Ministry of Defence* [2003] EWHC 793 (QB) (2003) in *Figure 2.5*.

*Figure 6.5 – Legal views on dBs*

16. Griffiths J, as he then was, observed in *Dunton v. Dover District Council* [1977] QB 87 that references to decibels are not helpful unless compared with everyday sounds to which we can all relate.

Case law would suggest therefore that SN noise investigations, which as identified in **2.1** accounts for a significant proportion of noise complaints to LAs, should use technology where possible, and with no specific permissible sound levels, recordings from mobile phones without sound level measurements such as through *TNA* should be permissible as evidence in such cases.

### 2.3 – Sound level meter apps (SLMAs) and smartphones

This section will consider SLMAs and the smartphones needed to use them. Although different to *TNA*, which is unique in taking and sending recordings directly to LAs, both rely on smartphone microphones. Though no studies have assessed the accuracy of *TNA* specifically, studies show smartphone microphones are the primary limitation to measurement capabilities (Robinson and Tingay, 2014).

Further key studies highlight that accuracy of measurements taken by SLMAs varied by specific app, smartphone operating system and age (Kardous and Shaw, 2014; Murphy and King, 2015; Odenwald, 2020). Furthermore, they struggle to accurately detect and measure low frequency<sup>2</sup> and low level noise (Sakagami *et al.*, 2019a; Sakagami *et al.*, 2019b), and even when calibrated were inaccurate and overestimated ambient noise levels < 50dB (Serpanos *et al.*, 2018). Though these limitations have implications for the application of *TNA*, given the nature and predominance of residential noise discussed in **2.1**, which usually consists of high

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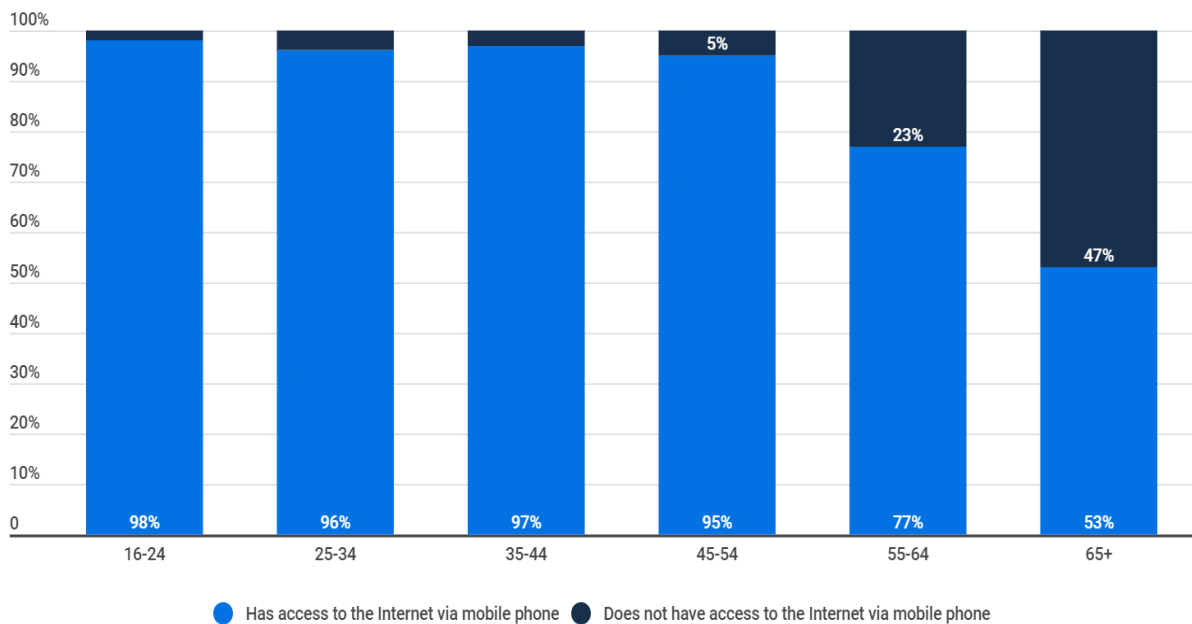
<sup>2</sup> Considered as the frequency range of circa 10Hz to 200Hz, low frequency noise has been found to cause extreme distress to the estimated 2.5% of population sensitive to it (Leventhall, 2004).

level noise not always associated with low frequency, it should be capable of detecting the majority of noise complained about.

Though SLMAs have limitations, studies have found they are generally capable of achieving a reasonable degree of accuracy. Murphy and King (2015) found that SLMAs on phones <6 months old had “an average differential from reference noise levels of only 0.15 dB(A)” compared to those more than two years old at 2.76 dB(A). Similarly, Ibeke *et al.* (2016) found SLMAs showed equivalent values to a sound level meter (SLM) with a maximum difference of 3dB and therefore, as McLennon *et al.* (2019) similarly found, although SLMAs may not be suitable for accurate determination of sound levels they were accurate enough to be suitable as screening tools, which could greatly assist LAs. Furthermore, considering the predominance of SN complaints in **2.1**, the establishment of which is subjective and does not require sound levels as per **2.2**, recordings taken through *TNA* may have use beyond triage for enforcement purposes, which is supported by developer literature to be discussed in **2.4**.

A further advantage of apps, including *TNA*, is that they are often free to users and, with figures showing that in 2020 84% of UK adults owned a smartphone capable of running them (Boyle, 2020), are accessible to most of the population. That said, for *TNA* to send recordings directly to LAs requires that the smartphone also has access to the internet, with *Figure 2.6* over page illustrating that whilst most of the population have this facility, older age groups may not have the technology to utilise *TNA*. Unfortunately no literature could be found providing age data relating to complainants which would have allowed better assessment of the scale of this limitation, a data gap the study will seek to redress.

Figure 7.6 – Smartphone internet access by age (Boyle, 2020)



Furthermore, the Lloyds Bank UK Consumer Digital Index (2020) shows 11.9m (22% of the population) lack the digital skills needed for everyday life, though digital literacy is rising. These studies show that a significant proportion of the population may lack the technology and skills to use *TNA* effectively and therefore it will not be appropriate for use in all noise cases. That said, it would appear to be simple and beneficial tool for the majority of potential complainants, whose experiences will be evaluated during this study as none have previously done so.

## 2.4 – Developer case studies

This section will review case studies provided by the developer, which indicate *TNA* may offer a number of benefits to subscribing organisations including triage and advantages over NME. These studies show that despite the limitations of smartphones as a monitoring platform (2.3), and although there have been cases where the defence has challenged *TNA* recordings, they have been used successfully in court for a wide range of cases, a brief summary of which follows in *Figure 2.7* over page.

Figure 8.7 – Environmental Health News (2018) article excerpt

**Q:** **Can its data be used in court?**  
**A:** Yes. Our clients have successfully prosecuted several court cases using data captured by The Noise App and we have published case studies.  
We believe that there have been more than 50 cases using the app so far. Data collected by the app has been used in cases ranging from enforcing noise abatement and community protection notices through to High Court injunctions leading to jail terms for the perpetrators. It has even been used in tenancy repossessions and anti-social behaviour cases.

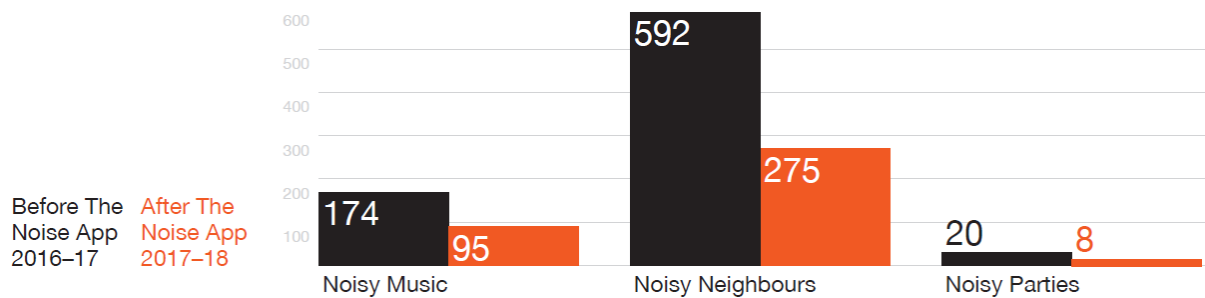
Other case studies provided by the developer detail individual successes described above, including a housing association who set *TNA* up in court and played recordings through a Bluetooth speaker, resulting in a successful conviction where the judge praised use of *TNA* in his summing up. Further to its application for enforcement purposes, one LA reported *TNA* offered “significant benefits in terms of customer service” and helped “prioritise complaints”, “focus efforts” and “enhance enforcement activities” (RHE Global). Similarly, another LA found it “brought immediate benefits”, with “the best thing it has done is triage” and allowed them to reduce their number of NME devices from three to one, resulting in a “cashable saving of three to four thousand pounds”. Similarly, 79% of subscribing organisations had experienced a reduction in the need for traditional NME (Williams, 2018). One LA has also “successfully used *TNA* in court as evidence to support breach of an abatement notice” (RHE Global). Further benefits identified included advantages over diary sheets and improvements to NME waiting times as shown in *Figure 2.8*:

Figure 9.8 – Selected quotes from RHE (2020) case studies

“We incorporated The Noise App into our normal noise investigation procedures as an alternative to paper based record sheets. Unlike paper record sheets, with The Noise App we know the precise time the records are made, where they’re sent from and have a brief recording to demonstrate the character of the noise.”	“The waiting list on noise monitoring equipment has decreased from 12–13 weeks to no more than 2 weeks within 6 months of introducing The Noise App at Derby Homes. By residents establishing cases through The Noise App the investigating officers at Derby Homes have been able to make a quick and well informed decision on how to pursue the noise investigation case.”
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A further advantage reported by a housing association was a significant reduction in the number of noise complaints received since subscribing to *TNA* as shown in *Figure 2.9*:

Figure 10.9 – Housing association noise nuisance figures before and after subscription (RHE Global)



Without further detail the data provided is not clear enough to determine the reasons for this significant drop. It could be indicative of *TNA* having a deterrence effect, as people are reluctant to have wrongdoing evidenced, though the effectiveness of detection as a deterrent is contested by studies (Grigg *et al*, 2018; Overbye 2016). Though this literature infers a number of advantages of *TNA* assisting in this study’s aim, it is provided by the developer and therefore prone to author bias and omission of facts (Kaisler and O’Connor, 2021). Further impartial investigation into *TNA* is therefore required to achieve a more critical evaluation.

## 2.4 – Summary

This chapter reviewed the law and trends relating to nuisance noise, finding noise complaints contribute significantly to LAs’ workloads at considerable expense and can be difficult to investigate and robustly evidence, in support of Objective 1. Reviewing literature pertaining to similar apps as well as developer literature on *TNA* has identified a number of advantages and limitations in terms of complainants and subscribing organisations assisting Objectives 2, 3 and 4. Data gaps for the study to pursue in support for the study’s aim have also been identified, the methods used to investigate which will now be discussed in Chapter 3.

## Chapter 3 – Methods

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### 3.1 - Introduction

This chapter will provide detailed explanation of and justification for the mixed-method research design devised for this study to critically evaluate *TNA*. A range of research methods and instruments were used to pursue the study's aim objectives identified in Chapter 1. Ethical considerations, sampling strategy, data collection and analysis will also be discussed.

### 3.2 – Rationale for mixed-method research design

A mixed-method approach was used for this study, utilising both qualitative and quantitative means to collect and analyse data (Creswell and Tashakkori, 2007). Bringing quantitative and qualitative research together can offer insights that otherwise might not be gleaned (Bryman, 2007) and “improves the validity and reliability of research or evaluation of findings” (Golafshani, 2003). Amongst eight key benefits, including “offsetting weaknesses and providing stronger inferences” and “answering different research questions”, Doyle *et al.* (2009) further identified “triangulation” as a key rationale for mixed-method design, which provides a wider evidence base (Baker, 2001) and additional validation and confidence in findings (Gamm *et al.*, 1998).

To achieve triangulation the study collected quantitative data regarding noise trends and use of *TNA*, which can be easily analysed to find patterns and generalise results to wider populations (Bhandari, 2020). This was supplemented with qualitative data on the expressions and experiences of real life people using *TNA* in real life situations, to better understand participants' feelings, opinions, and experiences (De Vaus, 2014; Eyisi, 2016; Leedy and Ormrod, 2014; Rahman, 2016). Verification between both data types collected will achieve methodological triangulation and a more comprehensive approach (Morse, 1991). Furthermore, it will allow for ‘complementarity’, allowing for elaboration, enhancement, illustration and clarification between results from one method and another (Greene *et al.*, 1989), in pursuance of the study's aim.

Although the integration of qualitative and quantitative methods continues to be much debated (Östlund *et al.*, 2010), such an approach has been recognised as the third major research approach (Johnson, *et al.*, 2007) and has acquired especially strong support in the



field of evaluation research (Tashakkori and Teddlie, 2003) and is therefore deemed most appropriate for this evaluative study.

### 3.3 – Ethical considerations

Following review of the proposed study, which described research methods and included documentation such as participant information and permission forms and questionnaires (Appendixes A.1-A.4), the University of Derby's Ethics Committee granted ethical approval. Permission to conduct the trial and use data pertaining to Moray was granted by MC (Appendix A.10).

### 3.4 – Research methods

The study comprised two elements: a survey to LAs to investigate noise trends, existing investigative techniques and use of *TNA*; and the MC trial of *TNA* which assessed the operational experiences of complainants and officers.

#### 3.4.1 – Secondary data

A range of key peer reviewed studies, journals, literature and government legislation were critically reviewed in Chapter 2, allowing for initial evaluation of *TNA* and identification of data gaps to pursue in line with the study's objectives. Data from this literature is compared to the study's findings in Chapter 5. Figures and officer observations from previous noise complaints held on MC systems were used to compare trends within Moray to the rest of the UK.

#### 3.4.2 – Primary data collection

The study collected a range of data. A questionnaire based survey of UK LAs was conducted, supplemented by follow up interviews where both possible with the respondent and beneficial to the study. Data from the MC trial of *TNA* was recorded on MC systems with officer observations captured in weekly meetings and views of complainants captured through use of a separate questionnaire.

#### *Questionnaires*

Though studies show that face-to-face interviews illicit the highest response rates (Han *et al.*, 2019), such an approach in this study would not have been suitable due to the geographic

distribution of respondents and the COVID-19 pandemic. The questionnaire to complainants was therefore conducted over the telephone as evidence suggests phone surveys have the highest response rates compared to postal and online surveys (Sinclair *et al.*, 2012), with response rates significantly higher when a personalised approach was taken (Heerwegh *et al.*, 2003), as in this case. The author transcribed participant responses on digital copies of the questionnaires.

Similarly, although studies show that telephone based surveys gain a higher response than online surveys (Fricker *et al.*, 2005; Han *et al.*, 2019; Szolnoki and Hoffmann, 2013) and higher response quality allowing the opportunity to probe deeper into issues (Block and Erskine, 2012), contacting 368 LAs in this way would have been too time consuming. A separate questionnaire was therefore emailed to LAs incorporating multimode response, comprising of a hardcopy of the questionnaire and Survey Monkey (SM) link, which has been shown to achieve responses of up to 70% (Yun and Trumbo, 2000). A reminder email was also sent as this has been shown to increase response rates (Glidewell *et al.*, 2012; O’Leary, 2017). Furthermore, as some of the information could be considered sensitive, using SM allowed respondents to reply anonymously which can lead to higher response rates and promote greater disclosure (Murdoch *et al.*, 2014). SM was chosen as it “is the most popular and versatile online questionnaire and survey tool” (Bell and Waters, 2014). Where hard copies were received the data was manually inputted into SM. Follow up interviews were conducted informally over the phone with the author noting responses in a Microsoft word document.

Although financial incentives have been shown to increase response rates (Glas *et al.*, 2017), as respondents were either professionals working in the same field or complainants being dealt with professionally such an approach was deemed inappropriate and indeed no funding was available. Therefore, whilst the validity of questionnaire based surveys depends on response rates, which is often low especially when respondents do not know the researcher (Patten, 1998), they were utilised for this study as they allowed timely gathering of large amounts of information from a large population (Jones *et al.*, 2013). This approach is further justified as this was a large project with a number of objectives as per Chapter 1 and subject to time restrictions (Bell, 2005; Silverman, 2004).

### *Interviews*

LA respondents were invited to participate in a semi-structured phone interview based on the questionnaire with the author noting responses. Many respondents declined to participate and due to time constrictions it was only possible to speak to five respondents, who were selected as their questionnaire responses identified them as beneficial to the study. The Crown Office and Procurator Fiscal Service (COPFS) was also approached for such an interview as per Appendix A.8 to assist Objective 3. A semi-structured format was chosen which allows greater depth of information to be collected and the opportunity to discover the respondents' experience (Blee and Taylor, 2002).

### *Other methods*

An eight week trial of *TNA* was conducted between 19 October 2020 to 14 December 2020, provided free of charge by the developer. During this time all noise complainants were offered *TNA* as part of the investigation process. Progress of the trial and observations were recorded through minuted weekly online meetings between officers involved in the trial. Data on complaints figures received during MCs trial of *TNA* was also collected, including the distance of the complainant's address from MC headquarters and drive time as estimated by Google Maps, as any reduction of these could lead to significant efficiency savings, integral to Objectives 3 and 4.

## 3.5 - Sampling strategy

The questionnaire in Appendix A.6 was emailed to all LAs within England, Scotland and Wales who have a statutory duty to investigate noise. No LAs in Northern Ireland are known to use *TNA* therefore they were not contacted. Within England this encompassed the 36 Metropolitan district councils, 32 London borough councils, 55 unitary authorities and 192 district councils listed on the UK Government (2019) website. With no responsibility for noise complaints, the 26 County Councils were not contacted resulting in the survey being emailed to a total of 315 enforcing LAs in England. Within Scotland, the survey was emailed to 31 of the 32 Scottish local authorities as per the Convention of Scottish Local Authorities (COSLA) (2020) website. The exception was MC where the project author is currently employed. All 22 Welsh local authorities listed on the Welsh Local Government Association (WLGA) (2020) were emailed, bringing the sample size to a total of 368.

Each LA was researched to obtain an email address. Where available the preference was to send them direct to environmental health (EH) teams, as this team would usually be responsible for undertaking noise investigations. Though other departments may have responsibility for noise, it would have been too time consuming to email multiple departments. Where no departmental email address was available the generic LA customer service email was used and marked for attention of the EH team. Where no email address was available a contact form was filled in asking for an appropriate point of contact. Once established, the covering email in Appendix A.5 was sent, with a hardcopy and link to the online SM version of the questionnaire, from the author's works email address. The complainant study consisted of individuals who contacted MC regarding nuisance noise during the eight-week trial period of *TNA*. The number in this sample was therefore impossible to predetermine, though MC noise complaint figures for 2017-2019 show an average of 34 complaints per month suggesting a potential sample size of 68.

### 3.6 – Instrument design

For the purposes of this study two separate questionnaires were prepared, around which semi-structured interviews were conducted as appropriate. An email was also sent to COPFs setting out topics for a further semi-structured interview.

#### *Questionnaires*

Both questionnaires were text based and combined open and closed questions for brevity's sake as studies (Deutskens *et al.*, 2004) found this approach elicited the highest response rate. The inclusion of open questions allowed for a better understanding of the respondents' true feelings and attitudes (Cleave, 2017), especially important in this instance as user experience is inherently subjective. The complainant questionnaire in Appendix A.3 consists of 11 questions, the first four of which enquired into demographics (to assess complainant age to see if they were predominantly older and therefore more likely to not have the technology and digital skills to use *TNA* as identified in *Figure 2.6*), type of phone and the nature of the noise being complained about to see if any trends emerged and what bearing these would have on the study's aim. The remaining questions focused on the complainants use, experiences and opinions of *TNA* in pursuance of Objective 2.

The questionnaire to LAs in Appendix A.6 encompassed ten questions, the first four of which established the country the respondent was located within and investigated noise trends in terms of sector, occurrence and impact of COVID-19 to establish triangulation and fill gaps with existing data reviewed in Chapter 2 to assist Objective 1. Understanding noise complaint trends is integral to evaluating the extent to which *TNA* could be used by LAs and allow determinations on Objectives 3 and 4. Question five pertained specifically to whether the respondent used *TNA* and where they did not they were asked to conclude the survey and answering questions was not mandatory to progress through the survey. Although such skip questions can amplify data quality problems, especially in regards to question nonresponse and response errors (Manski and Molinari, 2008), this approach was utilised as it can help achieve higher completion rates and more relevant results allowing more accurate analysis (Cleave, 2016). The remaining questions focused on how respondents utilising *TNA* used it, any enforcement successes and the perceived benefits of it to their organisation allowing them to leave contact details if they were willing to participate in a follow up interview in pursuance of Objectives 3 and 4.

#### *Interviews*

Follow up interviews were conducted around the questionnaire to expand on the response provided in the survey. This also allowed for respondent validation to assess the results' credibility and check for accuracy and resonance with respondents' experiences (Birt *et al.*, 2016).

### 3.8 – Data Analysis

Though far from perfect and at risk of producing serious distortions and misleading conclusions (Robinson, no date), quantitative data was subjected to simple descriptive statistical analysis using Microsoft excel. This allowed the data to be summarized to uncover trends (Glen, 2014), giving meaning to the numbers (Ali and Bhaskar, 2016). From this percentages could be derived which are convenient for allowing comparisons to be made (Parker, 2009) and for understanding patterns within the data (Test Science, 2020). Summarising the data thus allowed for charts to be created to present the numerous figures visually and illustrate the relationships within (Slutsky, 2014).

The large amount of quantitative data collected from questionnaires, interviews and officer meetings was subjected to thematic analysis using manual inductive coding and indexed using a spreadsheet to identify and report any patterns within the data. The codes derived from this are presented in a hierarchical coding frame in *Figure 3.2* on page 24. Procedures were established to prevent definitional drift and though more time consuming than deductive coding, this approach allowed for more complete, unbiased and insightful analysis of data (Braun and Clarke, 2006; Medelyan, 2020).

Where presented in Chapter 4, this data has been supplemented by key quotations from selected LAs, complainants and MC Officers using a random designation, to maintain anonymity, as per *Figure 3.1*. Due to the volume raw data collected the most significant quotations have been chosen as it is beyond the scope of the study to present all of it. Analysis of all collected data will allow determinations on the study’s aim and objectives to be made.

*Figure 11.1 – Qualitative data designators*

Examples:	[Scottish local authority][random numeric designation 24] = S24 [Welsh local authority][random numeric designation 3] = W3
Other designators:	C = complainant MCO = Moray Council Officer

### 3.9 - Initial limitations of study

The main limitation of the study is likely to be the participation rate, limited by the research methods and instrument design as previously discussed. Much debated, although there is no established acceptable minimum response rate (Lindemann, 2019) higher response rates are always preferable (Pandya, 2019). Though difficult to predict, the average response rate to email surveys has fallen since the 1980s and average a rate of 25%-30% (Fincham, 2008), an estimated 11% lower than other survey modes (Yan and Fan, 2010). Furthermore, Baruch and Holtom (2008) analysed the responses of over 100,000 organisations to 1,607 studies, finding the average response rate to be 35.7%. Although a response rate under 51% is

considered inadequate (Pinsonneault and Kraemer, 1993), considering the aforementioned and the impact of the pandemic, a response rate of 30% is likely which has also been shown to be the average for email surveys (Lindemann, 2019). This will leave the study open to non-response bias and an unrepresentative sample thus negatively impacting the generalisability of the study's findings (Johnson and Wislar, 2012). So would low complainant participation, which is equally difficult to predict, though it is hoped that despite the weaknesses of both methods sufficient data will be collected between them to complement each other and the existing literature discussed in Chapter 2, ensuring no data gaps through triangulation to meet the study's aim. Whilst in the event of low response rates the study sample could have been weighted to produce approximately unbiased estimates, though generally beneficial, this would inevitably be imperfect and so further study would be necessary (Brick and Kalton, 1996).

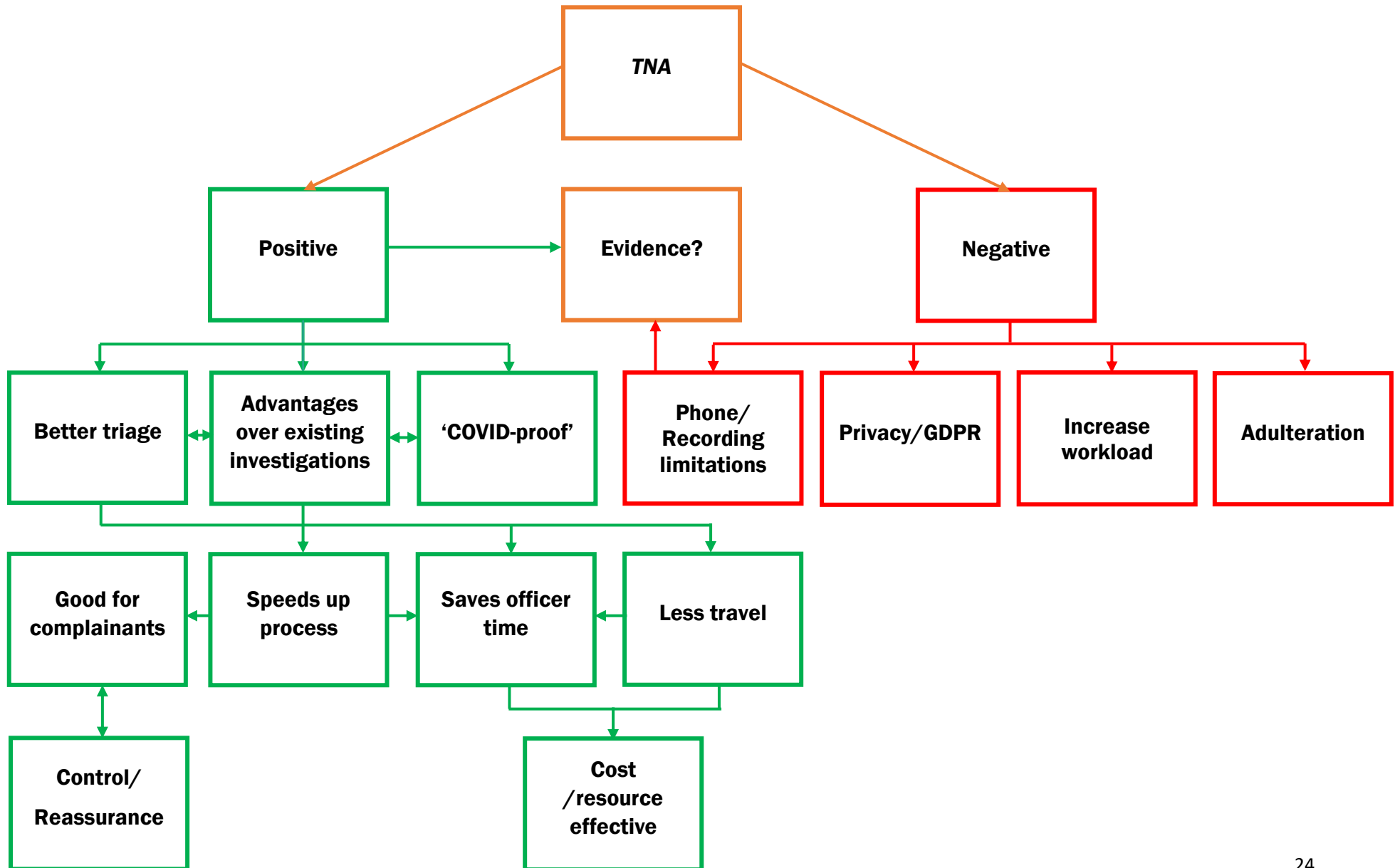
Furthermore, the study will not contact Housing Associations, some of whom use *TNA*. Whilst this could provide further data to support the study's aim, it would be unrealistic to contact the roughly 1,800 housing associations registered in the UK. In addition, they do not investigate the wide range of noise complaints that LAs do. It had also been hoped to assess the accuracy of *TNA* by taking recordings in a range of environments using different phone brands using a sound level meter (SLM) as a reference point. This could have provided data on the accuracy of recordings supporting Objective 3, though this was not possible as the only SLM the author had access to was being used for an investigation and as discussed in Chapter 2 accuracy of recordings would likely have varied by device.

### 3.10 – Summary

This chapter has detailed the research methods and instruments utilised to ensure sufficient data was collected to allow determinations to be made on the study's aim and objectives.

This data will now be reported in Chapter 4.

Figure 12.2 – Coding of TNA use





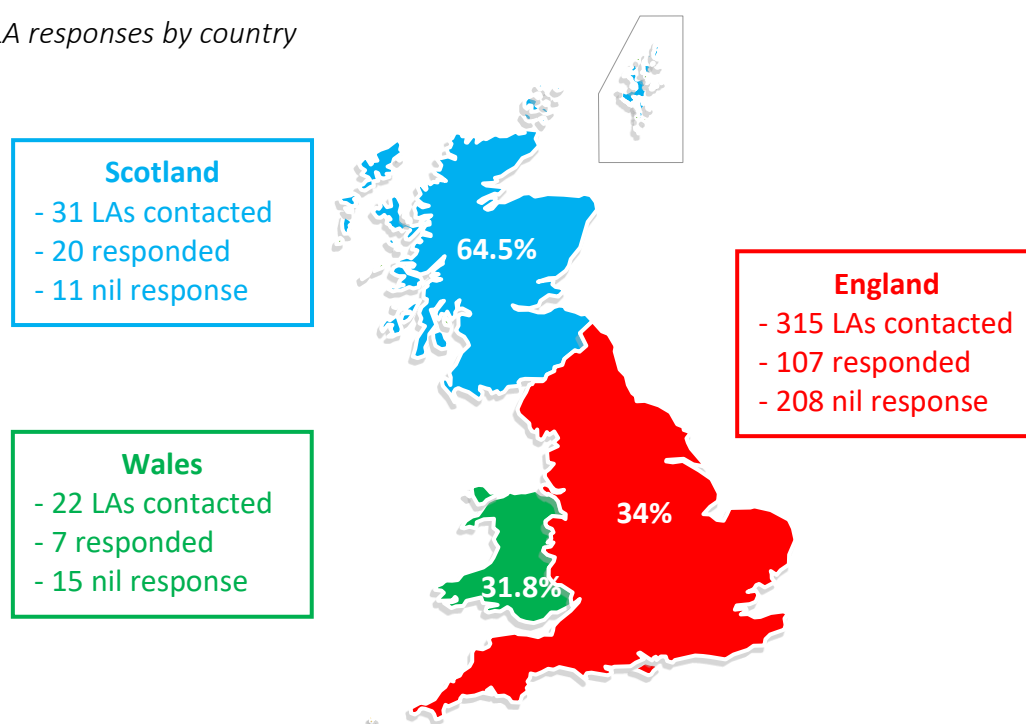
## Chapter 4: Results and analysis

Analysis and presentation of the results from this study are presented in this chapter. Findings are grouped and reported pertaining to the Objectives identified in Chapter 1 in pursuance of the study's aim.

### 4.1 – Dataset, cleansing and presentation

The study collected data through the MC trial, including complainant questionnaire, and the questionnaire to mainland UK LAs. At the end of collection there were three responses to the complainant questionnaire and 134 responses to the LA questionnaire, the rate of which varied by country as illustrated by *Figure 4.1*. Whilst responses to closed questions were generally all completed by respondents, the quality of responses to open questions varied. Therefore irrelevant responses, including single word answers and unanswered questions, were manually removed to improve the reliability and value of the qualitative data (Mahmutovic, 2021). The data collected is presented under the objective which it relates to.

*Figure 13.1 – LA responses by country*



If a response rate of 30% is acceptable (Sekaran and Bougie, 2010) as was the case for England and Wales, but 60% should be the goal of researchers (Fincham, 2008) as per the Scottish

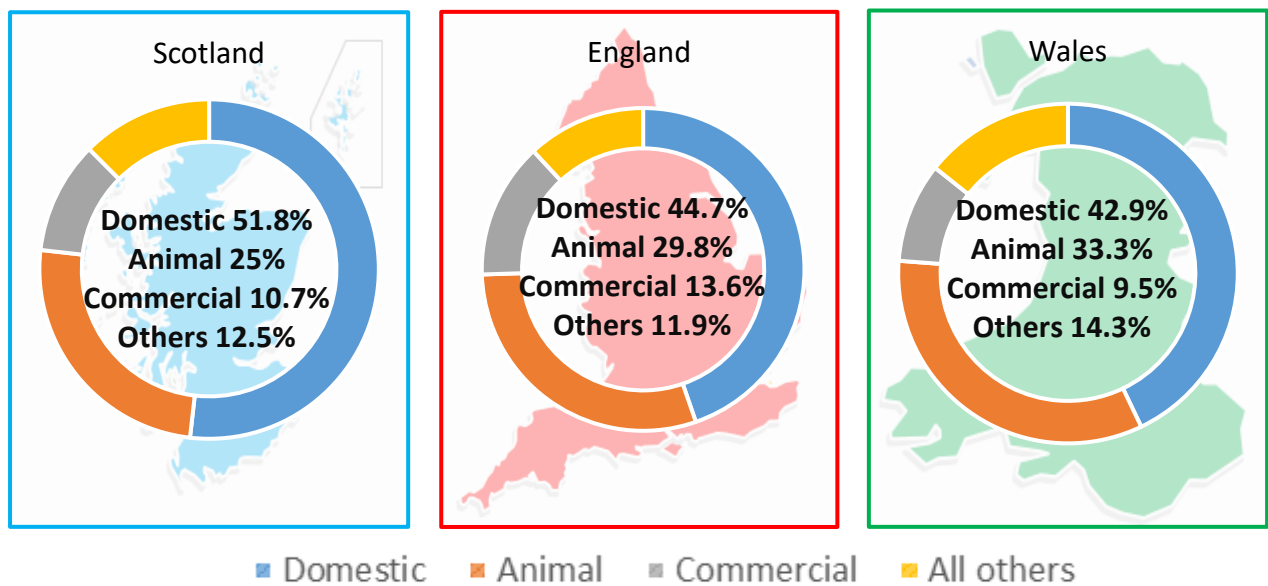
results, then reporting results separately by country will allow for comparison of trends and similarity in an attempt to validate between them.

## 4.2 Objective 1: Results

### 4.2.1 – LA questionnaire noise trends

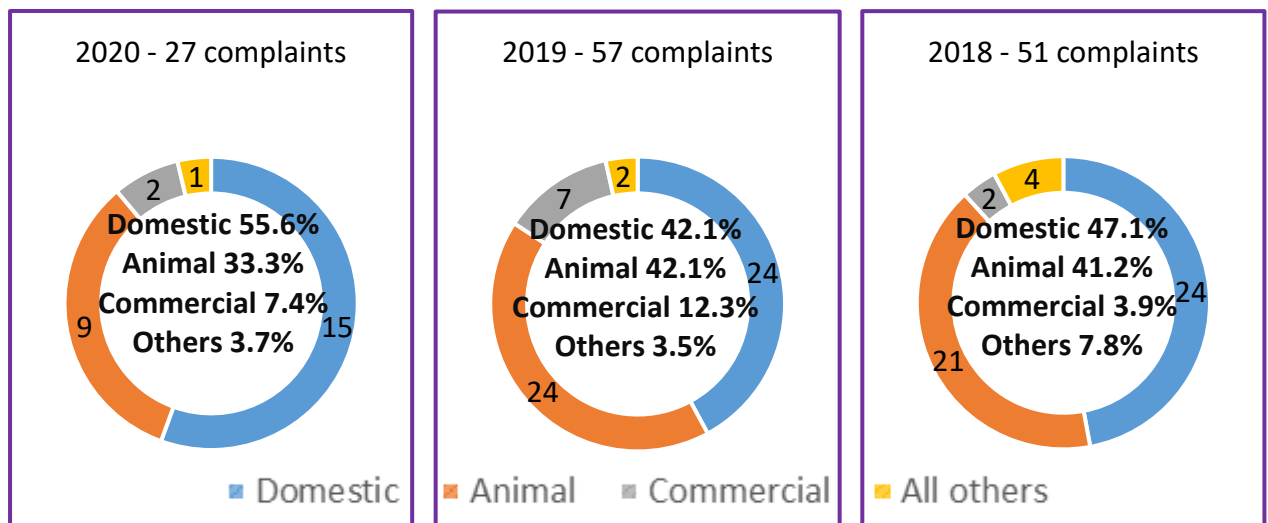
Figure 4.2 shows that the top three types of noise were identical across all three countries and accounted over 85% of total noise complaints:

Figure 14.2 – Most frequent noise complaints received by type



The type of noise reported during the MC trial also followed the trends found within the rest of the UK:

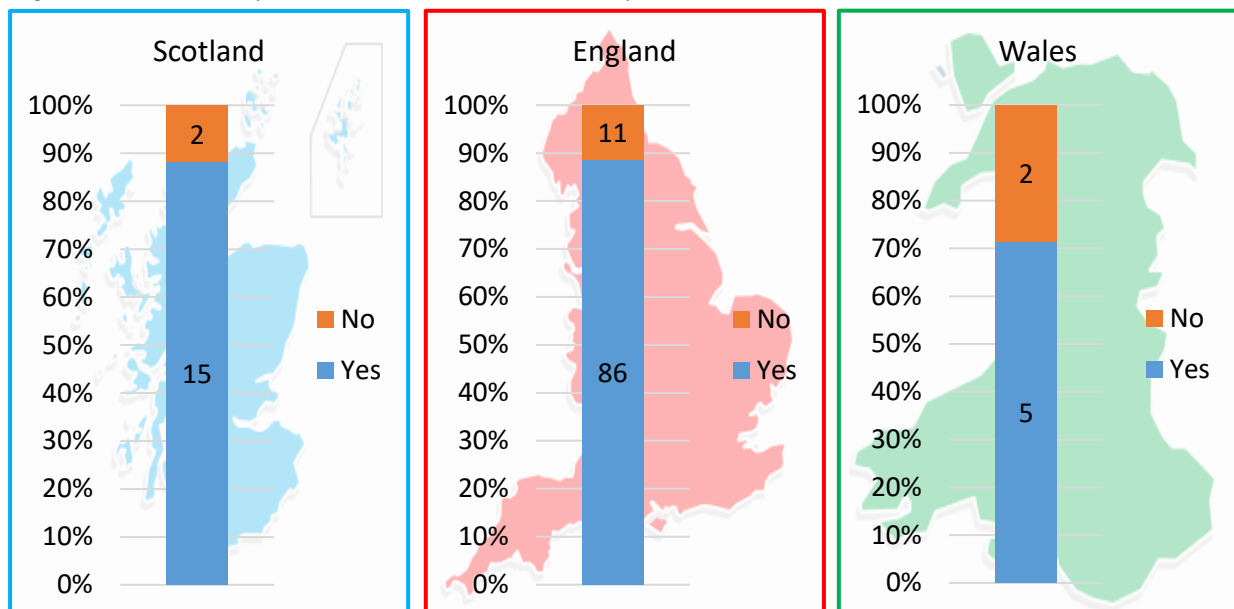
Figure 15.3 – Noise reported during MC trial and like for like time period by year and type



Analysis of qualitative feedback suggests changing noise trends, for example E4, E33 and E87 reported more late night parties potentially “because people don’t have to get up for work in the morning like they used to” (E87). Furthermore, “we noticed a reduction in dog barking complaints, with more people in properties able to spend more time with pet animals” (E42), similarly reported by W3, S15 and MC as can be seen in *Figure 4.3*.

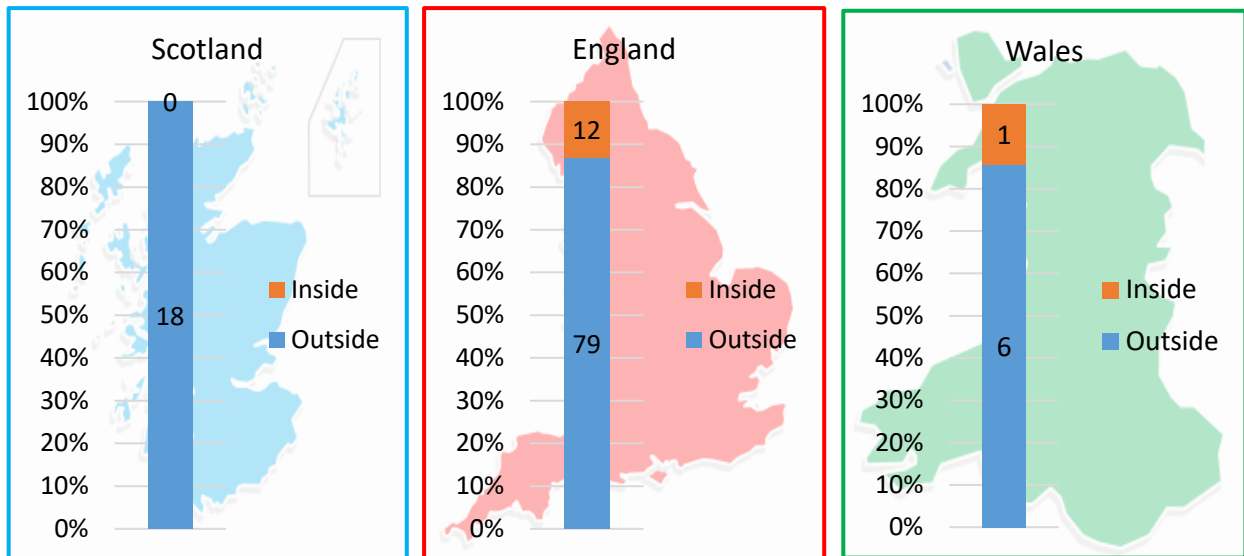
When compared with the analysis of responses illustrated in *Figure 4.4*, showing most LAs have received more noise complaints as a result of lockdown, this could be indicative of COVID-19 having an impact on noise complaint trends, though MC bucked this trend during the trial period as seen in *Figure 4.3*.

*Figure 16.4 – Have you received more noise complaints since lockdown?*



*Figure 4.5* shows that most noise complained about in the UK happens outside of office hours (Monday to Friday 1700-0700 and weekends), which could have consequences for LAs using officers as professional witnesses in investigations.

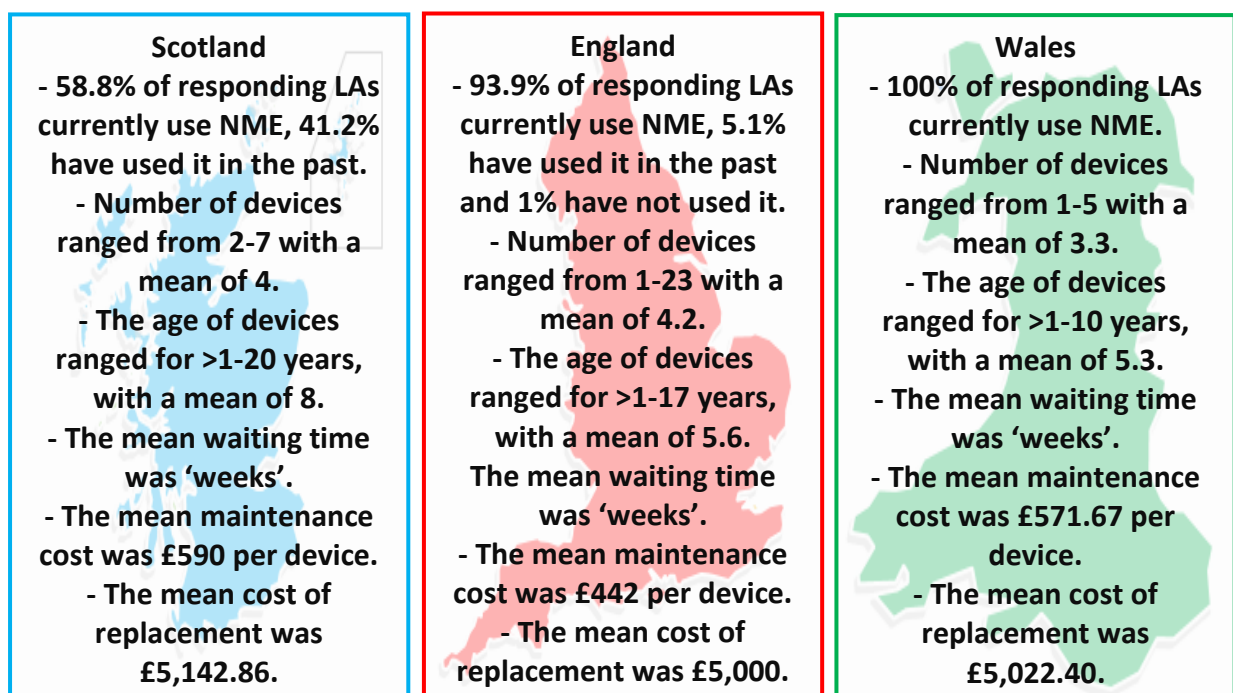
Figure 17.5 – Does most nuisance noise occur inside or outside of office hours



#### 4.2.2 – LA questionnaire use of NME

Figure 4.6 shows that significantly more respondents in England and Wales currently use NME for nuisance noise investigations than in Scotland, though the majority have used it at some point. Interrogation of supplemental information shows that whilst there was a wide range in terms of the number of devices, their age and the costs associated with them, the averages were similar as illustrated in Figure 4.7 with more detailed figures available in Appendix B.6.

Figure 18.6 – NME figures



Though variation in the figures above is to be expected due to a number of variants such as size of LA and their noise investigation policy and the differing brands and models of NME they use, when compared to the noise complaint figures discussed in Chapter 2 this illustrates just how finite NME resources are throughout the UK. Furthermore, it quantifies the cost of procuring and maintaining such devices.

## 4.3 – Objective 2: Results

Thematic analysis of complainants' responses to the questionnaire in Appendix A.3 identified a number of key themes, which are presented below with key quotations:

### 4.3.1 Intuitive

*TNA* "was really easy to install and use" (C1). Complainants "had no difficulty or concerns when using it" (C3).

### 4.3.2 - Control/reassurance

*TNA* made complainants feel "safer" (C1) and "reassured" (C2), which was corroborated by E51 who reported it "gives [complainants] a sense of control and reassurance." Furthermore it "helped me show what was going on and cope with it" (C1) and one complainant felt "really nervous when it was taken away because I was worried things would get worse and I wouldn't be able to prove it" (C2). Another participant who had complained about noise to MC previously advised "the app was much better than the last time you looked into it" (C3). The only negative reported was from one complainant who "really struggled to capture the dog barking a lot of the time because the recordings are so short, though I did get a lot of it" (C3) a view shared by E72 who thought "in some cases more than 30 secs would be better."

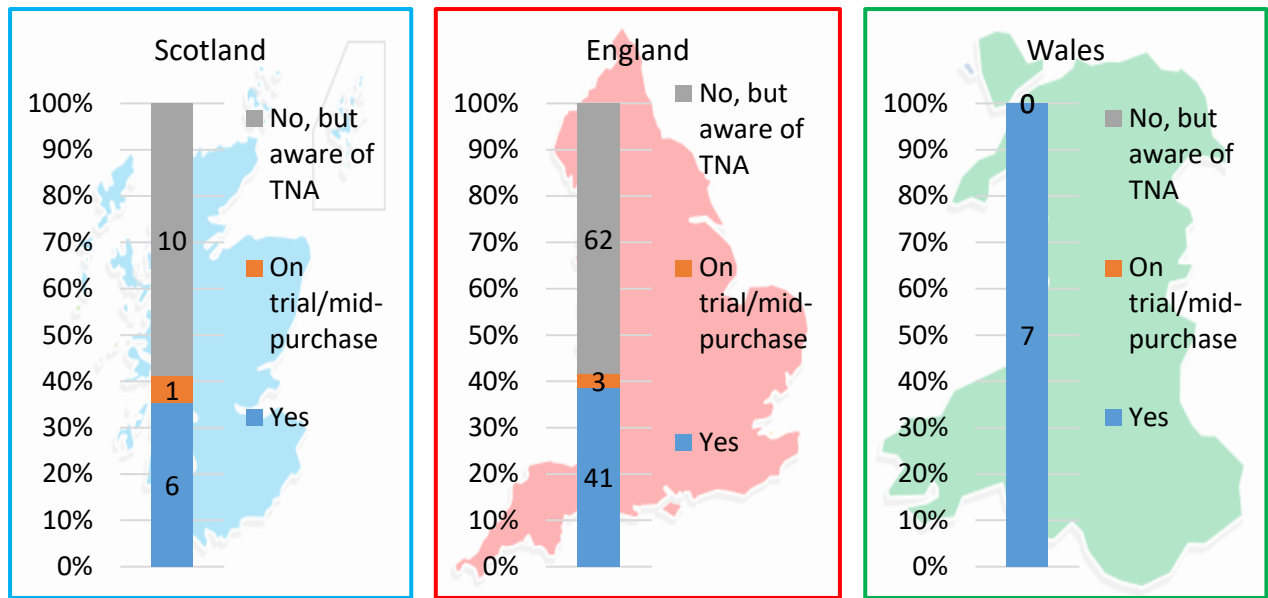
Complainants' positive experiences of *TNA* were corroborated by LA responses, with further benefits such as speeding up the complaints process also identified. As these are considered to benefit LAs also, they are reported in the following section.

## 4.4 Objectives 3 and 4: Results (benefits)

With the exception of one English LA, all respondents to the questionnaire were aware of *TNA*, so ignorance would not appear to be a factor for not using it. All Welsh respondents use

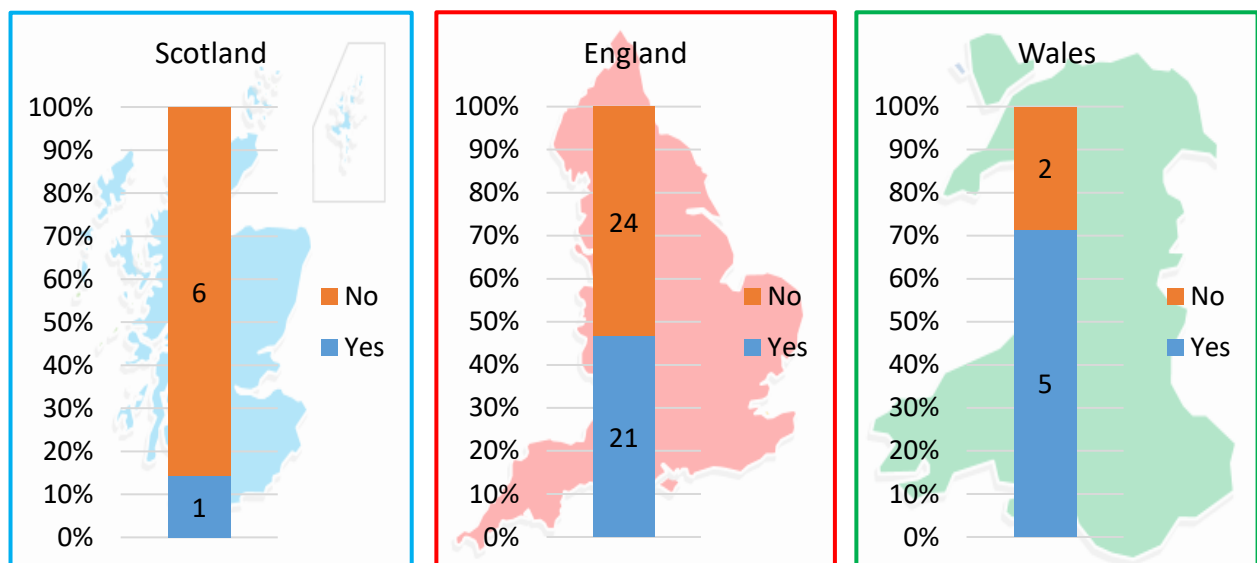
TNA as part of investigations, with rates much lower in Scotland and England as shown in Figure 4.7. At least 40% of respondents in each country are either currently using it or in the process of trialling/purchasing, indicating they believe TNA benefits them sufficiently to warrant the subscription fee.

Figure 19.7 – Do you use TNA for nuisance noise investigations?



LAs who did not use TNA were not asked to respond to the following questions therefore this section is based on those who use TNA. One benefit reported by LAs was that they had successfully used TNA for enforcement action.

Figure 20.8 – Have you used TNA for enforcement action?



#### 4.4.1 - Enforcement

Figure 4.8 shows differing levels of use of TNA for enforcement purposes. In some instances this could be down to the short period of time some had been subscribed. Where enforcement action had not been taken, 60% of English LAs and 100% of Scottish LAs had been subscribed for <1 year, predominantly since April 2020 coinciding with the lockdown, and therefore may not yet have had sufficient cause to use it for enforcement purposes.

Thematic analysis of the 28 qualitative responses around this question provided conflicting views and opinions on whether TNA recordings were suitable for use in formal interventions or as evidence in court. This data is captured in Figure 4.9, which illustrates the interventions which TNA recordings have been used for. No successful challenges or unsuccessful actions were reported.

Figure 21.9 – Use of TNA recordings for formal interventions

Intervention	Respondents
Pre-Court	
Abatement notices	English LAs – 8 Welsh LAs – 5
Community protection warnings	English LAs – 8
Community protection notices	English LAs – 5
Licensing reviews	Welsh LAs – 1
Fixed penalty notices	English LAs – 2
In Court	
Anti-social behaviour injunction	English LAs – 1
Interim Anti-social behaviour order	Scottish LAs – 1
Civil injunction	English LAs – 1
Successful prosecutions of breaches of notices/orders	English LAs – 4 Welsh LAs – 1

Further to the above, where the interim antisocial behaviour order was obtained TNA recordings “made up a large portion of the evidence submitted” “which the defence didn’t challenge” (S13). E65 encapsulates the wide range of interventions TNA recordings were applied to:

*We have used it for abatement notice failure to comply prosecutions, Community Protection Notice failure to comply prosecutions, perhaps 5 times in total. All successful actions. Also, fixed penalty notices, noise*

*equipment seizures under EPA/Noise Act 1996, and of course to evidence the issue of the underlying notices. All successful.*

Despite the LAs above having successfully used *TNA* recordings for enforcement action and associated prosecutions others reported that “it is un-calibrated and therefore unsuitable for use as formal evidence” (E3), a view shared by five out of 28 respondents. Four others stated that they “would not solely use prior to formal enforcement” because:

*The quality of recordings is such that [they] are no good for demonstrating a statutory nuisance. Housing providers may find them useful as their burden of proof is often lower than ours. (E41)*

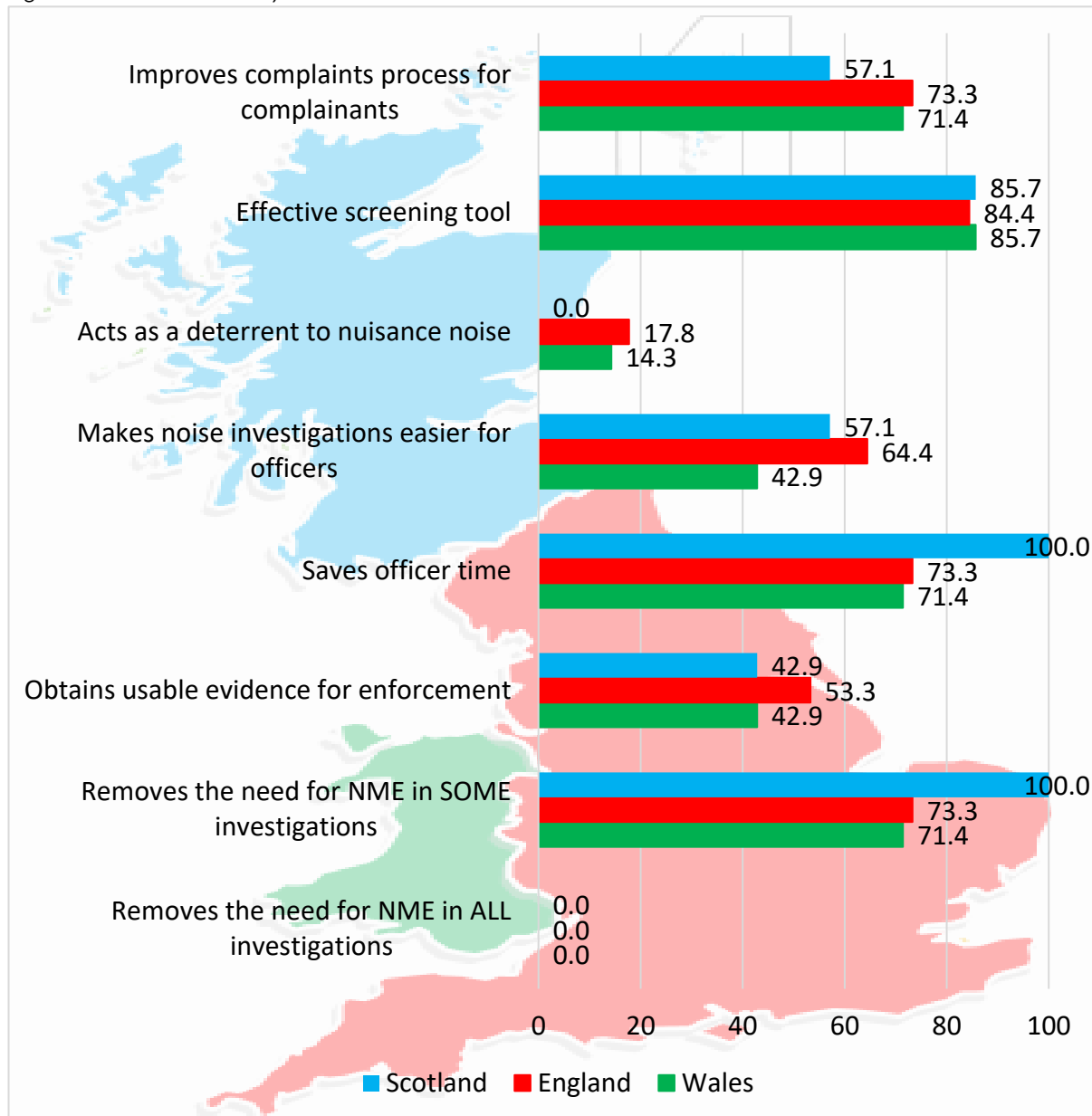
Furthermore:

*We trialled TNA for a month but ultimately thought it had too many problems. It is uncalibrated and therefore unsuitable for use as formal evidence. We felt it may have some benefit as a screening tool which would relieve some of the pressure off other noise recording equipment but felt it was too expensive for this. (E61)*

During the MC trial Moray Council officers (MCOs) found the recordings obtained through *TNA* to be “much clearer than our NME devices, probably to be expected due to their age” (MCO2) and in one case relating to a MC tenant such excessive noise was detected that a warning letter was issued. Although views on the evidential value of *TNA* recordings varied, reflected in the low responses in *Figure 4.10* over page, LA respondents reported a number of other perceived benefits of using *TNA*. Similarly, all but one of the 54 responding LAs currently using it would recommend *TNA* to other LAs, though there are bias issues with this particular data which will be discussed in Chapter 5.



Figure 22.10 – What are the benefits of TNA to your organisation? (% of respondents who agreed with statement)



The responses shown in *Figure 4.10* aligned with thematic analysis, described in Chapter 3, of the open ended questions in the LA questionnaire around which the follow up phone interviews were based. The key themes identified are as follows, with selected quotations:

#### 4.4.2 – Triage

As in *Figure 4.10* triage was a key theme with 29 of 43 respondents commenting this was a benefit of TNA. TNA “is a useful screening tool” (W3) and “you are able to determine quickly if there is a problem” (E5). This allows for “triage in real time” (E88), the “immediacy of which saves time” (E15) and “screen[s] out complaints that might take up officer time and would

come to nothing” (E27) and therefore “significantly reduces the number of cases where we use NME” (E42). 12 out of 43 LAs reported this capability led to efficiency savings as it “significantly reduces travel” (W4), “allows us to allocate officers and equipment more efficiently saving us time and money” (E48) and “has saved a huge amount of time and money” (W1).

TNA was also found to be effective for triage during the MC trial, with 76.5% of cases received resolved through it as per *Figure 4.11*. Though quantifying the amount of time saved by LAs through TNA is difficult, *Figure 4.11* illustrates significant reductions in travel and time during the MC trial equalling an estimated 364.8 miles and 9 hours 16 minutes for round journeys, which would have otherwise been undertaken.

*Figure 23.11 – Complaints received, location, use of TNA and outcome*

Nature of Complaint	Recordings submitted	Miles from MC HQ	Estimated travel time (mins) <sup>3</sup>	Notes (NFC = No further correspondence)	Outcome (NFA=No further action)
Resolved through TNA – 76.5%					
Domestic	0	20.4 (29)	29	Did not install, NFC.	NFA
Domestic	0	1.7 (5)	5	Did not install, NFC.	NFA
Domestic	0	5.2	8	Did not install, NFC.	NFA
Dog barking	0	35.9	51	Did not install, NFC.	NFA
Domestic	0	16.2	25	Did not install, NFC.	NFA
Domestic	0	16.4	25	Installed, did not submit recordings. NFC	NFA
Domestic	0	16.2	25	Installed, did not submit recordings. NFC	NFA
Domestic	1	16.7	27	Installed. One recording only.	NFA
Domestic	1	11.9	18	Installed. One recording only.	NFA
Domestic	1	16.5	26	Installed. One recording only.	NFA
Domestic	18	12.6	19	Installed. Only living noise evidenced.	NFA
Domestic	17	11.9	18	Installed. Only living noise evidenced.	NFA
Domestic	36	0.8	2	Repeated incidents of unacceptable noise evidenced.	Warning letter.

<sup>3</sup> As estimated by Google Maps

Resolved 'traditionally'/ongoing – 23.5%					
Commercial	0	14.4	21	Did not install.	Officer enquires.
Domestic	0	1.2	3	Did not install.	Officer enquiries.
Animal/ industrial	28	11.8	18	Frequent occurrences of animal noise detected.	Monitoring ongoing.
Animal noise	3	16.7	27	Evidence of animal noise in all recordings.	Monitoring ongoing.

#### 4.4.3 - Advantages over existing investigations

Advantages of TNA over existing methods were identified, with 18 of 47 respondents commenting on its superiority to diary sheets and 12 of 47 commenting on its 'immediacy' being an advantage to existing methods. *TNA* replaced "the need to send out paper diaries" (E26) as *TNA* "supports investigations as a digital alternative to diary sheets (E21) "with recording capabilities" (E21) and is "less easy to falsify than a diary sheet" (W1). LAs reported that they "get more take up than completing written diary sheets" (E42) with complainants reporting they perceive "the app as more meaningful than diary sheets" (E22). Unlike diary sheets, officers and NME it "can be delivered to the customer within seconds" (E2) and is "immediately available and improves and speeds up [the] complaints process for complainants" (S2). Furthermore, the complainant "always has the app to hand" (S1) "whereas the monitoring equipment can be installed and nothing recorded" (E16). 11 of 43 respondents reported it sped up the investigation process by sending recordings instantly "officers can listen to it much sooner" (E19) and "allows us to progress to more formal action far more quickly than waiting for NME" (E51).

Similarly, MCOs found *TNA* "was instant for complainants and allowed instant review of noise reports" (MCO1). This made "investigations much quicker for complainants and officers alike" (MCO1) and it was "easy to assign cases to officers and communicate with complainants using the online portal" (MCO2) and "made my job so much easier" (MCO2). The recordings were "also easy to get hold of, at times recordings taken on phones [not through *TNA*] get lost in the IT system or won't play" (MCO1).

#### 4.4.4 - 'COVID-proof'

A unique advantage of *TNA* identified was that it is 'COVID-proof', a term coined for the purposes of this study to reflect the 14 of 43 responding LAs who reported the ability to use it during lockdown was an advantage over existing methods. *TNA* was "a godsend" (E21) and "particularly useful during lockdown" (E22), acting "as a way of screening multiple complaints without visiting" (E43) because "COVID has stopped us being able to visit homes" (E2). Furthermore, it was "an excellent tool to use during lockdown when we're not installing NME in residential homes" (E66), "minimising the need for home visits" (E21) allowing LAs to "give the customer a better service during lockdown" (E72). During the MC trial this was also noted as a significant benefit as MCOs are not currently visiting properties and therefore *TNA* "allowed me to continue making enquiries in these strange times" (MCO3).

### 4.5 Objectives 3 and 4: Results (limitations)

Further to the debate over whether recordings can be used as evidence, negative themes further to those presented in **4.2** are reported below with supporting quotations:

#### 4.5.1 - Phone limitations

Concerns regarding ownership of phones and limitations in terms of recording quality, which lack sound level readings were reported by 15 of 43 respondents. *TNA* "does not provide dB readings" (E101) and the recordings are limited due to phone microphones "being centred on voice frequencies" (E71). This correlated heavily with concerns over the use of recordings for evidence discussed in **4.4.1**. *TNA* "relies on the complainant having a smartphone and doesn't work on some older models" (E51). Furthermore:

*Where the noise is low frequency, very quiet or needs longer recordings then we would need to use monitoring equipment (E57).*

#### 4.5.2 - Adulteration

Nine of 43 respondents reported sentiments similar to a "common issue is people making recordings by holding their device out of a door or window" (E52) or other "inappropriate location [and] the GPS location is not sufficiently accurate to prevent this" (E87).

#### 4.5.3 - Increases workload

Eight of 43 respondents reported that *TNA* can increase workload. “It can generate a lot more work for officers due to the number of recordings being submitted (even though we do limit these)” (E32). It can also “increase work load and is reliant on the quality of the microphone on the phone used” (W1) and “the lack of inbuilt automation does make it harder to manage a large caseload” (E81).

#### 4.5.4 - Privacy

Some concerns were also expressed about “wanting to ensure it wasn’t able to be hacked due to it containing personal information” (E22).

### 4.6 - Legal opinion

As part of the study the Crown Office and Procurator Fiscal Service was emailed (see Appendix A.8) to seek legal opinion on the evidential value of *TNA* recordings for use within the Scottish legal system. Despite a reminder email, no response was received.

### 4.7 – Summary

This chapter reported that the majority of complaints received by respondents pertained to residential noise. Furthermore, the majority of respondents reported an increase in noise complaints since lockdown and that most occur outside of normal office hours. This data supports Objective 1. Limited data was available from complainants, though a number of benefits were reported to assist Objective 2. The results also show competing views on the evidential value of the recordings as well as advantages of *TNA*, such as triage and being ‘COVID-proof’, were identified as were limitations in terms of phone limitations and increased workload as per Objectives 3 and 4. The significance of the results will be discussed in consideration of existing literature in the next chapter.

## Chapter 5 – Discussion

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This study sought to critically review *TNA* in LA noise complaint investigations, something that hitherto has not been undertaken. Through review of key existing literature, surveying UK LAs and conducting a trial this study found that noise complaints are rising and can be difficult to investigate and evidence. Furthermore, it found that despite limitations *TNA* offers benefits over existing investigative techniques, notably that it can allow complaints to be dealt with faster and is ‘COVID-proof’. These and other findings will be discussed in this Chapter in relation to the study’s objectives identified in Chapter 1, and will conclude with discussion of the study’s limitations, scope for future research and a summary.

### 5.1 – Main findings

#### 5.1.1 – Objective 1: Findings

Literature discussed in Chapters 1 and 2 identified noise complaints contribute significantly to LA workloads (CMO, 2017; CIEH, 2020b, 2020c, Churchill, 2018) and can be time consuming and costly to investigate. Building on this, the study identified that COVID-19 has had a significant impact on noise investigations, finding that responding LAs have received more noise complaints since lockdown as seen in *Figure 4.4*, supporting the limited literature available regarding this (BBC, 2020; RHE Global, 2020). Whilst further research will be needed to better understand the reasons for this, key literature reviewed in section **2.1** shows the impact COVID-19 and lockdown has had on society and behaviour, which coupled with falling background noise suggests noisier lifestyles and/or people becoming more aware and/or less tolerant of noise as a result of the lockdown. The impact of COVID-19 is not just limited to increased noise complaints to LAs, with the study finding that whilst noise was already a significant demand on LA resources, COVID-19 has exacerbated this by adding to the financial challenges already faced as discussed in **2.1**. Furthermore, it has made investigation into noise complaints more difficult as a result of lockdown restrictions in relation to entering properties as discussed in section **2.2**. COVID-19 therefore poses significant challenges in terms of noise complaint trends and existing investigative methodology.

The study also found that residential noise is most complained about as shown in *Figure 4.2*. This correlates with the findings of the CIEH England (2020b) and Wales (2020c) surveys,

building on these and other literature (Churchill, 2018) by reporting noise type data for Scotland and MC. The trends in Scotland correlated with the study's findings for the rest of the UK and existing literature in showing the predominance of residential noise complaints in the UK. There was some differentiation, with a comparison of *Figures 2.2 and 2.3 to 4.2* showing differences in terms of % rate of residential and animal noise between this study and the CIEH (2020b, 2020c) surveys. Two potential explanations for this, or combination thereof, are proposed:

1. Lockdown has resulted in shifting noise trends with evidence showing an increase in parties and decrease in dog barking noise reported in **4.2.1**. *Figure 4.3* similarly shows a significant reduction in dog barking complaints in Moray.
2. The CIEH survey does not clarify what constitutes 'residential noise', which could include animal based noise due to variability in classification. For example, the following four LAs responded to the CIEH (2020b) survey: Whereas Torridge District (2020) and Rossendale Borough Councils (2020) reference barking dogs under domestic noise headings on their respective websites, both Southwark (2020) and Wiltshire Councils (2020) differentiate dog barking from residential noise on theirs.

Whilst again suggesting COVID-19 has impacted noise complaint trends, all data collected and considered in the study confirms that residential noise is most complained about. This is significant, as although a wide term as discussed in **2.1**, residential noise usually consists of high information noise (Neimann *et al.*, 2006) not always associated with low frequency. Therefore despite technical limitations of smartphone apps as discussed in **2.3**, which may not accurately detect low level or low frequency noise (Sakagami *et al.*, 2019a, 2019b; Serpanos *et al.*, 2018), *TNA* should be capable of capturing the significant majority of noise complaints to LAs.

#### 5.1.2 – Objective 2: Findings

This study was the first to evaluate the complainant's experience of *TNA*, though existing literature provided by the developer suggested *TNA* can improve customer service as considered in section **2.4**. This correlated with the study's findings, with the majority of responding LAs reporting that it improved the complaints process for complainants as shown

in *Figure 4.10*. This is significant as studies show that quicker problem handling increases customer satisfaction and experience (Istanbulluoglu, 2017; Mattila and Mount, 2003).

The study further built on this existing literature by reporting user experience of *TNA* through the MC trial. Though some limitations were identified relating to the short recording length, feedback from complainants was overwhelmingly positive as reported in section **4.3**. Significantly, complainants reported that the ability to capture evidence whilst noise was ongoing was reassuring and helped them cope (**4.3.2**), in keeping with existing literature on CCTV which shows the ability to detect evidence was a viable tool for reassuring individuals (Gill and Spriggs, 2005; Gill *et al*, 2005). Furthermore, complainants also reported that *TNA* gave them a sense of control, which studies show is “a possible crucial moderator” in terms of health and stress (Gebhardt and Brosschot, 2002). Therefore by “empowering citizens to contribute to monitoring the environment in which they live” (Murphy and King, 2015) and providing them with an effective coping response to help alleviate the stress response (Cohen *et al.*, 1986; Gebhardt and Brosschot, 2002) *TNA* could provide complainants with a more meaningful service. Furthermore, *TNA* could help to “objectively” capture noise, which was found to be a major factor in low enforcement rates (Weinhold, 2015).

### 5.1.3 –Objective 3: Findings

As previously identified, *TNA* offers advantages in terms of better customer service therefore reducing the risk of dissatisfaction, which increases the likelihood of complaints to organisations and the resulting consequences (Folkes 1988; Richins 1983). The study identified a number of further benefits which *TNA* can offer LA noise investigations, the most notable of which will now be discussed. Correlating with the developer literature reviewed in **2.4**, LAs responses reported in this study found that *TNA* is an effective screening tool and facilitates more effective screening of complaints than diary sheets as reported in *Figure 4.10* and section **4.4.2**. The MC trial correlated with this finding, with big reductions in workload reported in *Figure 4.11* as 76.5% of complaints were successfully resolved at the point of triage. Furthermore, responding LAs reported *TNA* allowed them to better focus their resources, in keeping with studies which show effective triage better facilitates considered allocation of limited resources (Christian *et al*, 2006; Maves *et al.*, 2020; Reid 2020). This



could be particularly beneficial in terms of the limited NME devices reported in *Figure 4.6*, and officer time in the face of increasing noise complaints as reported in **2.1**.

This study correlated with existing literature in finding *TNA* had a number of advantages over traditional investigative techniques, building on it by identifying the particular advantage it offers during the pandemic. Whilst diary sheets remain an option to LAs, as described in **2.2** and **4.3** the pandemic has prevented many LAs from attending complainants' properties. *TNA* does not require officer attendance and many LA respondents reported in **4.4.4** that it was a 'COVID-proof' way to continue noise investigations, which may explain the increase in subscribing LAs since lockdown started reported in **4.4.1**. With no way to determine precisely how long the pandemic or lockdown will last, *TNA* therefore offers a significant advantage during the restrictions. Whilst complainants could utilise their phones to take recordings using different apps to supplement diary sheets, this would likely not be as 'smooth' as using *TNA* and could experience difficulties in terms of file format and being blocked by email firewalls as reported in **4.4.3**. This unique advantage will only last as long as restrictions do, however, and monitoring of post-COVID subscription rates, especially amongst recent subscribers, could identify whether being 'COVID-proof' was the predominant advantage.

LA responses reported in **4.4.2** also correlated with developer literature in identifying that *TNA* speeds up the complaints process. Whilst post-COVID diary sheets, officers acting as witnesses and NME will still provide detection capabilities, diary sheets usually take weeks to complete and NME can be subject to waiting times which was 'weeks' long amongst responding LAs (*Figure 4.6*). Furthermore, the study reported in *Figure 4.5* that most noise happens outside of normal office hours, which could make officer attendance for observations impractical due to the time of the alleged noise and could incur additional costs where 24/7 services are not in place. Indeed, the majority of LA respondents reported that *TNA* can remove the need for use of NME in some cases (**4.4**; *Figure 4.10*) which corresponded with existing literature provided by the developer (**2.4**).

Respondents also reported efficiency savings arising from the effective triage and quicker investigation offered by *TNA*. The majority of LA respondents using *TNA* reported that it saved officer time (*Figure 4.10*), with further efficiencies reported in **4.4.2** arising from reduced travel. Though this will vary significantly by LA, with Defra (2012) showing the cost of noise

complaints is higher in rural areas as a result of travel, figures show mileage cost LAs £223m in 2016-17 (Roberts, 2017) and so could offer significant savings. The MC study correlated with this finding, with significant reductions in travel time and mileage recorded in *Figure 4.11*. Though developer literature reported subscribing organisations had been able to significantly reduce the number of NME devices they use (2.4; Williams, 2018), the study did not assess this. However, as reported in 2.4 further efficiency savings could be possible through reduced NME devices and the associated costs reported in *Figure 4.6*.

Building on the developer literature discussed in 2.4, the study identified limitations of *TNA*, as reported in 4.5. LA respondents and MC trial participants identified that the short length of *TNA* recordings could fail to capture intermittent noise. This is especially pertinent when considering the prevalence of animal noise identified in *Figure 4.2*, which mainly comprised dog-barking (see Appendixes B.1 and B.2) which can be intermittent by nature. Though LA respondents found the 30 second recordings easier to review than hours of NME recordings, with MC officers corroborating this, they also reported evidence could be missed due to their short length (4.3.2) something which was also experienced by a trial participant in 4.3. LA respondents reported that this could result in excessive use of *TNA* and increase workload, though the number of recordings submitted can be controlled to mitigate this (4.4.7).

LA respondents reported in 4.5.1 that *TNA* relied on smartphone ownership and appropriate digital skills, supporting existing literature reviewed in 2.4 in finding that not all complainants meet these requisites. This was further supported by the MC trial where two complainants were not able to download *TNA* due to not having a smartphone or being visually impaired, though a version of *TNA* for the visually impaired is available and was offered. Furthermore, LA respondents reported a number of concerns relating to the technical limitations of smartphones as a recording platform, particularly in relation to low level and low frequency noise which correlated with the studies into SLMAs reviewed in 2.3. Though most noise complaints received relate to residential noise which *TNA* should be able to record as discussed in 5.1.1, it will not be able to detect all noises and will not be suitable for all complainants. Therefore, the developer's claim that *TNA* "replaces the need to use noise meters in almost all noise nuisance cases" (RHE Global, 2020) perhaps under-represents the limitations, with no LA respondents reporting that *TNA* could replace NME in all noise cases (*Figure 4.10*).

LA respondents reported differing views on adulteration of recordings, with some reporting *TNA* made it more difficult for complainants to do so, whilst others reported that the GPS function was not accurate enough to counter it as reported in **4.4.2** and **4.5.2**. Though *TNA* might not be able to prevent adulteration, as discussed in **2.2** diary sheets and NME can be similarly abused. LA respondents also reported concerns about privacy regarding personal information being stored on a third party website (**4.4.8**), though to date there is no evidence of data breaches occurring.

Of particular interest was the disparity in responses relating to use of *TNA* recordings for enforcement purposes reported in **4.4.1**. Whilst some LA respondents reported having used *TNA* recordings to justify a range of formal interventions and court actions in *Figure 4.9*, a significant number reported they were not accurate enough or suitable for this purpose. Whilst concerns over accuracy are supported by existing literature (Kardous and Shaw 2014; Murphy and King, 2015; Serpanos *et al.*, 2018), the study's findings both supported and contradicted the developer's case studies reviewed in **2.4**.

Furthermore, respondents who assessed *TNA* recordings as not being appropriate for formal interventions would appear to contradict the case law reviewed in **2.2**, which encourages the use of technology (Home owner vs Westminster Council), and shows sound levels are not necessarily required as there is no prescribed standard in terms of permissible noise in SN cases (*R (London Borough of Hackney) v Moshe Rottenberg* 2007). Considering this case also set a precedent that whether noise constituted a SN was a decision for the Court to make based on the evidence available and not just expert opinion, *TNA* could arguably allow LAs to present stronger cases through increased evidence, which could help avoid the legal costs incurred with failed legal cases. Whilst the reasons for the disparity in views from LA respondents regarding use of *TNA* for enforcement purposes could be explained by variability in complaints and/or enforcement policies and procedures, further research is required to better understand this.

In any case, though the data does not cover Scotland, considering the low number of cases where formal intervention is required as per *Figure 2.1*, the differing views on this are unlikely to be a limitation as enforcement is a rare undertaking. Therefore, further to the consensus amongst LA respondents that *TNA* was an effective screening tool in *Figure 4.10* which

correlated with the SLMA studies reviewed in **2.4**, the study presented evidence that *TNA* could be used for evidential purposes also, clarification of which could help individual LAs determine whether subscription is value for money.

#### 5.1.4 – Objective 4: Findings

The study highlighted a number of benefits that *TNA* could offer to MC. Moray is a predominantly rural LA with an area of 2238km<sup>2</sup> (MC, 2008) which the study found to incur higher costs in terms of noise investigations relating to travel (Defra, 2012). The results of the MC trial found substantial reductions in travel time and mileage as reported in *Figure 4.11*. Considering that the trial period saw lower than usual noise complaints as seen in *Figure 4.3* these efficiency savings could offset the £540 set up and £1080 annual subscription fee.

Furthermore, MC currently only has three operational NME devices, lower than the Scottish average (*Figure 4.6*), two of which are nuisance noise recorders and therefore do not capture sound levels similarly to *TNA*. At 15 years old, they are nearly twice the Scottish average NME age, replacement of which has been considered due to wear and tear with the cost of replacement estimated at £5,000 per device correlating with *Figure 4.6*. Consideration could be given to adopting *TNA* as opposed to replacing these nuisance noise recorders as though both capture recordings without sound levels, *TNA* is not limited to two devices. Furthermore, the existing devices are predominantly used to investigate residential noise by MC's housing department, with Appendix B.10 showing that 45% of noise complaints received relate to MC tenancies where the burden of proof is lower, as similarly reported by a LA respondent in **4.4.1**. During the study, MCOs reported the recordings obtained and instant screening achieved through *TNA* to be superior to using the existing NME (**4.3**), also using it as evidence to take tenancy action (**4.4.1**). The study would suggest therefore that *TNA* would particularly benefit MC's housing department and other LAs who have similar such aging nuisance noise recorders.

Furthermore, although it reported evidence suggesting animal noise is falling (**4.2.1**), which may change as people return to offices post-COVID, the study found that it remains a significant source of complaints to MC and Scottish LAs as seen in *Figures 4.2* and *4.3*. As per Appendixes B.1 and B.10, these consisted mainly of dog-barking complaints, which are often very difficult to sufficiently evidence as a SN (Highland Council, 2019). Though the study found

limitations in terms of *TNA* capturing intermittent noise as previously discussed, during the MC trial a complainant was still able to capture evidence via the app. Therefore *TNA* recordings could help establish whether or not a SN exists and/or be provided to complainants to facilitate private legal action under the Civic Government (Scotland) Act 1982<sup>4</sup>, allowing MC and indeed all Scottish LAs to provide better customer service in such circumstances. Recommendations to MC on adoption of *TNA* will be made in the next Chapter.

## 5.2 Limitations

Existing literature discussed in Chapter 2 established that noise contributes significantly to LA workloads. Building on this the study was both the first to assess noise by type in Scotland and in the UK after the societal and environmental changes resulting from lockdown measures. Furthermore, it is the first study to critically evaluate the use of *TNA* in noise complaint investigations. The study is therefore of significance, but was limited in a number of ways which will be discussed in this section.

### 5.2.1 – Poor instrument design

Whilst a mixed method design was most suitable for this evaluative study (**3.2**), some of the instruments used could have been significantly improved. The questionnaire to LAs (Appendix A.6) was biased as it focused only on the benefits of *TNA*. Furthermore, by focusing on those currently using it vital data on the limitations of *TNA* has been missed from LAs who have used it previously but are no longer subscribed. Such data would have been beneficial to the study, and would have allowed for better exploration of *TNA*'s limitations. Similarly, some questions added little to the study such as question six, as where LAs subscribed to it they used it for all noise types. Question nine was also significantly flawed and biased; LAs currently subscribed have arguably justified the expenditure as they have found it of benefit and were therefore always going to recommend it, otherwise why remain subscribed. LA data presented in Chapter 4 is therefore not as robust and balanced as it could have been.

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<sup>4</sup> Section 49 of the Civic Government (Scotland) Act 1982 permits a District Court to deal with anyone who keeps a creature which is giving reasonable cause for annoyance to any person residing in the vicinity (Aberdeenshire Council).

Furthermore, higher response rates could have been achieved through freedom of information requests, though data protection officers dealing with such requests would not have been able to provide some of the insights and opinions the study sought to obtain. In emailing LAs or their environmental health sections directly it was hoped more meaningful responses and ongoing engagement could be obtained. Whilst email addresses were researched on respective LA websites, there was no way to ensure these were accurate and therefore this approach could have contributed to the low response rate.

### 5.2.2 – Response rates

The response rate to the complainant questionnaire was disappointing. After the normal drop off in complainants as per *Figure 4.10* only ten complainants remained, many of whom were advised there was no case to answer and arguably therefore had a negative experience reducing their willingness to participate in the study as described in existing literature (McDaniel *et al*, 1985; Schleifer, 1986; Stocké and Langfeldt, 2004). As a result, there were only three participants making this data of limited value and not comprehensive enough to allow for more detailed analysis. Furthermore, these responses were from individuals whose complaints had been successfully resolved or were still ongoing and therefore offered a limited view of TNA.

Similarly, responses to the LA questionnaire were low as anticipated in **3.9**. This was likely due to the unprecedented challenges posed by COVID-19 discussed in Chapter 2. Though the Scottish rate exceeded the 60% threshold which should be the goal of researchers (Fincham, 2008), the overall response rate of 36.4% is below 51% and therefore considered inadequate (Pinsonneault and Kraemer, 1993). This leaves the study open to non-response and sample bias, making it low power and incurring substantial estimate error as the number of non-respondents is large relative to the sample size (Sivo *et al.*, 2006). Similarly, legal opinion from COPFS would have been invaluable for this study, though no response was received. COVID-19 has also had an impact on COPFs, who have received consistently higher cases than 2019-20 levels (Scottish Government, 2020), whilst having to adapt to new working practices resulting in a backlog of cases awaiting trial which could take a decade to clear (BBC, 2020).

Furthermore, as described in Chapter 3, answering questions was not mandatory and response rates varied by individual questions (see Appendix B) but remained above the 30%

threshold. Open ended questions were most frequently skipped in this study, which is to be expected in web based questionnaires owing to the greater burden placed on respondents (Reja *et al.*, 2003). Other explanations include respondent fatigue, if too much effort is required or the question is deemed inappropriate or overly sensitive (Penczak, no date). The five follow up phone interviews were particularly beneficial to filling some of these gaps and collected more in-depth qualitative data which significantly aided the study. Whilst outside the scope of the study, follow up phone calls to all willing participants would have allowed for more personal interaction with LAs to collect deeper insights (Szolnoki and Hoffman, 2013) and allow for wider respondent validation.

### 5.3 – Recommendations for further study

In the short term, a follow up survey utilising more robust and balanced instruments would make the study's data more robust. Furthermore, it would seek to identify LAs who have used *TNA* in the past but do not currently and capture their reasons for unsubscribing which would allow for more balanced critical evaluation of *TNA* in pursuance of the study's aim. Similarly, adoption of *TNA* by MC even if for a short period of time would hopefully ensure more complainants participated in the complainant questionnaire to acquire better data to assist Objective 2.

As discussed in 5.2 it is likely that the unprecedented challenges presented by COVID-19 significantly impacted the response rates from LAs and COPFS. Therefore, in the longer term a post-COVID-19 study, again using better balanced instruments, would arguably garner a higher and thus more meaningful response. Consideration could be given to directing enquiries through a FOI request to ensure a response of some extent from all UK LAs to assist this. Furthermore, this approach would expand on Objective 1 by shedding further light on emerging noise complaint trends resulting from the societal and environmental changes resulting from lockdown discussed in 5.1.1 and determine whether relaxation of lockdown restrictions affects subscription rates to *TNA*. In the event it did, such data would allow for better critical evaluation of *TNA*, as would legal advice from COPFS on use of *TNA* recordings in Scottish Courts.

During formulation of the study only one Scottish LA was subscribed to *TNA*, rising to seven during the study period (*Figure 4.7*) with others also considering trials. With this growing

interest in Scotland and the study finding that *TNA* recordings have now successfully been used in Scottish Courts (**4.4.1**) a further study in Scotland would build on Objective 4 and be particularly beneficial to Scottish LAs. It would ensure operational experiences and legal findings are shared, building on the conversations had between the author and fellow Scottish LAs which formed part of this study. Post-COVID-19 a detailed structured phone interview would not be implausible in Scotland with only 32 LAs, allowing for more detailed and ongoing evaluation of *TNA* within a Scottish LA context.

## 5.4 – Summary

Though a number of limitations have been identified, this chapter discussed the study's main findings in relation to the objectives identified in **1.3**. It found that noise complaints are rising and new trends may be emerging due the wide scale changes resulting from lockdown measures supporting Objective 1. *TNA* can improve the complaints experience through speeding up the complaints process, with this finding achieving Objective 2 though the data was extremely limited. Though it has limitations, *TNA* offers LAs effective triage and advantages over existing investigations, including being 'COVID-proof' which could be of benefit to LAs, supporting Objectives 3 and 4. Concluding comments on the study's aim as well as recommendations to MC to achieve Objective 4 will follow in the next chapter.



## Chapter 6 – Conclusion

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This study sought to critically evaluate use of *TNA* in LA noise complaint investigations which it achieved through the objectives identified in **1.3**. By reviewing existing literature the study found that noise complaints are a significant demand on LA resources, current investigations into which can be difficult due to limitations in existing investigative methodology, justifying a new approach to investigations. Building on existing literature, as the first study to consider noise complaints by sector for Scotland and post-COVID-19 it confirmed residential noise is most complained about. Furthermore, it identified the challenges which the pandemic has caused, with responding LAs seeing more complaints since lockdown which has also hampered investigations into them.

By using a mixed-method research approach to collect a range of quantitative and qualitative data through surveying LAs and conducting a trial of *TNA* in Moray, the study was the first to identify and evaluate a range of benefits offered by *TNA*. Notable findings include that it offers faster investigation of noise complaints and more effective triage, benefits which are currently amplified as *TNA* has been unaffected by the pandemic. Through the MC trial the study was the first to report on complainant's experiences of *TNA*, with positive feedback received corroborated by LAs reporting similar improvements to customer service. This also allowed the study to identify and evaluate advantages of *TNA* specifically to MC. Further to existing literature provided by the developer the study also identified and evaluated a number of limitations finding that the quality of recordings achieved through a smartphone platform was a cause for concern amongst some responding LAs. This in turn identified discrepancies over the evidential value of *TNA* recordings for formal interventions, resolution of which could be pivotal to the overall benefits of *TNA* in LA noise complaints.

The study found therefore that *TNA* is useful to LA noise complaints, though as a subscription service incurring fees, against a backdrop of funding cuts exacerbated by COVID-19, "it is up to individual LAs to secure value for money in their spending decisions" (Hall, 2020) which will be an inherently subjective decision for individual LAs. Whilst it is therefore beyond the scope and remit of this study to make blanket recommendations to LAs, in fulfilment of Objective 4 the study found that *TNA* would be suitable for MC. As a large rural LA the efficiency savings *TNA* offers could assist MC in realising its Digital Transformation programme as prescribed by

Scottish and UK governments to provide more efficient and accessible services, helping it to adapt to an era of funding challenges which COVID-19 will undoubtedly continue to exacerbate.

Furthermore, adoption of *TNA* for the remainder of the lockdown restrictions will allow MC to continue to provide “high quality customer service” as per its Customer Charter (MC, no date) and help fulfil its statutory duty to investigate noise. Moreover, acknowledging the study’s limitations in terms of bias and poor response rate, adopting *TNA* thus would allow for a more detailed investigation of the benefits it can offer MC and collect more detailed and meaningful complainant experiences. This would also allow for further study across Scotland to be implemented as discussed in **5.3**, during which time better understanding of the evidential value of recordings within a Scottish context could be realised.

To conclude, *TNA* like any other product has benefits and limitations, consideration of which allows consumers to decide whether or not it offers value for money. In the case of MC, operational advantages have been identified and the efficiency savings it offers in relation to officer time, mileage and new nuisance noise recorders would likely more than offset the fees involved. This could deliver further efficiency savings which could help MC adapt to ongoing funding challenges and allow safe investigation of noise during the pandemic. *TNA* therefore would appear to offer excellent value for money to MC, and is therefore recommended at least whilst lockdown restrictions remain.

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# Appendix A – Instruments and supporting documentation

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## Appendix A.1 – Participant Information Sheet

1. Research Project Title

A critical evaluation of the use of The Noise App in noise nuisance investigations.

2. Invitation

You are being invited to participate in this research project conducted by Trainee Environmental Health Officer Tim Betts at Moray Council as part of his MSc in Environmental Health. Please take time to read the information below before you decide whether to participate. If anything is unclear or you require more information please do not hesitate to ask any questions you may have. Thank you for reading this and please take as much time as necessary to decide if you wish to participate. Whether you chose to or not will not affect the way in which your complaint is handled.

3. What is the project's purpose?

This project aims to investigate the potential benefits of *The Noise App* to nuisance noise investigations.

4. Why have I been chosen?

You have been chosen because you have contacted Moray Council about nuisance noise.

5. Do I have to take part?

This is your decision entirely and will not affect the manner in which your complaint is investigated. Your feedback of your experience of The Noise App will help inform a decision as to whether it is useful to nuisance noise investigations. If you are happy to participate you can retain this document for reference purposes and please complete the attached consent document. You can withdraw at any time during the trial period and do not have to give a reason. Once the trial period has been concluded you will be unable to withdraw your responses, though these will be collected anonymously and you will be in no way identifiable.

6. What do I have to do if I take part?

You will be asked to download and use The Noise App as part of investigations into the nuisance noise. You will be asked about your experiences of the app by way of a questionnaire which will be conducted over the phone with the study author during the course of investigations; the questionnaire is attached to this document for reference. There are no other commitments or restrictions. If for any reason the study stops you will be informed. Information on the app will be provided in due course.

7. What are the possible disadvantages and risks of taking part?

It is not anticipated your participation will cause you any disadvantage or discomfort. If at any stage you have any concerns, please contact your investigating officer.

8. What if something goes wrong?

If you have concerns about your participation please contact your investigating officer in the first instance who will be happy to discuss these. If you still have concerns thereafter about your participation in the study you can contact the University of Derby, details below. If you have concerns about the way the nuisance noise is being investigated your investigating officer will be happy to discuss these with you and signpost you to Moray Council's complaints procedure as necessary.

9. Will my participation in the study be kept confidential?

Information collected for the purposes of this study, such as questionnaires and your feedback, will be collected anonymously. Likewise, any statistics relating to your participation which are used to assess performance of *The Noise App* will also be anonymous.

Information collected by Moray Council for the purposes of investigating your concerns regarding nuisance noise will be processed and recorded in accordance with all relevant data protection legislation and Moray Council policy as per the following link: [http://www.moray.gov.uk/moray\\_standard/page\\_119859.html](http://www.moray.gov.uk/moray_standard/page_119859.html)

Data collected will be anonymised and may be shared with third parties. Being anonymised, you will not be identifiable in any way.

10. Will I be recorded, and how will the recorded media be used?

You will only be recorded through use of questionnaires, and where you have comments these will be noted down anonymously. Should you be recorded during your use of the app these recordings will only be used for the purposes of investigating your complaint and will be deleted once they are no longer needed unless your express permission is sought.

11. What information will be sought from me and why is this relevant to the study's objectives?

You will be asked about your experiences and of using the app. Your feedback will be an integral part of the project and help establish the effectiveness of the app.

12. What will happen to the results of the study?

The study will be published, though you will not be in any way identifiable. If you would like a copy please let your investigating officer know.

13. Who is organising and funding the study?

This study is being conducted by Trainee Environmental Health Officer Tim Betts at Moray Council in relation to his MSc in Environmental Health. Use of The Noise App has been agreed on a trial basis with the developer RHE Global.

14. Who has ethically reviewed the project?

This study has been scrutinised and ethically approved by the University of Derby.

15. Contacts for further information

If you have any queries about your investigation please contact your investigating officer who will provide their contact details separately as part of the investigation process. For further information on the study please contact [redacted].

## Appendix A.2 – Participant consent form

### **A critical evaluation of the use of The Noise App in noise nuisance investigations: Consent to take part in research**

- I..... voluntarily agree to participate in this study.
- I understand that I may withdraw from the study at any time during the trial period without consequence. Once the trial period has been concluded I understand that I will be unable to withdraw my responses, and understand that these be collected anonymously and I will be in no way identifiable.
- I have had the study and purpose for my participation explained to me in writing and the opportunity to ask questions about it.
- I understand that participation involves downloading and using *The Noise App* to facilitate enquiries into the noise nuisance I am experiencing and that I will be asked to provide feedback on my experiences with the app, which will be recorded anonymously and will be included in a report based on this study.
- I understand that disguised extracts of my feedback may be quoted in a report based on this study.
- I understand that I will not directly benefit from participating in this study.
- I understand that all information I provide will be kept confidential and in keeping with relevant data protection legislation.
- I understand that if I inform the investigating officer that I or someone else is at risk of harm they will have to report this to the relevant authority, in line with Moray Council policy. They will discuss any concerns with me initially but may be compelled to report with or without my permission.
- I understand that signed consent forms and questionnaires/feedback notes relating to the study will be securely retained within a locked unit within Moray Council's Annex building by the study author who will act as the data controller in this regard and they will only be used for the purpose for which they were obtained. Once grading of this study has been completed by the University of Derby they will thereafter be confidentially disposed of.

- I understand that information stored by Moray Council for the purposes of complaint investigation will be kept in line with relevant data protection legislation and Moray Council policy.
- I understand that under freedom of information legislation I am entitled to submit a Subject Access Request to access the information I have provided to both the study and to Moray Council.
- I understand I am free to contact the investigating officer or study organiser should have any questions or concerns and that I have their contact details.

*Signature of research participant*

.....

Participant signature

.....

Date

*Signature of researcher*

I believe the participant is giving informed consent to participate in this study

.....

Researcher signature

.....

Date

## Appendix A.3 – Trial participant questionnaire

### Section 1 - About you

1. Please tick the appropriate age category

18-30	31-40	41-50	51-60	61-70	70+

2. Do you own a smart phone? If so what brand and roughly how old is it?

3. What noise are you experiencing? Please tick as appropriate.

- Industrial
- Noisy neighbours – subject owns property
- Noisy neighbours – subject rents, including housing associations
- Noisy neighbours – council tenant
- Barking dogs
- Vehicles
- If other, please describe:

4. How frequently is the noise intrusive and during what hours of the day does it occur?

### Section 2 – About the app

1. Did you find the app easy to use?

2. How often did you use the app?

3. Did you have any problems whilst using the app? Please describe.



4. Did you have any concerns about downloading the app onto your phone? If yes, please explain.
  
5. How could the app be improved?
  
6. After using the app, do you feel things have improved? Did the app help?
  
7. Any other comments?

## Appendix A.4 – Trial participant debrief note

Project Title: A critical evaluation of the use of The Noise App (TNA) in noise nuisance investigations.

Thank you for participation in this study. Your experiences of TNA will be used to evaluate complainants' experiences of TNA during investigation into noise nuisance. This will allow for a critical evaluation of TNA and for recommendations to be made on the suitability of the continued use of TNA to Moray Council in nuisance noise complaints.

If you would like any further information on this study or its findings once completed then please contact me on the details below. Please note however, that as questionnaire data is collected anonymously, I will not be able to provide you with your individual results.

If participation in this study has raised any specific concerns then please contact me to discuss further. If I am unable to assist I can signpost you accordingly.

Many thanks once gain for your participation.

Tim

[contact details redacted]

## Appendix A.5 – Initial email to local authorities

Good afternoon

I hope this finds you well. Apologies if this is not the most suitable destination for the following invitation, I would be much obliged if you could forward it on as necessary.

I am writing to request your participation in a brief questionnaire regarding local authority use of 'The Noise App', a smartphone application which records alleged nuisance noise and sends recordings directly to the investigating authority for triage and investigation. Your responses will assist my 'A critical evaluation of the use of 'The Noise App' in noise nuisance investigations' project as part of my Master of Science in Environmental Health through the University of Derby.

The survey is completely voluntary, brief and should not take long to complete. I have attached a copy for your reference and welcome responses either by returning the completed attachment or through Survey Monkey via the following link: <https://www.surveymonkey.co.uk/r/HZZ73QN>

Depending on your responses, and especially where you may have used the app for legal proceedings, a brief follow up interview to discuss further would be very much appreciated.

Your response to the questionnaire will be kept confidential and no identifiable information will be used in any reports based on the data you provide without permission. Should you wish to discuss this further please do not hesitate to contact me on the details below.

Many thanks for your assistance at what I appreciate is a busy time.  
Tim

**Tim Betts** | Trainee Environmental Health Officer | Economic Growth and Development

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## Appendix A.6 – Local authority questionnaire

### Local Authority use of 'The Noise App'

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1. Which country are you located within?

- England
- Scotland
- Wales

2. What type of noise complaint(s) do you receive most frequently? Please rank your top three from the list in the box below.

For example if 'domestic noise - subject of complaint is council tenant' is the most common, followed by 'barking dogs' then 'other - please specify' your answer would be as follows: 8, 2, 10 - windfarms.

1. Alarms
2. Barking dogs
3. Birdscarers
4. Cockerels/poultry etc
5. Commercial
6. Construction
7. Industrial
8. Domestic noise - subject of complaint is council tenant
9. Domestic noise - subject of complaint is non-council tenant
10. Other – please specify

3. a.) When do most of the noise nuisances reported to you occur?

b.) Have you received more nuisance noise complaints than usual since the introduction of lockdown measures in response to the coronavirus?

Please select two choices below as applicable.

- a). Most noise occurs within normal office hours: Monday to Friday, 0700-1700
- a). Most noise occurs outside normal office hours: Monday to Friday 1700-0700 and weekends
- b). Yes - more noise complaints since lockdown measures
- b). No - no change to noise complaints since lockdown measures

4. Do you use noise monitoring equipment to investigate noise complaints?

- Yes
- No
- No, but have done previously

If you use or have used noise monitoring equipment, please briefly describe the following:

1. How many devices and their age.

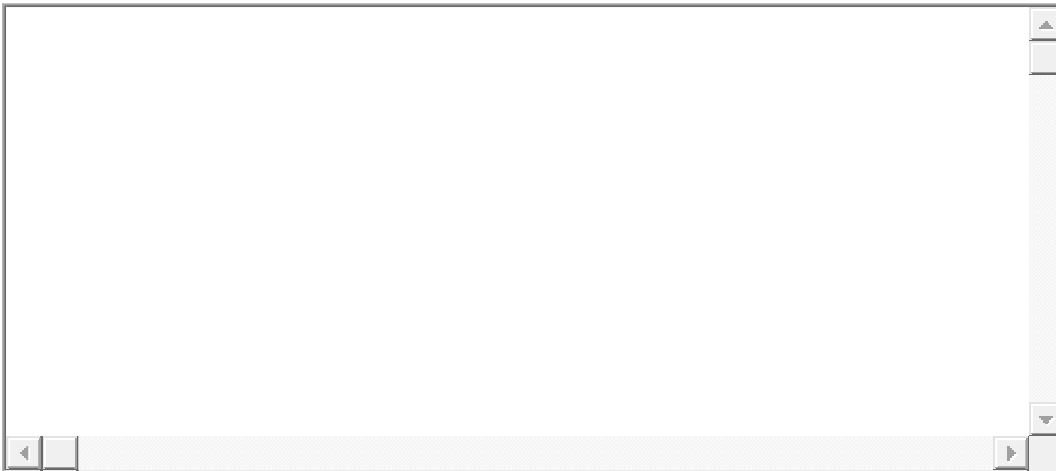
2. The type of noise they are used to investigate.

3. The usual waiting time for deployment of equipment (does not have to be exact for example 'days', 'weeks', 'months').

3. Estimated annual maintenance and calibration costs per device (does not have to be exact for example '£hundreds', '£thousands' etc).

4. The estimated cost of replacement per device (does not have to be exact for example

'£hundreds', '£thousands' etc).

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5. Do you use The Noise App as part of your statutory duty to investigate complaints of nuisance noise?

- Yes
- No - aware of The Noise App but do not use it; please skip to end of survey
- No - unaware of The Noise App; please skip to end of survey

If yes, for how long have you used it?

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6. What types of noise do you use The Noise App to investigate? Please tick all that apply.

- Alarms
- Barking dogs
- Birdscarers
- Cockerels/poultry etc
- Commercial
- Construction
- Industrial

- Domestic noise - subject of complaint is council tenant
- Domestic noise - subject of complaint is non-council tenant
- Other (please specify)

7. Have you used evidence obtained from The Noise App to facilitate enforcement action?

- Yes
- No

If yes, please describe the type of action taken, how frequently it has been used for this purpose and whether the action was successful.

8. What are the benefits of using The Noise App to your organisation? Please tick all that apply:

- Improves complaints process for complainants
- Effective screening tool
- Acts as a deterrent to noise nuisance
- Makes noise investigations easier for officers
- Saves officer time
- Obtains usable evidence for enforcement, if necessary
- Removes need for noise monitoring equipment in SOME noise investigations
- Removes need for noise monitoring equipment in ALL noise investigations
- Other(s) (please specify)

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9. Would you recommend The Noise App to other local authorities?

- Yes
- No

Please briefly describe why and any other comments you may have.

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10. It may benefit this study to discuss your responses. Would you be able to participate in a brief voluntary follow up interview?

- Yes
- No

If yes, please provide contact details.

Bottom of Form

**Thank you for your time and participation.**

If you would like to discuss this further please do not hesitate to contact me. Many thanks,  
Tim.



## Appendix A.7 – Follow up email to local authorities

Good afternoon

I hope this finds you well and apologies if you have already responded to my request below; many sincere thanks for participating and please disregard this email.

I appreciate this is a busy time of what has been an unprecedented year, but I would be extremely grateful if you would still be able to participate in my study into local authority use of 'The Noise App', described in the email below, by answering the applicable questions of the brief questionnaire attached. Responses are welcome either by completing and returning the attachment or through Survey Monkey via the following link: <https://www.surveymonkey.co.uk/r/HZZ73QN>

Many sincere thanks once again for your time and all the best for the festive period.  
Tim

**Tim Betts** | Trainee Environmental Health Officer | Economic Growth and Development

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## Appendix A.8 – Initial email to COPFS

Good afternoon

I hope this finds you well. Apologies if this is not the most suitable destination for this enquiry, I would be much obliged if you could forward it on as necessary.

I am writing to request a discussion about your thoughts on any potential legal issues of using 'The Noise App' in nuisance noise investigations. 'The Noise App' is a smartphone application which records alleged nuisance noise and sends recordings directly to local authorities for triage and investigation. This will form part of my 'A critical evaluation of the use of The Noise App in noise nuisance investigations' project as part of my Master of Science in Environmental Health through the University of Derby.

Whilst recordings obtained using 'The Noise App' have been used successfully as evidence within English Courts, I am unaware of any such use within the Scottish legal system therefore I would be extremely grateful if someone could spare time for a phone call to discuss the following subject areas:

Could the recordings obtained by this app be used as evidence in legal proceedings, under the following legislation for example:

- Civic Government (Scotland) Act 1982 Section 49
- Environmental Protection Act 1990 Section 80
- Environmental Protection Act 1990 Section 82
- Any legal concerns or difficulties around the use of this app for nuisance noise.

Should you need any further details please do not hesitate to contact me on the details below.

Many thanks for your time

Tim

**Tim Betts** | Trainee Environmental Health Officer | Economic Growth and Development

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## Appendix A.9 – Follow up email to COPFS

Good afternoon

I appreciate this is a busy time of what has been an unprecedented year, but I would be extremely grateful if you would still be able to participate in my study into local authority use of 'The Noise App', described in the email below. If you could find time for a brief discussion on the points below I would be extremely grateful.

Many sincere thanks once again for your time and all the best for the festive period.

Tim

**Tim Betts** | Graduate Trainee Environmental Health Officer | Economic Growth and Development

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## Appendix A.10 – Permission from Moray Council



### **ECONOMIC GROWTH AND DEVELOPMENT**

**[Redacted]**  
**Principal Environmental Health Officer**  
**Moray Council**  
**PO Box 6760 High Street Elgin Moray IV30 1BX**

Website: [www.moray.gov.uk](http://www.moray.gov.uk)

Our Reference:

TNA Trial

18 September 2020

To whom it may concern

#### **Moray Council trial of 'The Noise App' in support of Tim Betts**

I can confirm that Moray Council employee Tim Betts has been granted permission to conduct an eight week trial of 'The Noise App' within the Moray Council local authority area.

This will include access to Moray Council systems and data for the purposes of his 'a critical evaluation of the use of 'The Noise App' in noise nuisance investigations' forming part of his Master of Science in Environmental Health studies. Such access will be in line with Moray Council policy.

I trust this is satisfactory, though should you require further clarification please do not hesitate to contact me using the details provided.

Yours faithfully

**[Redacted]**

Principal Environmental Health Officer

## Appendix B – Data charts

### Appendix B.1 – Most frequent noise complaint received grouped by type Scotland

Type of noise	Specific sub group	Ranked first	Ranked Second	Ranked Third	Total	Total as % (1dp)
Animals	Barking dogs	6	3	5	14	25
	Cockerels/Poultry etc	0	0	0	0	0
	<b>COMBINED ANIMAL NOISE TOTAL</b>	<b>6</b>	<b>3</b>	<b>5</b>	<b>14</b>	<b>25</b>
Commercial		1	1	4	6	10.7
Construction		1	2	2	5	8.9
Domestic noise	Domestic noise - subject of complaint is council tenant	7	6	1	14	25
	Domestic noise - subject of complaint is non-council tenant	3	7	4	14	25
	Living noise (answered under 'other' in questionnaire)	0	0	1	1	1.8
	<b>COMBINED DOMESTIC NOISE TOTAL</b>	<b>10</b>	<b>13</b>	<b>6</b>	<b>29</b>	<b>51.8</b>
Industrial		0	0	0	0	0
Miscellaneous	Alarms	0	0	0	0	0
	Birdscarers	0	0	0	0	0
	<b>COMBINED MISCELLANEOUS</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other	Low frequency noise	1	0	0	1	1.8
	Railway maintenance	1	0	0	1	1.8
	<b>COMBINED OTHER</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3.6</b>

Note – 1 respondent provided only the top two noise types.

## Appendix B.2 – Most frequent noise complaint received grouped by type England (E) and Wales (W)

Type of noise	Specific sub group	Ranked first		Ranked Second		Ranked Third		Total		Total as % (1dp)		E&W total	E&W total as %
		E	W	E	W	E	W	E	W	E	W		
Animals	Barking dogs	26	6	31	1	26	0	83	7	28.1	33.3	90	26.9
	Cockerels/Poultry etc	0	0	1	0	4	0	5	0	1.7	0	5	1.5
	COMBINED ANIMAL TOTAL	26	6	32	1	30	0	88	7	29.8	33.3	95	28.4
Commercial		1	0	7	0	32	2	40	2	13.6	9.5	42	12.5
Construction		1	0	4	0	12	2	17	2	5.8	9.5	19	5.7
Domestic noise	Domestic noise - subject of complaint is council tenant	11	0	26	1	3	2	40	3	13.6	14.3	43	12.8
	Domestic noise - subject of complaint is non-council tenant	52	1	23	5	9	0	85	6	28.8	28.6	91	27.2
	Domestic noise – tenancy not specified (answered under ‘other’ in questionnaire)	1	0	4	0	2	0	7	0	2.4	0	7	2.1
	COMBINED DOMESTIC TOTAL	64	1	53	6	14	2	132	9	44.7	42.9	141	42.1
Industrial		0	0	1	0	5	0	6	0	2.0	0	6	1.8
Misc.	Alarms	1	0	0	0	1	0	2	0	0.7	0	2	0.6
	Birdscarers	0	0	0	0	0	0	0	0	0	0	0	0
	COMBINED MISCELLANEOUS	1	0	0	0	1	0	2	0	0.7	0	2	0.6
Other	Impact noise	0	0	0	0	1	0	1	0	0.3	0	1	0.3
	Music	6	0	0	0	0	1	6	1	2.0	4.8	7	21.1
	Pubs/Clubs	0	0	0	0	1	0	1	0	0.3	0	1	0.3
	Unspecified/Unid entified ie ‘hum’	0	0	1	0	1	0	2	0	0.7	0	2	0.6

Notes 1 English respondent provided only the top two noise types.

2 English respondent provided only the top noise type.

## Appendix B.3 – Simplified noise complaint by sector

Which type of noise complaint do you receive most frequently?						
	Scotland		England		Wales	
Total responses	19		100		7	
Response rate to question as % of overall cohort	61		32		32	
	Type	% (1dp)	Type	% (1dp)	Type	% (1dp)
1	Domestic	51.8	Domestic	44.7	Domestic	42.9
2	Animal	25	Animal	29.8	Animal	33.3
3	Commercial	10.7	Commercial	13.6	Commercial	9.5
	All others	12.5	All others	11.9	All others	14.3
Total		87.5		88.1		85.7

## Appendix B.4 – Noise occurrence by time and impact of lockdown

	Scotland		England		Wales	
Total responses	18		98		7	
Response rate to question as % of overall cohort	58.1		31.1		31.8	
	Responses	% (1dp)	Responses	% (1dp)	Responses	% (1dp)
<b>When does most noise occur?</b>						
Most noise occurs within office hours (Monday to Friday, 0700-1700)	0	<b>0</b>	12	<b>12.2</b>	1	<b>14.3</b>
Most noise occurs outside office hours (Monday to Friday 1700-0700 and weekends)	18	<b>100</b>	79	<b>80.6</b>	6	<b>85.7</b>
No response	0	<b>0</b>	7	<b>7.1</b>	0	<b>0</b>
<b>Have you received more noise complaints since lockdown?</b>						
More noise complaints since lockdown	15	<b>83.3</b>	86	<b>87.8</b>	5	<b>71.4</b>
No change to noise complaints since lockdown	2	<b>11.1</b>	11	<b>11.2</b>	2	<b>28.6</b>
No response	1	<b>5.6</b>	1	<b>1.0</b>	0	<b>0</b>



## Appendix B.5 – Use of NME

Do you use NME as part of noise complaints?						
	Scotland		England		Wales	
Total responses	17		98		7	
Response rate to question as % of overall cohort (1dp)	54.8		31.1		31.8	
	Responses	% (1dp)	Responses	% (1dp)	Responses	% (1dp)
Yes	10	<b>58.8</b>	92	<b>93.9</b>	7	<b>100</b>
No, but have previously	7	<b>41.2</b>	5	<b>5.1</b>	0	<b>0</b>
No	0	<b>0</b>	1	<b>1</b>	0	<b>0</b>

## Appendix B.6 – Supplemental NME information

	Scotland	England	Wales
Total responses	15	85	7
Response rate to question as % of overall cohort (1dp)	48.4	27	33.3
Range of NME nos.	2-7	1-23	1-5
Mean of NME nos.	4 (3.3)	4.2 (3.98)	3.3
Median of NME nos.	3 (2)	3 (3)	4
Mode of NME nos.	2 (2)	3 (3)	4
Age range of NME	>1-20 years	>1-17 years	>1-10 years
Mean of NME age	8	5.6	5.3
Median of NME age	7.5	5	5
Mode of NME age	10	5	-
Range of waiting times	None-2 months	None-2 months	Days-weeks
Average waiting time	Weeks	Weeks	Weeks
Annual maintenance/calibration costs range	£250-£1000	£150-£850	£365-£850
Annual maintenance/calibration costs mean	£590	£442	£571.67
Annual maintenance/calibration costs median	£450	£480	£500
Annual maintenance/calibration costs mode	£250	£500	-
Maintenance costs (textual estimate)	£hundreds	£hundreds	£hundreds
Replacement costs range	£1500-£6000	£1,500-£9,000	£3000-£7000
Replacement costs mean	£5,142.86	£5,006.13	£5,022.40
Replacement costs median	£5,000	£5,000	£5,000

Replacement costs mode	£5,000	£5,000	-
Replacement costs (textual estimate)	£thousands	£thousands	£thousands

## Appendix B.7 – TNA users

Do you use TNA for noise complaints?						
	Scotland		England		Wales	
Total responses	17		107		7	
Response rate to question as % of overall cohort (1dp)	51.6%		31.7%		31.8%	
	Responses	% (1dp)	Responses	% (1dp)	Responses	% (1dp)
Yes	6	<b>35.3</b>	41	<b>38.3</b>	7	<b>100</b>
Currently on trial/in process of acquiring	1	<b>5.9</b>	3	<b>2.8</b>	0	<b>0</b>
No, but aware of app	10	<b>58.8</b>	62	<b>51.5</b>	0	<b>0</b>
No, unaware of app	0	<b>0</b>	1	<b>0.9</b>	0	<b>0</b>

## Appendix B.8 – Use of *TNA* for enforcement

Have you used <i>TNA</i> to facilitate enforcement action						
	Scotland		England		Wales	
Use <i>TNA</i>	7		45		7	
Total responses	7		45		7	
Response rate to question as % of overall cohort (1dp)	100		100		100	
	Responses	% (1dp)	Responses	% (1dp)	Responses	% (1dp)
Yes	1	<b>14.3</b>	21	<b>46.7</b>	5	<b>71.4</b>
No	6	<b>85.7</b>	24	<b>53.3</b>	2	<b>28.6</b>

## Appendix B.9 – Benefits of TNA

What are the benefits of using TNA to your organisation?						
	Scotland		England		Wales	
Total responses	7		45		7	
Response rate to question as % of overall cohort (1dp)	100		100		100	
	Responses	% (1dp)	Responses	% (1dp)	Responses	% (1dp)
Improves complaints process for complainants	4	<b>57.1</b>	33	<b>73.3</b>	5	<b>71.4</b>
Effective screening tool	6	<b>85.7</b>	38	<b>84.4</b>	6	<b>85.7</b>
Acts as a deterrent to noise nuisance	0	<b>0</b>	8	<b>17.8</b>	1	<b>14.3</b>
Makes noise investigations easier for officers	4	<b>57.1</b>	29	<b>64.4</b>	3	<b>42.9</b>
Saves officer time	7	<b>100</b>	33	<b>73.3</b>	5	<b>71.4</b>
Obtains usable evidence for enforcement	3	<b>42.9</b>	24	<b>53.3</b>	3	<b>42.9</b>
Removes need for noise monitoring equipment in SOME noise investigations	7	<b>100</b>	33	<b>73.3</b>	5	<b>71.4</b>
Removes need for noise monitoring equipment in ALL noise investigations	0	<b>0</b>	0	<b>0</b>	0	<b>0</b>
Other, please specify	5	<b>71.4</b>	11	<b>24.4</b>	3	<b>3</b>
Would you recommend TNA to other LAs?						
Total responses	7		44		7	

Response rate to question as % of overall cohort (1dp)	100		97.8		100	
	Responses	% (1dp)	Responses	% (1dp)	Responses	% (1dp)
Yes	7	<b>100</b>	43	<b>97.7</b>	7	<b>100</b>
No	0	<b>0</b>	1	<b>2.3</b>	0	<b>0</b>

Appendix B.10 – Number of complaints received by Moray Council over like for like trial time period

	2020 time period		2019 time period		2018 time period	
	Complaints	% (1dp)	Complaints	% (1dp)	Complaints	% (1dp)
Domestic – non council	6	<b>22.2</b>	9	<b>15.8</b>	6	<b>11.8</b>
Domestic - council	9	<b>33.3</b>	15	<b>26.3</b>	18	<b>35.3</b>
Barking dogs - council	3	<b>11.1</b>	10	<b>17.5</b>	9	<b>17.6</b>
Barking dogs – non council	4	<b>14.8</b>	14	<b>24.6</b>	12	<b>23.5</b>
Other animals	2	<b>7.4</b>	0	<b>0</b>	0	<b>0</b>
Commercial	2	<b>7.4</b>	7	<b>12.3</b>	2	<b>3.9</b>
Industrial	1	<b>3.7</b>	1	<b>1.8</b>	2	<b>3.9</b>
Construction	0	<b>0</b>	1	<b>1.8</b>	2	<b>3.9</b>



## Appendix C – Diary sheet screenshot

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## Keeping a noise nuisance diary

A noise diary is a document on which you can record details of the noise disturbing you.

It contains entries for the time, description and the effect the noise had on you. The diary needs to be maintained by the complainant for two weeks or until it is full (whichever is sooner).

The Community Safety team use this diary to investigate the complaint.

Once completed, the record sheets should then be sent back to the Community Safety team.

If it is not returned after four weeks the team will send a reminder.

If the record sheets are still not returned after a further two weeks, the case will be closed.

If a noise pack is received by the Council at a later date and with information more than three months old, it may be necessary for a new pack to be sent out.

In order for the Community Safety team to take legal action on your behalf, an officer must first experience the noise and be satisfied that a statutory nuisance exists.

This means the noise occurring must be gross, persistent and regular and is likely to interfere with the reasonable enjoyment of your home.

If the Community Safety team cannot gather enough evidence to determine a statutory nuisance, or cannot take your case to court for other reasons, you can deal with the matter privately and take your case directly to the Magistrates' Court.

- [Noise diary](#) - use this diary to record instances on noise nuisance.
- [Noise a Guide for Neighbours](#) - useful tips for being a quiet neighbour and tips for dealing with noisy neighbours
- [Noise pollution decibels](#)
- [Noise pollution from fireworks](#)

(screen shot taken from:

<https://www.harrow.gov.uk/environment-parks/noise-nuisance/8?documentId=12444&categoryId=210270>)