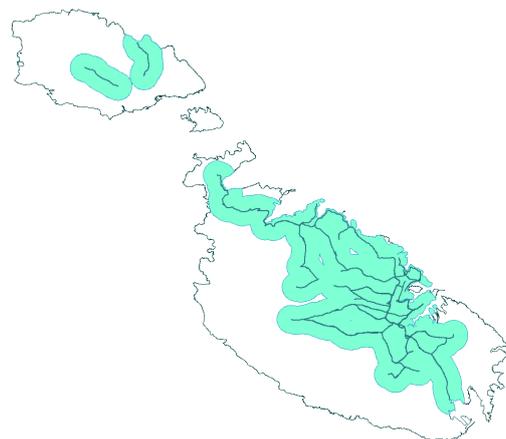
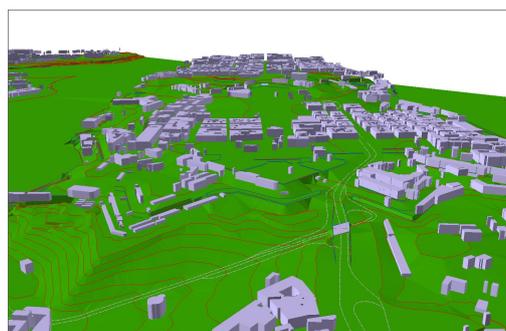
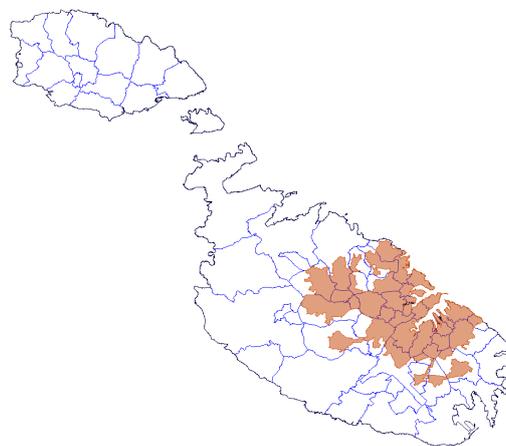


Consultancy and Field Surveys to Implement the EU Noise Directive 2002/49/EC in Malta

**Contract Ref. No.:
2332/2009**

Implementation of Directive 2002/49/EC in Malta



Document Code: 536-1-27/4

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Acustica Ltd

DARH2 Acoustics & Civil Engineering Ltd

Report for



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Executive Summary

Noise is normally defined as 'unwanted sound'. A more precise definition could be: noise is audible sound that causes disturbance, annoyance, impairment or damage to health. Adverse effects due to noise occur when the individuals intended activities are disturbed or disrupted. The World Health Organisation (WHO) defines health as a “*state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity*”.

There is an increasing body of research which demonstrates that if a certain population is exposed to substantial noise, many people will notice it and develop adverse feelings to this. Within a part of this exposed population, stress reactions, sleep-stage changes and other biological and biophysical effects may occur. These may in turn increase risk factors such as blood pressure. For a relatively small part of the population these factors may then develop into clinical symptoms like insomnia and cardiovascular diseases which, as a consequence, can even increase the death rate.

As part of the Community policy to achieve a high level of health and environmental protection, EC Directive 2002/49/EC relating to the assessment and management of environmental noise, commonly referred to as the Environmental Noise Directive (END), was established to pursue the Community objective to protect against the effects of environmental noise.

The Directive established a common approach to monitoring and managing environmental noise, including the use of common methods of assessment and common noise indicators. The objectives of the Directive are to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end the following actions are to be implemented in stages within each Member State:

- (a) Determine the exposure to environmental noise, through noise mapping, by common methods of assessment;
- (b) Ensure that information on environmental noise and its effects is made available to the public;
- (c) Adopt action plans, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.

The Directive also aims to provide a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery.

The Directive applies to environmental noise to which humans are exposed; in particular built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas; and in areas affected by noise from designated major road, railway or aircraft transport sources. This designation of urban agglomeration areas, and areas affected by major transport sources means that only certain areas within a Member State are covered by the Directive, not the whole country. Therefore, strategic noise maps and noise action plans are to be drawn up for areas inside designated agglomerations, and

areas in the vicinity of major roads, major railways and major airports. It is not required to draw up strategic noise maps or noise action plans for locations outside these designated areas.

The Directive does not apply to noise that is caused by the exposed person himself, noise from domestic activities, noise created by neighbours, noise at work places or noise inside means of transport or due to military activities in military areas. This specifically excludes neighbourhood noise, entertainment noise, workplace noise and military noise; which are to be addressed by other means.

The Directive sets out specific information on the results of the strategic noise mapping which are to be reported to the EC every five years. The first round reports were to be submitted by 31 December 2007, the second round reports are due by 31 December 2012. The Directive also sets out specific information on the action planning which is to be reported to the EC every five years. The first round reports were to be submitted by 18 January 2009, the second round reports are due by 18 January 2014.

In Malta, the Directive was transposed by the “*Assessment and Management of Environmental Noise Regulations, 2004*”, L.N. 193 of 2004 (Regulations). The Regulations were made by the Minister for Rural Affairs and the Environment under the Environmental Protection Act, 2001 (CAP. 435), subsequently amended in 2005. The Regulations designate the Malta Environment and Planning Authority (MEPA) as the competent authority for the making of strategic noise maps, the publication of information on environmental noise, and the drawing up of action plans.

Approach

Prior to the introduction of the Regulations there was no legislative framework established in Malta to manage environmental noise. The Regulations transpose the Directive in Maltese law, and bestow certain powers and responsibilities on the Malta Environment and Planning Authority (MEPA). Whilst the Directive and Regulations set out a process to be followed on a five yearly cycle, they do not set out a strategy or methodology for how the required actions are to be undertaken, or to what goals or objectives the noise action plans should aspire.

This report sets out a strategy for the monitoring and management of environmental noise in Malta under the EU Noise Directive. This report is supplemented by two technical annexes which set out the detailed processes to be followed when drawing up strategic noise maps and noise action plans under the Directive:

- 536-1-28 Strategic Noise Mapping in Malta
- 536-1-29 Noise Action Planning in Malta

These three reports together provide set out a strategy and methodology for the cycle of activity required under the Directive and Regulations. The strategy provides a framework for the main aims and objectives of the Regulations in Malta, whilst the two annexes set out detailed processes which provide a transparent and accountable set of activities designed to fulfil the objectives of the Regulations.

Conclusions and Recommendations

The END requires Member states to collect information on long term noise exposure due to road, rail, aircraft and industrial noise sources through the use of strategic noise mapping. This noise monitoring does not cover the whole country, rather just the areas

designated as being within an urban agglomeration, or in the vicinity of major transport routes above a defined flow threshold. These defined noise management zones therefore cover a part of the country, and a proportion of the population.

The required monitoring of environmental noise is undertaken with the aid of 3D noise assessment models and noise mapping software, and unlike air quality is not undertaken through the use of extensive measurement networks. Noise measurement equipment may be utilised to help capture or validate input data or source emission levels modelled with the strategic noise mapping process, and/or to validate the receptor immission levels at the noise sensitive locations within the action planning process, however it is not the primary tool used for monitoring environmental noise in line with the Directive, that is the role of the noise mapping software.

This report sets out the strategy for implementation of the END in Malta, and within two technical Annexes provides detailed processes to be followed when undertaking strategic noise mapping and noise action planning in the future.

The process for strategic noise mapping in Malta describes the use of measurements to validate the source noise emission levels used within the mapping. Part of the process for noise action planning in Malta requires validation of the receptor noise immission level at the noise sensitive location. These procedures lead to a proposal being developed for equipment and staff requirements in order to undertake this work. The requirements for equipment were then used to form the basis of the procurement notice technical specification delivered in a separate report.

The project has included the drawing up of initial strategic noise maps for major roads in Malta in line with the requirements of the first round of the Directive. This work is detailed in a separate report. A summary of the lessons learnt and recommendations for the future which have come out of this work is set out within this implementation report.

The requirements for equipment and personnel from the noise mapping and action planning processes were then combined with the recommendations coming out of the initial strategic noise mapping, and they were used to develop a series of high level short, medium and long term objectives for monitoring of environmental noise in Malta, these are set out below:

Short term objectives, by the end of the current contract in March 2011:

- Deliver strategic noise mapping for Round 1 of Directive to the EC,
- Deliver contract documentation for the procurement of noise measurement equipment and noise mapping software to improve the capability of MEPA to monitor environmental noise; and
- Deliver a long term strategy for monitoring environmental noise in Malta.

Medium term objectives

- Using the R1 strategic noise maps as a basis, meet reporting obligations for Round 2 in a timely manner, and deliver strategic noise mapping for Round 2 of the Directive to the EC by 30 December 2012;
- Improve stakeholder engagement and improve collaboration by establishing a cross-departmental working group on strategic noise mapping;

- Utilise improved input data delivered via GIS enabling of Government agencies, the proposed Inspire portal and especially the wider environmental monitoring programme, specifically LiDAR survey results;
- Develop capacity within MEPA to deliver the requirements of the noise action planning process set out within the strategy,
 - including additional personnel required to undertake the work set out; and
 - including staff training to enable effective use of the technical measurement equipment and noise mapping software procured.

Long-term objectives

- Develop a unified spatial data infrastructure for sharing relevant datasets between stakeholders;
- Improve quality of underlying datasets;
- Improve quality of mapping results through training, better input data and verification through source emission measurements and medium term immission measurements;
- Develop planning guidance to help protect the future noise environment:
 - Guidance on assessment of noise on proposed residential developments; and
 - Guidance on control of potential of noise impacts from proposed developments on existing residential areas
- Assess the potential for introducing noise limits to control impact on noise sensitive locations;
- Assess the potential for expanding the noise management zones to cover the whole of the Maltese islands to provide consistent protection for all inhabitants;
- Increase institutional capacity to become increasingly self sufficient for noise action planning and strategic noise mapping:
 - Develop expertise in strategic noise mapping through procurement of personnel and training;
 - Develop expertise in noise action planning and noise mitigation through procurement of personnel and training;
- Report results of strategic noise mapping to the EC on 5 yearly cycle in line with deadlines.

This implementation report sets a strategy for the management of environmental noise in Malta. It is based upon the monitoring of environmental noise through strategic noise mapping, and management of environmental noise through the dual approach of protection of the future noise climate, and reduction of the existing noise climate where necessary.

A methodology for delivering the strategy is set out which includes a series of identified short, medium and long term objectives to be attained by the MEPA Noise team. In support of the strategy and methodology there are two separate technical annexes which contain detailed processes to be followed in subsequent rounds of strategic noise mapping and noise action planning required under the Directive. The strategic noise mapping process will be followed on a five yearly cycle in order to produce and deliver the results required by the EC. The action planning process is an ongoing approach to identifying and mitigating noise where necessary.

The framework of the Regulations and the Action Plans creates an opportunity to establish a cross departmental noise steering committee charged with a remit to set out design targets and guidance at national or local level in order to help ensure that future developments include provisions to protect the population from the effects of environmental noise. Planning guidance relating to noise would help to support the aims of the Environmental Noise Regulations and Noise Action Plans by providing tools for the planners to use when assessing and granting new developments.

The long term objective include the introduction of planning guidance on noise, which will help to deliver long term management of environmental noise with the aim of reducing the potential for high noise exposure resulting from future development.

Through these three approaches; namely strategic mapping, action planning and development controls; the aims and objectives of the Directive can be delivered through the control and management of environmental noise.

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1 Introduction

Noise is normally defined as 'unwanted sound'. A more precise definition could be: noise is audible sound that causes disturbance, annoyance, impairment or damage to health. Adverse effects due to noise occur when the individuals intended activities are disturbed or disrupted. The World Health Organisation (WHO) defines health as a “*state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity*”.

There is an increasing body of research which demonstrates that if a certain population is exposed to substantial noise, many people will notice it and develop adverse feelings to this. Within a part of this exposed population, stress reactions, sleep-stage changes and other biological and biophysical effects may occur. These may in turn increase risk factors such as blood pressure. For a relatively small part of the population these factors may then develop into clinical symptoms like insomnia and cardiovascular diseases which, as a consequence, can even increase the death rate.

As part of the Community policy to achieve a high level of health and environmental protection, EC Directive 2002/49/EC relating to the assessment and management of environmental noise, commonly referred to as the Environmental Noise Directive (END), was established to pursue the Community objective to protect against the effects of environmental noise.

The Directive established a common approach to monitoring and managing environmental noise, including the use of common methods of assessment and common noise indicators. The objectives of the Directive are to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end the following actions are to be implemented in stages within each Member State:

- (a) Determine the exposure to environmental noise, through noise mapping, by common methods of assessment;
- (b) Ensure that information on environmental noise and its effects is made available to the public;
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The Directive also aims to provide a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery.

The Directive applies to environmental noise to which humans are exposed; in particular built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas; and in areas affected by noise from designated major road, railway or aircraft transport sources. This designation of urban agglomeration areas, and areas affected by major transport sources means that only certain areas within a Member State are covered by the Directive, not the whole country.

The Directive does not apply to noise that is caused by the exposed person himself, noise from domestic activities, noise created by neighbours, noise at work places or noise inside means of transport or due to military activities in military areas.

The Directive sets out specific information on the results of the strategic noise mapping which are to be reported to the EC every five years. The first round reports were to be submitted by 31 December 2007, the second round reports are due by 31 December 2012. The Directive also sets out specific information on the action planning which is to be reported to the EC every five years. The first round reports were to be submitted by 18 January 2009, the second round reports are due by 18 January 2014.

In Malta, the Directive was transposed by the “*Assessment and Management of Environmental Noise Regulations, 2004*”, L.N. 193 of 2004 (Regulations). The Regulations were made by the Minister for Rural Affairs and the Environment under the Environmental Protection Act, 2001 (CAP. 435), subsequently amended in 2005. Following the passing of CAP 504, *Environment and Development Planning Act, 2010*, the regulations were subsequently renumbered as Subsidiary Legislation 504.63 of 2007, *Assessment and Management of Environmental Noise Regulations, 2004*. The Regulations designate the Malta Environment and Planning Authority (MEPA) as the competent authority for the making of strategic noise maps, the publication of information on environmental noise, and the drawing up of action plans.

1.1 Scope

Prior to the introduction of the Regulations there was no legislative framework established in Malta to manage environmental noise. The Regulations transpose the Directive in Maltese law, and bestow certain powers and responsibilities on the Malta Environment and Planning Authority (MEPA). Whilst the Directive and Regulations set out a process to be followed on a five yearly cycle, they do not set out a strategy or methodology for how the required actions are to be undertaken, or to what goals or objectives the noise action plans should aspire.

This report sets out a strategy for the monitoring and management of environmental noise in Malta under the EU Noise Directive. This report is supplemented by two technical annexes which set out the detailed processes to be followed when drawing up strategic noise maps and noise action plans under the Directive:

- 536-1-28 Strategic Noise Mapping in Malta
- 536-1-29 Noise Action Planning in Malta

These three reports together provide set out a strategy and methodology for the cycle of activity required under the Directive and Regulations. The strategy provides a framework for the main aims and objectives of the Regulations in Malta, whilst the two annexes set out detailed processes which provide a transparent and accountable set of activities designed to fulfil the objectives of the Regulations.

1.2 Report Outline

This report is set out as follows:

- Chapter 1: Introduction
- Chapter 2: Background
- Chapter 3: Overview of Strategic Noise Mapping and Action Planning
- Chapter 4: Initial Assessment of Noise Exposure in Malta

- Chapter 7: Environmental Noise Management Strategy
- Chapter 8: Conclusions and Recommendations

Further information is set out in the Appendices at the end of the document.

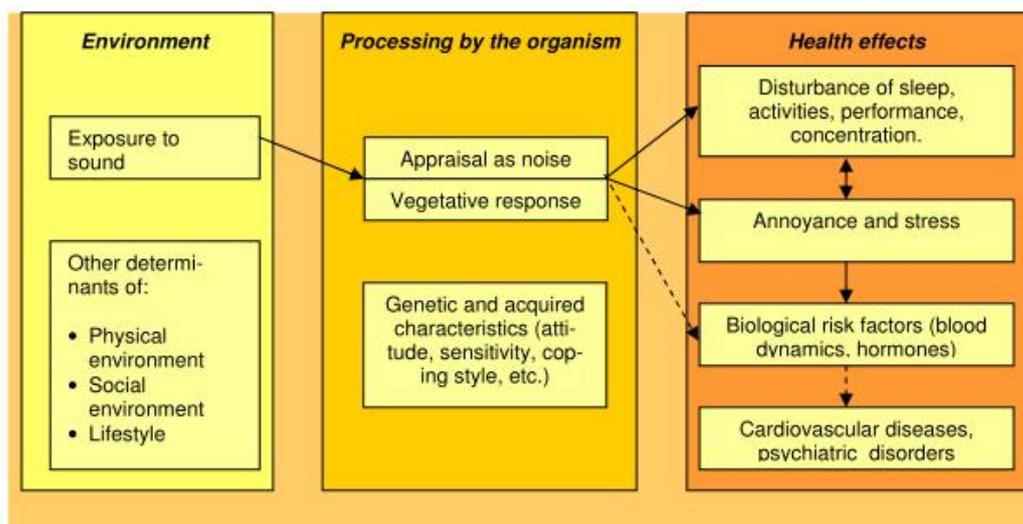
2 Background

2.1 Noise and Health

There are many different effects of noise, and individuals experience each of them to different degrees. It is known that noise can disturb human activity, by causing distraction or by physically interfering with it. These effects can include:

- Annoyance;
- Mental health effects;
- Cardiovascular and other physiological effects;
- Sleep disturbance;
- Cognitive effects on children;
- General detection/distraction;
- Speech interference; and
- Disruption of work/mental activity.

Any of these can lead to annoyance and possibly more overt reactions, including complaints.



Source: HCN (Health Council of the Netherlands), 1999.

Figure 2.1: The mechanism of noise-induced health effects

Figure 2.1 summarises the potential mechanisms of noise-induced health effects and their interactions. In the first place, noise exposure can lead to disturbance of sleep and daily activities, to annoyance and to stress. This stress can in turn trigger the production of certain hormones (e.g. cortisol, noradrenalin and adrenaline), which may lead to a variety of intermediate effects, including increased blood pressure. Over a prolonged

period of exposure these effects may in their turn increase the risk of cardiovascular disease and psychiatric disorders.

The degree to which noise leads to disturbance, annoyance and stress depends partly on individual characteristics, in particular a person's attitude and sensitivity to noise. Finally, the relation between noise and personal health and well-being is also influenced by external factors like physical and social environment and lifestyle.

Figure 2.2 illustrates how exposure to noise affects health and wellbeing. Of a total population exposed to substantial noise, many people will notice it and develop adverse feelings to this. Within a part of this exposed population, stress reactions, sleep-stage changes and other biological and biophysical effects may occur. These may in turn increase risk factors like blood pressure. For a relatively small part of the population these factors may then develop into clinical symptoms like insomnia and cardiovascular diseases which, as a consequence, can even increase the death rate.

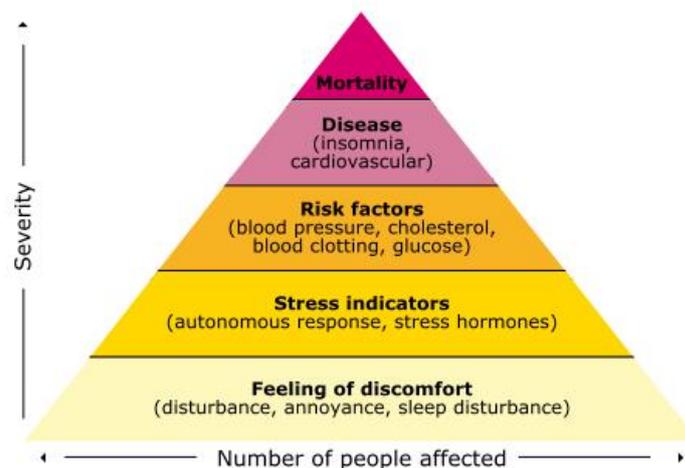


Figure 2.2: Pyramid of effects (WHO 1972, as modified by Babisch, W, 2002)

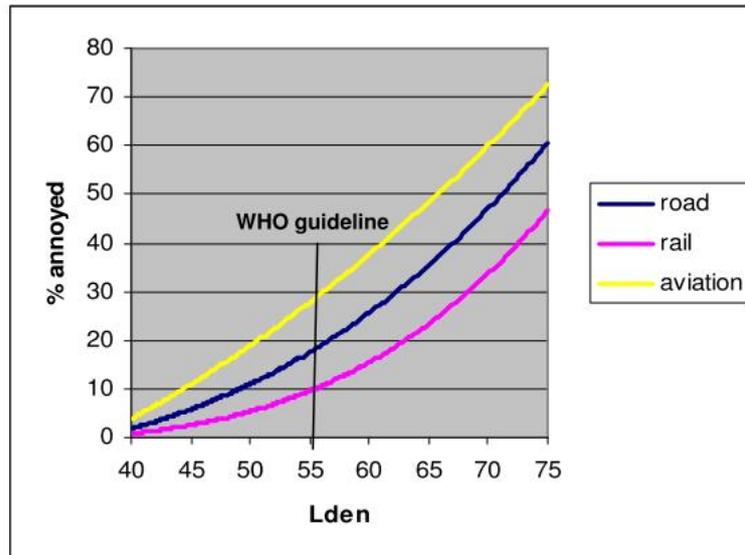
2.1.1 Annoyance

The most widespread problem created by noise is annoyance. Annoyance can be defined as a general feeling of displeasure or adverse reaction triggered by the noise. Among the ways it can express itself are fear, uncertainty and mild anger. In the urban environment road traffic is the dominant source of noise annoyance.

Figure 2.3 shows the population dose-response curves for annoyance due to long term exposure from noise due to road, rail and aircraft sources. It shows that aircraft noise is perceived as more annoying than road and rail traffic noise at the same noise level, L_{den} . At a noise level of 55 dB L_{den} , the guideline limit set by the WHO, approximately 30% of those exposed are annoyed by aircraft noise, about 20% by road traffic noise and about 10% by rail traffic noise. Some people begin to experience annoyance at traffic noise from noise levels of 40 dB(A) upwards.

The level of noise exposure is the primary link to the degree of annoyance perceived, the higher the noise level, the more people are annoyed and the greater the perceived annoyance. Annoyance is also related to other aspects of the noise, the higher the

frequency (pitch) the more annoyance is reported, whilst the duration and intermittency also influence the degree of annoyance.



Source: Miedema & Oudshoorn (2001).

Figure 2.3: Percentage of people annoyed as a function of noise exposure of dwellings (L_{den} in dB(A))

To some extent, people frequently exposed to traffic noise develop strategies of adapting and coping with the problem. The problem still remains, however: subconscious physical reactions, such as raised blood pressure, and levels of annoyance due to chronic noise will not diminish over time unless the noise itself is abated.

2.1.2 Sleep disturbance

There is plenty of evidence that sleep is a biological necessity, and disturbed sleep is associated with a number of health problems. Studies of sleep disturbance in children and in shift workers clearly show the adverse effects. Noise disturbs sleep by a number of direct and indirect pathways. Even at very low levels physiological reactions (increase in heart rate, body movements and arousals) can be reliably measured. Also, it was shown that awakening reactions are relatively rare, occurring at a much higher level than the physiological reactions.

The recent WHO night-noise guidelines¹ concluded:

“The review of available evidence leads to the following conclusions:

- *Sleep is a biological necessity and disturbed sleep is associated with a number of adverse impacts on health;*

¹ World Health Organisation, “Night Noise Guidelines for Europe”, 2009, ISBN 978 92 890 4173 7

- *There is sufficient evidence for biological effects of noise during sleep: increase in heart rate, arousals, sleep stage changes and awakening;*
- *There is sufficient evidence that night noise exposure causes self-reported sleep disturbance, increase in medicine use, increase in body movements and (environmental) insomnia;*
- *While noise-induced sleep disturbance is viewed as a health problem in itself (environmental insomnia), it also leads to further consequences for health and wellbeing;*
- *There is limited evidence that disturbed sleep causes fatigue, accidents and reduced performance; and*
- *There is limited evidence that noise at night causes hormone level changes and clinical conditions such as cardiovascular illness, depression and other mental illness.*

It should be stressed that a plausible biological model is available with sufficient evidence for the elements of the causal chain.”

2.1.3 Impaired cognitive functioning

Exposure to traffic noise can impair an adult’s cognitive functioning (information processing, understanding and learning). To have this effect, though, noise levels must be high, or the task complex or mentally demanding. Repetitive and simple tasks are unaffected by (road traffic) noise. The influence of noise on cognitive functioning depends on a person’s perceived control of the noise and its predictability.

In general, the following effects have been found for children exposed to high levels of traffic noise:

- Difficulty sustaining attention;
- Difficulty concentrating;
- Poorer discrimination between sounds and poorer perception of speech;
- Difficulty remembering, especially complex issues; and
- Poorer reading ability and school performance.

It is thought that ambient noise leads to a loss in the content of a teacher’s instruction, and consequently children may have problems with speech perception and language acquisition. This, in turn, can lead to impairment of children’s reading skills and vocabulary, and eventually to difficulties with other, higher-level processes, such as long-term memory for complex issues.

2.1.4 Cardiovascular disease

Exposure to traffic noise is associated with changes in blood pressure and increased risk of various types of heart disease (e.g. ischemic heart diseases, angina pectoris, myocardial infraction). Noise-induced cardiovascular diseases are considered to be the consequence of stress. Exposure to noise triggers the production of (stress) hormones like cortisol, noradrenaline and adrenaline. It does so both directly and indirectly, through disturbance of activities. These hormones may cause changes in the

values of a number of biological risk factors, such as hypertension (high blood pressure), blood lipids (e.g. cholesterol) and blood glucose. These risk factors can increase the risk of cardiovascular disease. Persistent exposure to environmental noise could therefore result in permanent changes to the vascular system, with elevated blood pressure and heart diseases as potential outcomes. The magnitude of these effects will be partly determined by individual characteristics, lifestyle behaviours and environmental conditions.

2.1.5 Health Endpoints

The EEA “*Good practice guide on noise exposure and potential health effects*”² presents a summary of the noise level threshold values associated with the onset of a range of health effects. These are shown in Table 2.1.

Table 2.1: Effects of noise on health and wellbeing with sufficient evidence (EEA Technical report No 11/2010)

Effect	Dimension	Acoustic indicator *	Threshold **	Time domain
Annoyance disturbance	Psychosocial, quality of life	L_{den}	42	Chronic
Self-reported sleep disturbance	Quality of life, somatic health	L_{night}	42	Chronic
Learning, memory	Performance	L_{eq}	50	Acute, chronic
Stress hormones	Stress Indicator	L_{max} L_{eq}	NA	Acute, chronic
Sleep (polysomnographic)	Arousal, motility, sleep quality	$L_{max, indoors}$	32	Acute chronic
Reported awakening	Sleep	$SEL_{indoors}$	53	Acute
Reported health	Wellbeing clinical health	L_{den}	50	Chronic
Hypertension	Physiology somatic health	L_{den}	50	Chronic
Ischaemic heart diseases	Clinical health	L_{den}	60	Chronic

Note: * L_{den} and L_{night} are defined as outside exposure levels. L_{max} may be either internal or external as indicated.
 ** Level above which effects start to occur or start to rise above background.

2.2 Population and Transport in Malta

The Republic of Malta is an archipelago of three islands located in the Mediterranean Sea, 93 km south of Sicily and 288 km east of Tunisia. The Islands have a total land area of 316 km² and comprise three main islands: Malta (246 km²), Gozo (67 km²) and Comino (2.7 km²). Malta has a total population of 412,970³. Malta has the highest population density in Europe of some 1,300 persons per square kilometre (2010), followed by the Netherlands with 490 persons per square kilometre.

² European Environment Agency Technical Report No 11/2010 “Good practice guide on noise exposure and potential health effects”, ISSN 1725-2237, October 2010

³ National Statistics Office, Malta, 09/07/10. Available from: http://www.nso.gov.mt/statdoc/document_view.aspx?id=2733&formAction=init&backUrl=%2fsite%2fpage.aspx [Assessed July 2010]

C1. Population: 1842-2005

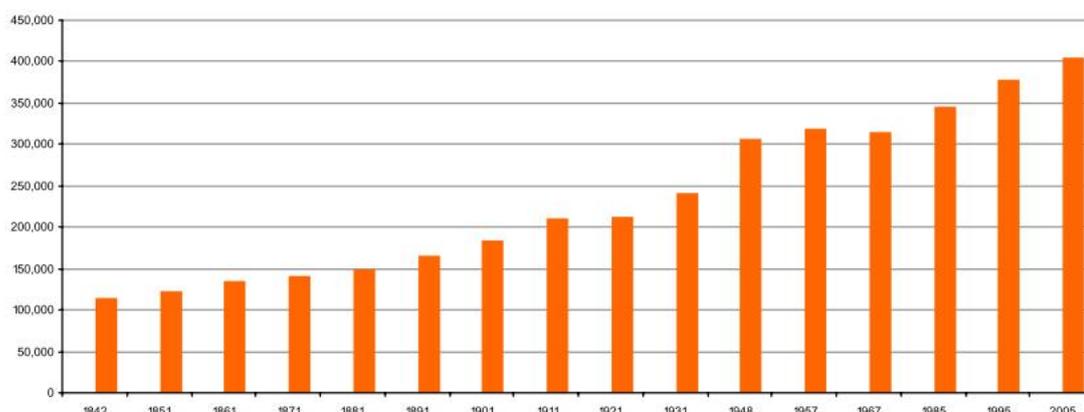


Figure 2.4: Population of Malta 1942 – 2005, NSO.

The population of Malta has grown substantially since the first national census in 1842, when the total population was 115,000, see Figure 2.4. In the past sixty years the population has increased by approximately one third, from 305,000 in 1948 to almost 405,000 in 2005⁴.

Figure 2.5 shows the population density map of Malta, based upon the 2005 Census data. A population density of <math><150 \text{ inh/km}^2</math> (green) is regarded by OECD as being a rural area, whilst a population density of >math>>500 \text{ inh/km}^2</math> (pink or red) is widely regarded as indicating an urban area. The main centre of population is centred on Valetta, and stretches from Zabbar in the East, to Naxxar in the West.

The rapidly rising population has led to an expansion in the urban fabric of Malta, which coupled to the economic development of Malta has caused a significant rise in the number of road vehicles operating on the islands. The total number of licensed vehicles in 1995 was 204,000, which subsequently increased by 50% over the next 15 years to 301,000 at present; which represents a vehicle density of 980 vehicles/km². Based upon 2008 data, it was estimated that car density is the fourth highest in Europe at 555 per 1,000 inhabitants⁵, compared to an EU average of 470, see Figure 2.6.

⁴ *Census of Population and Housing 2005, Volume 1: Population*, National Statistics Office, 2007.

⁵ *The Automobile Industry Pocket Guide, Key Figures, Vehicles in Use 2008*, European Automobile Manufacturers Association, 2010. Available from: http://www.acea.be/index.php/news/news_detail/vehicles_in_use/ [Accessed July 2010]

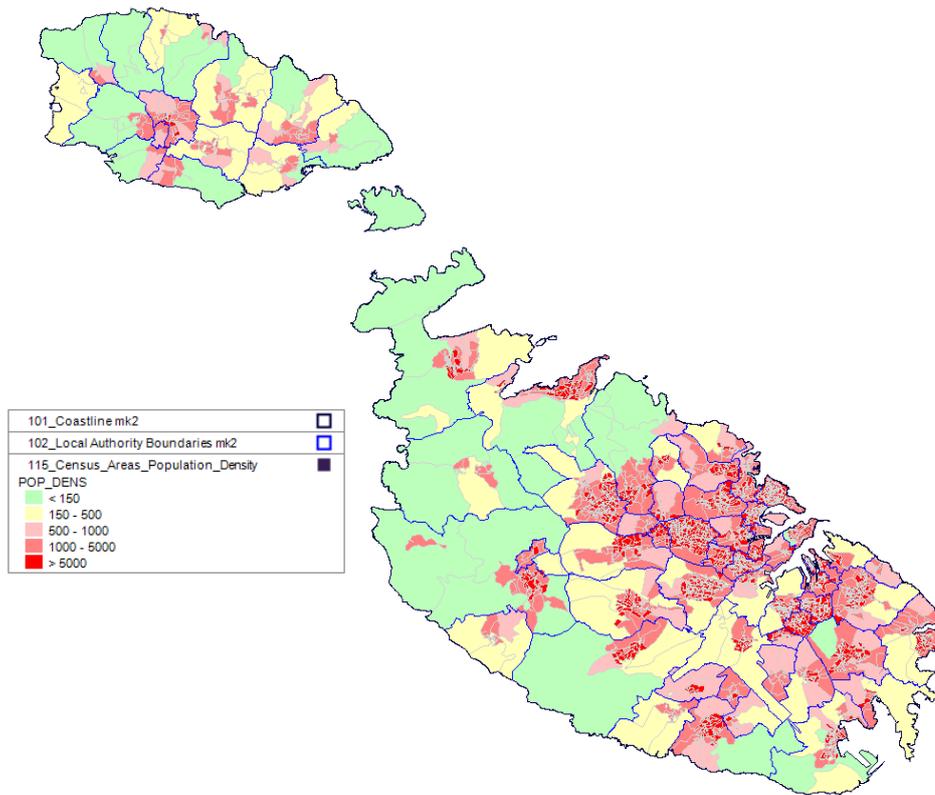


Figure 2.5: Population density (inhabitants/km2) derived from 2005 Census Output Areas

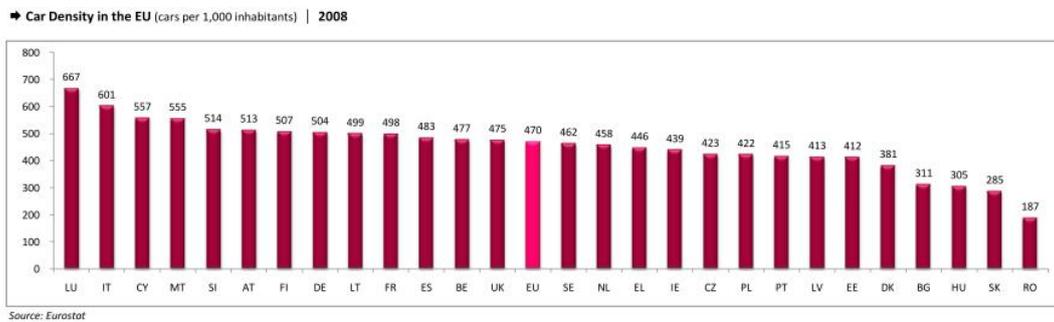


Figure 2.6: Car density in the EU, 2006

Figures from Transport Malta, published by NSO⁶ indicate that in 2008 there were a total of 294,658 licensed motor vehicles, of which 222,775 were private cars, 48,210 were commercial vehicles, 14,411 were motorcycles and 9,262 “other”. The NSO reported a total of 712 licensed vehicles per 1,000 population, and 539 passenger cars per 1,000 inhabitants.

Malta International Airport is the islands’ main airport, servicing 3,124,846⁷ passengers in 2008, with a strong bias towards the summer months when tourism results in a large influx of visitors to the islands, as shown in Figure 2.7.

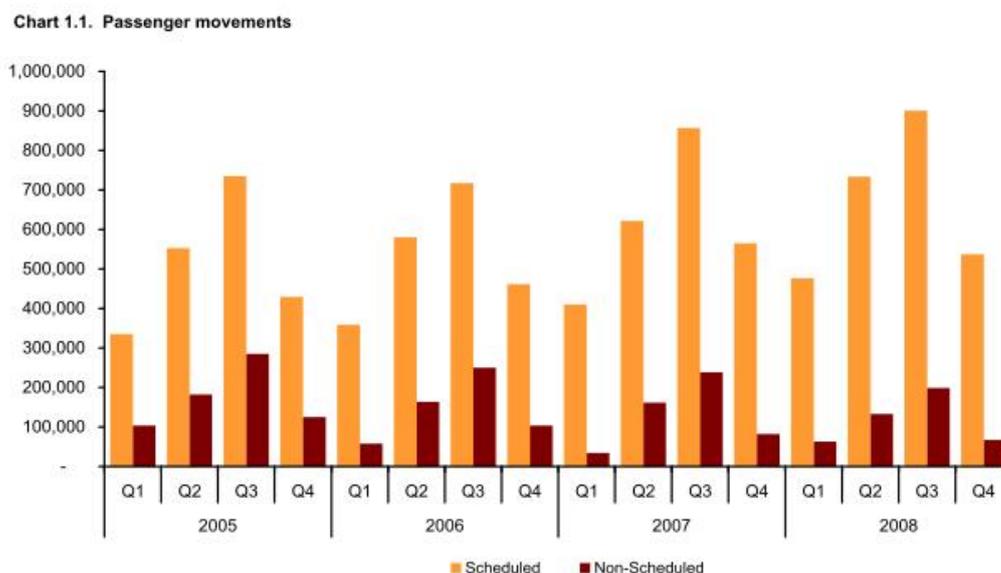


Figure 2.7: Air passenger movements 2005-2008, NSO

Information available from the airport⁸ indicates that in 2006 there were a total of 24,711 aircraft movements and 2,692,019 passenger movements. In 2009 these figures had increased to 26,305 aircraft movements, with most flights to and from the UK, Germany and Italy.

Between 1883 and 1931, Malta had a railway line which connected Valletta to the army barracks at Mtarfa via Mdina and a numbers of smaller towns and villages. The railway fell into disuse and was eventually closed. There is now little evidence remaining of the original railway stations or tracks, many of which were used as the basis for roads⁹, and presently there are no plans to re-introduce railways to Malta.

⁶ *Malta in Figures 2009*, National Statistics Office, Malta, 2009.

⁷ *Malta Transport Statistics 2009*, National Statistics Office, Malta, 2009.

⁸ *Annual Statistical Summary*, Malta International Airport plc, 2009. Available from: <http://www.maltaairport.com/page.asp?n=statistics> [Accessed July 2010]

⁹ *Malta Railway, Brief History*. Available from: <http://www.maltarailway.com/history/history.html> [Accessed July 2010]

2.3 Legislative Background

Directive 2002/49/EC of the European Parliament and of the Council relates to the assessment and management of environmental noise, and is commonly referred to as the Environmental Noise Directive or END.

The aim of the Directive is:

“to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise”.

The underlying principles are¹⁰:

- Monitoring the environmental problem;
- Informing and consulting the public;
- Addressing local noise issues; and
- Developing a long-term EU strategy.

And to that end three stages are set out:

- Undertake strategic noise mapping to determine exposure to environmental noise; this monitors the environmental problem by observing and collecting data;
- Ensure information on environmental noise and its effects is made available to the public; this is in line with the principle of the Aarhus Convention¹¹; and
- Adopt action plans, based upon the noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.

The Directive does not set any limit value, nor does it prescribe the measures to be used in the action plans, which remain at the discretion of the Member States and competent authorities, in the case of Malta this would be the Office of the Prime Minister (OPM) and Malta Environment and Planning Authority (MEPA).

The information on the results of the Strategic Noise Mapping assessment, and the proposal set out within the Action Plans, are reported to the EC to provide evidence to support the development of long-term EU strategy. This may include objectives to reduce the number of people affected, and provides a framework for developing existing Community policy on noise reduction from sources.

The Directive defines noise mapping, strategic noise maps and action plans as:

- ‘noise mapping’ shall mean the presentation of data on an existing or predicted noise situation in terms of a noise indicator, indicating breaches of any relevant limit value in force, the number of people affected in a certain area, or the

¹⁰ European Commission, *The Directive on Environmental Noise*. Available from: <http://ec.europa.eu/environment/noise/directive.htm> [Accessed July 2010]

¹¹ *Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*. Available from: <http://www.unece.org/env/pp/> [Accessed July 2010]

number of dwellings exposed to certain values of a noise indicator in a certain area;

- ‘strategic noise map’ shall mean a map designed for the global assessment of noise exposure in a given area due to different noise sources or for overall predictions for such an area;
- ‘action plans’ shall mean plans designed to manage noise issues and effects, including noise reduction if necessary.

The END requires Member States to produce strategic noise maps for the main sources of environmental noise, i.e. major roads, major railways, major airports and agglomerations with a population of more than 250,000 persons in 2007.

For the second and subsequent rounds of strategic noise mapping and action planning under the END, the population threshold for assessment of agglomerations is reduced from 250,000 to 100,000 persons, and the traffic flow thresholds for major roads and major railways are reduced from 6 million to 3 million and 60,000 to 30,000 vehicle passages per year respectively. The flow threshold for major airports remains at 50,000 movements per year.

This change in assessment thresholds will result in a significant increase in the coverage of the strategic noise mapping, several Member States have estimated a fivefold to sevenfold increase in the length of qualifying major roads for example.

The Directive is transposed separately in each Member state of the EU into local legislation. In Malta, the END is transposed by the “*Assessment and Management of Environmental Noise Regulations, 2004*”, L.N. 193 of 2004 (Regulations). The Regulations were made by the Minister for Rural Affairs and the Environment under the Environmental Protection Act, 2001 (CAP. 435), subsequently amended in 2005. Following the passing of CAP 504, *Environment and Development Planning Act, 2010*, the regulations were subsequently renumbered as Subsidiary Legislation 504.63 of 2007, *Assessment and Management of Environmental Noise Regulations, 2004*.

2.4 Designated Bodies

The Regulations state that the designated competent authority for the making of strategic noise maps, the publication of information on environmental noise, and the drawing up of action plans, is the Malta Environment and Planning Authority (MEPA)¹². The Minister responsible for the environment retains the power to designate other bodies or persons as the competent authority for different provisions and different purposes of the Regulations.

This is in line with the activities of the Authority, which is responsible for environmental enforcement, whilst the Department of Rural Affairs and the Environment was responsible for environmental policy in 2004. The Department is now the Ministry for Resources and Rural Affairs, and environmental policy is now the responsibility of the Office of the Prime Minister (OPM).

The Regulations empower MEPA through the development of action plans to set up noise management zones, or to designate quiet areas either inside agglomerations or in open countryside, or to establish noise reduction programmes where necessary.

¹² Article 4

2.5 Scope of the Noise Management Zones

The Strategic Noise Maps are to be made as part of the first phase of work under the Directive. The Regulations set out to:

*“define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise.”*¹³

The Regulations are to apply to environmental noise to which people are exposed, in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals, and near other noise-sensitive buildings and areas.¹⁴

The Regulations shall not apply to noise that is caused by the exposed person himself, noise from domestic activities, noise created by neighbours, noise at work places or noise inside means of transport or due to military activities in military areas.¹⁵

In the context of the Regulations, environmental noise is defined as unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity.¹⁶

Furthermore the Strategic Noise Maps are not to cover the whole of Malta; rather the areas covered by the Strategic Noise Maps are defined as those areas which are affected by environmental noise.¹⁷

In line with the Directive the Regulations set out the requirement for the areas to be included within the scope of the strategic noise maps and action plans, namely the designated agglomerations and the areas affected by noise from major roads, railways and airports above the relevant flow threshold. In the case of Malta this means that the noise management zones will be the area covered by the designated agglomeration, and areas in the vicinity of the roads outside the agglomeration which are designated as being above the relevant flow threshold.

Within the agglomeration noise from roads, aircraft, industry and commercial ports is to be assessed and managed. Outside the agglomeration noise from section of roads above the flow threshold are to be considered. This results in only a part of Malta falling within the noise management zones, and is a consequence of the current wording of the Directive. If local policy determines it appropriate, it is possible to extend the noise management zones to cover the entire country, however this is considered to be a decision for the OPM to take in consultation with MEPA. At present MEPA is responsible for fulfilling the requirements set out in the Regulations.

2.6 Timetable and Reporting Requirements

2.6.1 Reporting under the Directive

Annex VI of the Directive sets out details of the data to be sent to the Commission in connection with the work required. The Member States within the EC need to submit the results of the strategic noise mapping and action planning to the Commission. As

¹³ Article 2 (1)

¹⁴ Article 3 (1)

¹⁵ Article 3 (2)

¹⁶ Article 4

¹⁷ Article 8 (1)

the designated competent authority it is the responsibility of MEPA to report the results of the strategic noise mapping and action planning to the Commission.

To this end the EC have published the recommended Electronic Noise Data Reporting Mechanism (ENDRM)¹⁸ for reporting under the END, which sets out 11 Data Flow templates covering the Member State (MS) reporting obligations set out in the Directive. The Data Flows cover the first and second round implementations of the END with deadlines ranging from 2005 to 2014.

The information reported to the EC under the various data flows may be updated at any time by MEPA.

The following timetable applies with regard to the reporting requirements for the first round of actions under the END:

- **30 June 2005** – Report to be submitted to the European Commission (EC) by MEPA designating the major roads, major railways, major airports and agglomerations relevant to the 1st round of the END – ENDRM DF1;
- **18 July 2005** – Report to be submitted to the EC by MEPA identifying the competent bodies for strategic noise maps, action plans and data collection – ENDRM DF0 and DF2;
- **18 July 2005** – Report to be submitted to the EC by MEPA identifying noise limit values in force or planned and associated information – ENDRM DF3;
- **30 December 2007** - Report to be submitted to the EC by MEPA containing strategic noise maps related data as listed in Annex VI for major roads, railways, airports and agglomerations concerned by 1st round in respect of the 2006 calendar year – ENDRM DF4;
- **18 January 2009** - Report to be submitted to the EC by MEPA providing details of any noise control programmes that have been carried out in the past and noise-measures in place – ENDRM DF6; and
- **18 January 2009** – Report to be submitted to the EC by MEPA providing summaries of action plans related data as listed in annex VI for major roads, railways, airports and agglomerations concerned by 1st round, and any criteria used in drawing up action plans – ENDRM DF7.

The EC recommended Reporting Mechanism for the END, is documented in the report *Reporting Mechanism proposed for reporting under the Environmental Noise Directive 2002/49/EC*, EC DG Environment, October 2007 (ENDRM)¹⁹. More recently the submission of reports has moved to the European Environment Agency (EEA) EIONET/Reportnet online system, which contains up to date guidance, report templates and online checking tools to support submission of the required reports²⁰.

¹⁸ Available at:

http://circa.europa.eu/Public/irc/env/d_2002_49/library?l=/reporting_mechanism/reporting_mechanism&vm=detail&sb=Title [accessed July 2010]

¹⁹ Available from:

http://circa.europa.eu/Public/irc/env/d_2002_49/library?l=/reporting_mechanism/reporting_mechanism&vm=detail&sb=Title [Accessed July 2010].

²⁰ EEA EIONET available from: <http://www.eionet.europa.eu/> [Accessed July 2010].

The above timetable is to be repeated on a 5 year cycle. This results in strategic noise mapping information being submitted for future rounds in 2012, 2017, 2022, 2027 etc with Action Plan reports being submitted one year after each.

To illustrate the ongoing reporting requirements, the following timetable applies with regard to the reporting requirements for the second round:

- **31 December 2008** – Report to be submitted to the EC by MEPA designating major roads, major railways, major airports and agglomerations designated as relevant to the 2nd round thresholds of the END – ENDRM DF5;
- **30 June 2010** – Report to be submitted to the European Commission (EC) by MEPA designating the major roads, major railways, major airports and agglomerations relevant to the 1st round thresholds of the END – ENDRM DF1;
- **31 December 2012** - Report to be submitted to the EC by MEPA containing strategic noise maps related data as listed in Annex VI for major roads, railways, airports and agglomerations concerned by 2nd round in respect of the 2011 calendar year – ENDRM DF8;
- **18 January 2014** - Report to be submitted to the EC by MEPA providing details of any noise control programmes that have been carried out in the past and noise-measures in place – ENDRM DF9; and
- **18 January 2014** – Report to be submitted to the EC by MEPA providing summaries of action plans related data as listed in annex VI for major roads, railways, airports and agglomerations concerned by 2nd round, and any criteria used in drawing up action plans – ENDRM DF10.

2.6.2 *Reporting under the Regulations*

In addition to these reporting requirements laid down by the Directive, and delivered to the European Environment Agency (EEA) via Reportnet, the Regulations set out certain other deadlines and reporting requirements:

- **30 June 2007** – MEPA to have completed strategic noise maps for the preceding calendar year (2006) for all designated agglomerations, major roads, major railways and major airports²¹;
- **18 July 2008** – MEPA to have draw up action plans designed to manage noise issues and effects, including noise reduction is necessary²²;
- **30 June 2012** – MEPA to have completed strategic noise maps for the preceding calendar year (2011) for all designated agglomerations, major roads, major railways and major airports²³;
- **18 July 2013** – MEPA to have draw up action plans designed to manage noise issues and effects, including noise reduction is necessary²⁴;
- **Date not specified** - MEPA shall set up a database of information on strategic noise maps in order to facilitate compilation of a report to assess the need for

²¹ Article 8 (1)

²² Article 9 (1)

²³ Article 8 (2)

²⁴ Article 9 (2)

further actions on environmental noise, such as: medium and long term goals for the reduction of the number of people exposed; reduction of noise emission by specific sources; and protection of quiet areas in open country. The report shall contain strategies and measures, shall be reviewed every five years, include an assessment of the implementation of the Regulations, and propose amendments to the Regulations if appropriate²⁵.

2.6.3 Information to the Public

Within the context of the Regulations, and the Directive, the strategic noise maps are to serve as a public statement of the extent to which environmental noise currently affects the area covered by the maps, and to provide the basis of evidence for the development of noise action plans.

To this end information for the public on strategic noise maps, should be clear and comprehensible, and include a summary setting out the most important points²⁶.

Dissemination to the public should be via any appropriate means, including through the use of available information technologies²⁷, and should be in accordance with relevant Regulations. On dissemination, the Directive states that it should be in “accordance with relevant Community legislation, in particular Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment”, which has subsequently been repealed and replaced by Directive 2003/4/EC of 28 January 2003 on public access to environmental information. Directive 2003/4/EC is transposed into Maltese law as S.L. 435.61, Freedom of Access to Information on the Environment Regulations, L.N. 116 of 2005.

European Commission Working Group Assessment of Exposure to Noise (WG-AEN) have developed a Position Paper on “Presenting Noise Mapping Information to the Public”, March 2008²⁸. This provides clear guidance, advice and examples of best practice on how to publish noise mapping information. One important aspect which the position paper covers is the need for suitable supporting information and explanation alongside the noise mapping results in order for the relevance and context of the results to be conveyed.

2.6.4 Cycle of Activity

The timetable and reporting requirements set out above demonstrates that whilst there may be a peak of activity preparing the strategic noise maps and then through to preparing the action plans, there remains an ongoing requirement to undertake work in connection with the Directive and Regulations in order to meet the various national and EC reporting requirements throughout the whole 5 yearly cycle

2.7 Aspects of Noise Management

In order to understand the position of environmental noise control within the wider landscape of noise management it is worth considering the draft I-INCE publication “A

²⁵ Articles 11 and 12

²⁶ Article 10 (2)

²⁷ Article 10 (1)

²⁸ Available from: http://circa.europa.eu/Public/irc/env/noise_map/library?l=/wg-aen_001_2008doc/_EN_1.0_&a=d [accessed July 2010]

Global Approach to Noise Control Policy”²⁹ which classifies three areas of noise policy:

- Occupational Noise
 - Unwanted sound in the workplace, indoors or outdoors, caused by sources in the vicinity of a workplace;
- Community Noise
 - Unwanted sound in a non-occupational setting, indoors or outdoors, caused by sources over which an individual has little or no control, including sounds produced by neighbours; and
- Consumer Product Noise
 - Unwanted sound at the position of a user or bystander of a noise-producing product over which an individual may have some control, including noise in passenger compartments of vehicles, but excluding occupational and community noise.

As discussed above, occupational and consumer product noise are covered by separate Regulations and are the responsibilities of the Occupational Health and Safety Authority, and Malta Standards Authority respectively.

The I-INCE description of community noise covers a wide range of situations:

- New roads, railways, airports, industry or recreational activities adjacent to residential properties or noise sensitive premises such as schools or hospitals, or recreational spaces;
- New residential properties or noise sensitive premises such as schools or hospitals, adjacent to existing roads, railways, airports, industry or recreational activities;
- The development of mixed residential/commercial use buildings, and multi-part residential buildings;
- The management of noise levels within noise sensitive properties, such as schools and hospitals, to address external noise break-in, as well as room to room transmission and noise levels within public spaces;
- Noisy neighbours, barking dogs;
- Gardening machinery, construction activities, ice cream vans and street cleaning;
- Air-conditioning equipment;
- Public house, night clubs, restaurants or other recreational activities; and
- Industrial operations, workshops and factories.

²⁹ Noise Control Engineering. J. 52 (6), 2004 Nov–Dec

In line with the provisions of the Directive, the Assessment and Management of Environmental Noise Regulations, S.L.435.59, are designed to cover environmental noise as defined as:

“unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity”³⁰.

The Regulations are thus concerned with certain aspects of the I-INCE description of community noise, whilst other aspects could be described as noise nuisance or neighbourhood noise issues and should be managed and controlled via other legislation and guidance.

It is suggested that a fully encompassing noise management policy would provide guidelines, targets, and possibly limits across all aspects of occupational, community and consumer product noise, backed up by legislative powers and regulations as appropriate, however this discussion is limited to the scope of the Environmental Noise Regulations.

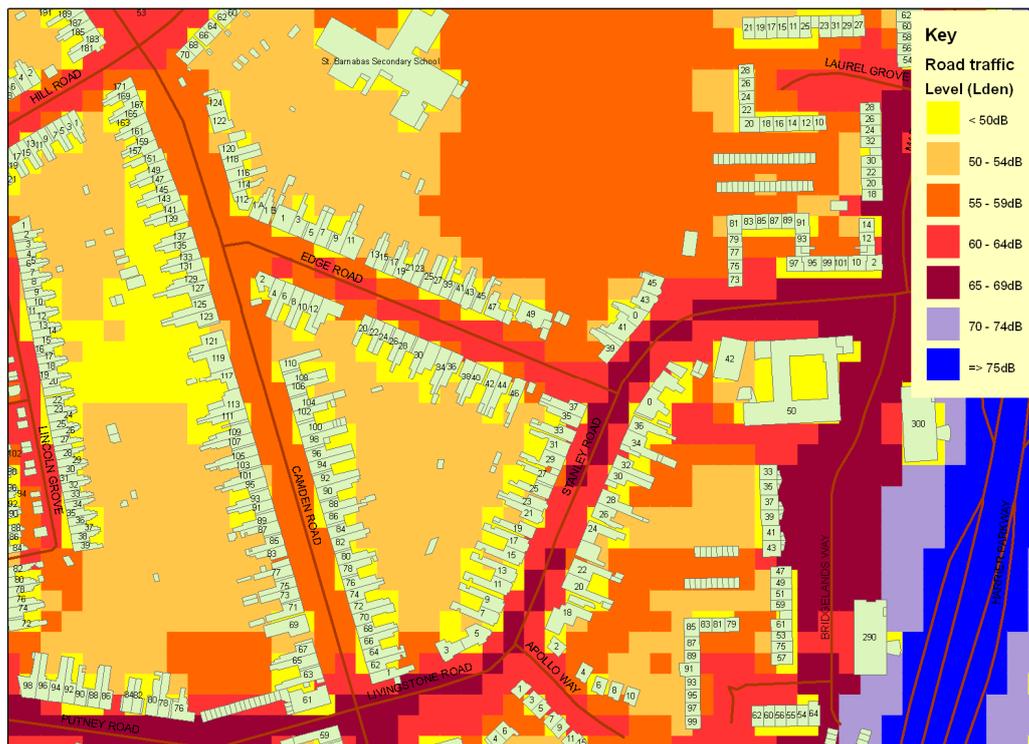


Figure 2.8: A graphical presentation of strategic noise mapping results

2.8 Assessment of Environmental Noise

The Directive sets out a common approach intended to avoid, prevent or reduce environmental noise, and determines exposure to noise through noise mapping as the first stage of implementation.

³⁰ Article 4

A strategic noise map is designed for the assessment of noise exposure in a given area, resulting from strategic noise sources such as roads, railways, airports and industry. Just as a landscape map may have contours indicating how ground level height changes across an area, a noise map can illustrate how environmental noise levels change across an area. Figure 2.8 shows a typical graphical presentation of a strategic noise map (from WG-AEN Position Paper on Presenting Noise Mapping Information to the Public).

The purpose of strategic noise mapping is primarily threefold:

- to provide the European Commission (EC) with strategic estimates of noise exposure across Europe to assist in the future development of European noise policy;
- to provide information to the public and decision makers on noise exposure locally, nationally and internationally; and
- to develop action plans for the purpose of managing noise exposure, by reducing noise levels where necessary, or preserving quiet areas where appropriate.

Strategic noise maps are normally produced by computer modelling techniques which calculate the noise level at specific points resulting from the sound emanating from the particular sources. The modelling software utilised source data such as traffic flow, type of road and rail, types of vehicles and the nature of industrial processes. The source data is positioned within a three dimensional (3D) computer model of the area of assessment. The 3D model includes features which can directly affect sound transmission, such as barriers, buildings, topography, weather conditions and how acoustically reflective or absorbent different surfaces can be. The calculations produce noise levels at receptor points on a 10 metre grid at a height of four metres above the ground, there will be approximately 10,000 receptor points every 1 km², or approximately 25,900 receptor points every square mile.

The process of making strategic noise maps is similar to the methodologies used within noise modelling for environmental impact assessments associated with major developments, such as major extensions to the road network, or expansions to airports. The key difference tends to be the significantly greater area to be covered by the strategic noise mapping within one assessment, and therefore the amount of information required to develop the required computer models. The amount of time and resources required to collect the necessary source and 3D data, build the models, run the calculations and derive the reporting information should not be underestimated. It is typical for a large regional or national scale project to take an experienced team between 9 and 12 months to complete the process.

In some other national environmental assessment, such as air quality or radiation, it is common to use measurement techniques to determine the long term average exposure. This approach is not possible for the building level noise assessment required under the Directive as noise is a short distance pollutant, i.e. the noise exposure level can change very significantly over distance of as little as 5 to 10m, and the concept of “regional” or “background” monitoring, familiar from air quality or radiation monitoring, are not relevant for environmental noise. Due to the nature of environmental noise the use of a small number of measurement locations, to form a monitoring network, does not provide regional monitoring information, rather it just provides information on the noise situation at the measurement site which cannot be interpolated across wider areas. For

this reason the use of noise calculation models has become the most cost effective means of undertaking the detailed building level assessment of noise exposure necessary to deliver reasonably accurate results for long term exposure.

The input data required to develop the strategic noise maps is wide ranging in its coverage and quantity, and is typically managed by a wide array of stakeholders. Transport authorities record traffic data, mapping agencies record landscape and building information, and the statistics bureau record population information. Strategic noise maps have not previously been developed in Malta, and successful delivery of the maps will require cooperation and data sharing between MEPA Environment and a number of internal and external stakeholders to be a success.

2.9 Management of Environmental Noise

The Directive aims to prevent and reduce, where necessary, environmental noise through the adoption of action plans. The action plans are to act as a means of managing environmental noise.

The Regulations define the “action plans” as:

“plans designed to manage noise issues and effects, including noise reduction if necessary”

The Regulations define the term “acoustical planning” as:

“controlling future noise by planned measures, such as land-use planning, systems engineering for traffic, traffic planning, abatement by sound-insulation measures and control of noise sources”

As indicated by these definitions, and demonstrated by experience across the EC, successful management of environmental noise necessitates a range of actions across policy, regulation, guidance and enforcement areas from a number of government agencies and third party stakeholders.

A consideration of the scope of the Directive illustrates the range of actors involved. The Directive covers noise sources which are either the responsibility of the transport authority, namely roads, railways and airports; or environment regulator, namely licensing industrial sites. The impact assessment and criteria for noise mitigation are to be based upon health impact, including annoyance, typically the responsibility of the health department. The assessment is to be undertaken using modelling in computer systems which construct 3D models of the area of assessment, requiring data from the mapping agency and the transport and environmental departments.

The noise action plans may be required to abate noise levels, which could be the construction of noise barriers, which would involve the transport department and planning. Additionally it may be appropriate to control noise emission at source, this would affect type approval testing, the responsibility of the standards agency. Finally the control of future noise levels is most cost effectively managed by the use of planning policy and development controls, the responsibility of the planning department, with support from the environment regulator.

Management of environmental noise typically requires a multi-agency approach as noise is a secondary environmental consequence of activities which are normally regulated or managed under the remit of their primary purpose. The environment

regulator requires cooperation from a number of stakeholders, often alongside regulatory powers to deliver actions to control noise.

2.9.1 Noise Management in Malta

The noise Regulations sit within a wider framework of noise and nuisance legislation which sit on the Maltese statute. An initial search has identified over 70 current items of primary or subsidiary legislation. In addition to these were found 10 guidance or review documents which provide support on how to interpret or implement the legislation. Further details can be found in Appendix B.

In broad outline the agencies responsible for noise management include:

- **Police**

A number of the chapters of the Code of Police Laws make reference to either noise or nuisance. These typically cover street and certain licensed activities. As is normal with primary legislation there is no detail as to how “nuisance” should be interpreted, or at what level and in what situation a noise becomes unacceptable, which means that application of the powers, and enforcement, may be inconsistent.

- **Office of the Prime Minister**

The OPM is responsible for environmental policy, including noise. The OPM is also responsible for undertaking Strategic Environmental Assessments (SEA) to assess the impact of any strategic policies or plans, which could possibly include a noise strategy.

- **Department of Health**

The DOH is responsible for public health, and within the 2006 National Environmental Health Action Plan included noise as a risk factor. The emerging evidence base linking long term environmental noise to health impact, reported by the WHO, also links the DOH to long term noise policy.

- **Department of Consumer Affairs**

The DCA is responsible for product safety, which includes noise limit values associated with certain types of outdoor equipment and recreational craft.

- **Malta Environment and Planning Authority**

Due to the multi-disciplinary nature of the organisation MEPA hold responsibilities for three related areas.

The Planning Directorate are responsible for planning policy, development control and licensing of development. Within this remit is included environmental impact assessment and licensing of certain trading activities. In recent years two draft acts have been issued for consultation, Draft Building Regulation Act 2009 and Draft Environment and Development Act 2010, both of which are relevant to management of noise.

The Environment Protection Directorate is the regulator enforcing environment policy. Responsibilities cover a wide range of activities, including waste management, construction sites and IPPC permitting.

The Directorate for Corporate services is responsible for mapping and land surveying as the national mapping agency and would be the primary supplier of the data required for the strategic noise mapping.

MEPA have also issued a number of guidance documents covering issues such as quarry working, shooting ranges, micro wind turbines, planning policy, rural development, EIAs and traffic calming measures.

- **Malta Standards Authority**

The MSA are responsible for product safety, and included within this remit is the type approval legislation which includes noise level requirements for motor vehicles, rail systems, machinery, hearing defenders, motor cycles, agricultural machinery and fireworks.

- **Transport Malta**

Transport Malta are responsible for aspects of noise emissions from roads, airports and ports. TM is responsible for management of the road network, including vehicle licensing and roadworthiness tests, road development and road maintenance.

For civil aviation TM is responsible for noise certification and regulation of certain airport operations. TM is also responsible for the ports, and crew noise exposure whilst working inside merchant and fishing vessels.

- **Occupational Health and Safety Authority**

The OHSA is responsible for the regulation of noise exposure in the workplace, including mineral extraction and construction sites.

- **Malta Tourism Authority**

MTA regulate the licensing of bars, restaurants and nightclubs, under which they have powers to control noise from kitchen equipment and music reproduction equipment.

- **Local Council**

Local Councils have some powers of control through licensing certain trading activities. Including within the scope of the licensing powers is the ability to avoid excessive noise impact from the activities.

- **Multi-Agency**

The Traffic Signs and Carriageway Markings Regulations, SL 65.05, enables the Police, Director of Public Works or Transport Malta to erect traffic signs. These include two with either specified or implied noise control aspects.

(b) This sign conveys the information that there is a hospital in the neighbourhood. Vehicles should be driven with the minimum of noise possible.

(4)



(d) The first sign prohibits the use of acoustic signals by all motor vehicles, except in an emergency. Unless the sign is attached to the name plate of a built-up area (in which case the prohibition applies to the whole built-up area) the distance over which the prohibition extends may be indicated by means of a plate, of the type shown as No.(4) or (5) under paragraph G of this Part of the Schedule, appended to the sign. The second sign cancels the first one.

(8)



NO HORN BLOWING

(9)



END OF NO HORN BLOWING

Figure 2.9: Noise control traffic signs

3 Overview of Strategic Noise Mapping and Action Planning

3.1 Strategic Noise Mapping Process

The technical annex on strategic noise mapping, report 536-1-28 “*Strategic Noise Mapping in Malta*”, sets out a detailed process for delivering noise maps in line with the requirements of the Directive. The approach set out may be summarised as a seven stage process, as shown in Figure 3.1 below.

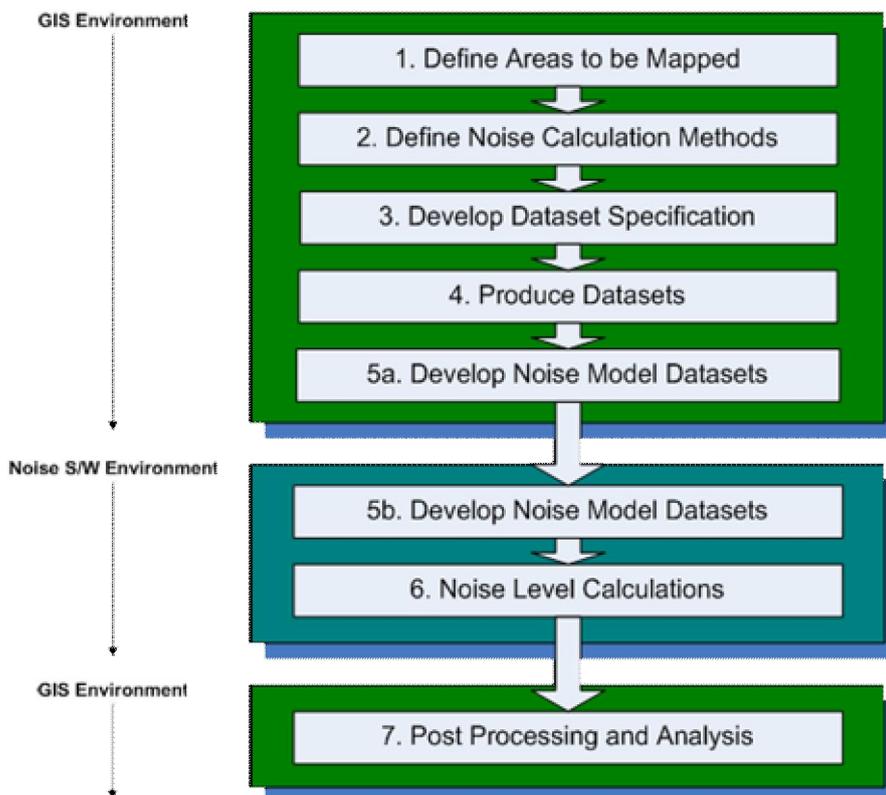


Figure 3.1: Overview of noise mapping process

- Stage 1 - Define Areas to be Mapped
 - The area to be mapped:
 - Agglomeration: a continuous urban extent with a high population density; and
 - Major roads: sections of road with an annual traffic level above 3 million vehicles.
- Stage 2 – Define Noise Calculation Methods
 - The Regulations define the EC Recommended Interim Methods.

- Stage 3 – Develop Dataset Specification
 - The noise mapping process requires a wide range of input datasets, many of which need to be spatially referenced. The dataset specifications provide an organised means of centrally managing and combining the different spatial datasets and attribute databases. The required data can include items such as ground contours, building outlines, road centrelines, and traffic flow data.
- Stage 4 – Produce Datasets
 - Within this stage the raw GIS datasets will be collected, collated and catalogued with the aim of carrying out a gap analysis and audit against the specifications drawn up within Stage 3.
- Stage 5 - Develop Noise Model Datasets
 - Tuning dataset resolution to acoustic calculation requirements; and
 - Appending datasets to best exploit capabilities of the calculation kernel.
- Stage 6 - Noise Level Calculations
 - Running of the noise calculations over the entire area to be mapped, using all the data from the model area; and
 - Production of noise results datasets developed from the calculation process.
- Stage 7 - Post Processing and Analysis
 - No. of people exposed within noise bands;
 - No. of people exposed within noise bands in dwellings with special noise insulation;
 - No. of people exposed within noise bands in dwellings with a quiet façade;
 - Total area exposed within noise bands; and
 - No. of dwellings exposed within noise bands.

3.2 Noise Action Planning Process

The technical annex on noise action planning, report 536-1-29 “*Noise Action Planning in Malta*”, sets out a detailed process for delivering noise maps in line with the requirements of the Directive. The approach set out may be summarised as a five stage process, as shown in Figure 3.2 below.

- Stage 1 - Extent of noise exposure when assessment is considered necessary
 - Identify the important area by identifying noise sensitive locations above the proposed onset levels for noise mitigation measures.
- Stage 2 - Review strategic noise maps to identify priorities
 - Using a noise scoring decision matrix to draw up a short list of potential areas for action, both above the onset values, and below the level for preservation, to help identify Quiet Areas.
- Stage 3 - Confirmation of extent of impact
 - Undertake noise level measurements to confirm that the noise levels indicated by the strategic noise mapping are being experienced by the properties and population at a particular location.
- Stage 4 - Review possible mitigation measures
 - Once the extent of the existing noise impact has been confirmed for the locations under review, the potential noise mitigations measures may be investigated, and a cost benefit analysis undertaken for each, with the aim of developing a selection matrix which leads towards a recommendation for action.
- Stage 5 - A recommendation for action
 - The mitigation measures may then be put forward to the relevant departments and fund holders to be incorporated within their future work plans.

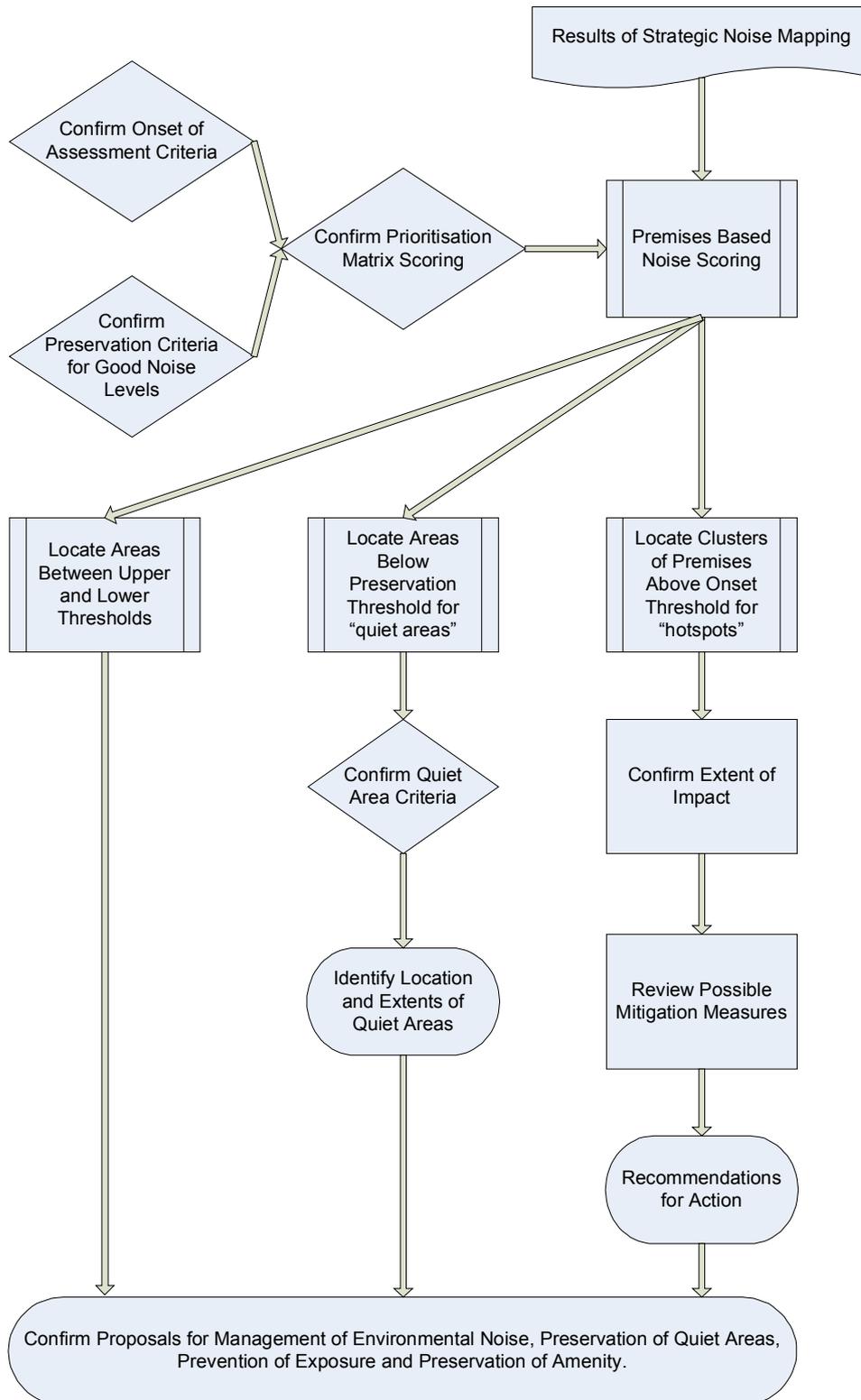


Figure 3.2: Overview of approach to determine actions to be undertaken

4 Initial Assessment of Noise Exposure in Malta

4.1 Introduction

The technical report 536-4-40 “*Strategic Noise Mapping of Malta for the First Round of the END*”, sets out details of the assessment of noise exposure in Malta for the first round of the Directive. The strategic noise mapping is discussed in outline below to present the most relevant outputs.

4.2 Definition of Major Airports

There is a requirement to assess the noise levels from “major airports” at any location within or outside any agglomerations. A “major airport” is defined as one with in excess of 50,000 total movements per year, an average of approximately 137 movements per 24 hours. There were 24,711 aircraft movements associated with Malta International Airport (MIA) during the 2006 assessment year, therefore MIA is not designated as a “major airport” under the Regulations, and thus does not need to be mapped.

4.3 Definition of Major Railways

There were no railways, light rail or tram systems within Malta, therefore there are no “major railways”.

4.4 Definition of Major Roads

The Directive requires that the strategic noise mapping includes all “major roads” within a Member State, and that in agglomerations the noise exposure assessment shall include “noise emitted by road traffic”.

Major roads are defined in the Directive as:

“‘major road’ shall mean a regional, national or international road, designated by the Member State, which has more than three million vehicle passages a year”

The Regulations, L.N. 193 of 2004, defined major roads as:

“‘major road’ means a regional, national or international road, designated by the competent authority which has more than three million vehicle passages a year”

For the first round in 2007 the total flow value was six million vehicle passages, for the second and subsequent rounds, from 2012, the three million figure from the definitions above is to apply.

Six million vehicle passages per annum is approximately 16,438 vehicle passages per average 24 hours during the 2006 assessment year. Three million vehicle passages per annum is approximately 8,219 vehicle passages per average 24 hours during the upcoming 2011 assessment year.

4.4.1 *Extent of road network*

As described above, the Regulations state that “major road” means a regional, national or international road, designated by the competent authority which has more than three million vehicle passages a year. Unfortunately there is no day-to-day use of regional, national or international as road classifications by MEPA or Transport Malta. It is therefore necessary to form an interpretation of the Regulations which fits together with the road classifications in use by MEPA and TM.

The Structure Plan for the Maltese Islands currently defines four classes of roads:

1. Arterial roads
2. Distributor roads
3. Local access roads
4. Access only and pedestrian streets

Classes 1 and 2 are wholly the responsibility of the Government, through Transport Malta, whilst maintenance of classes 3 and 4 are the responsibility of Local Councils. Since 2004 some 51 km of the Arterial roads have been classified as TEN-T roads. TEN-T is the Trans-European Transport Network as set out under EC Decision 1692/96/EC, of 1996, and subsequent amendments in 2001 and 2004.

MEPA Mapping Unit currently has eight classifications within their dataset of street centrelines:

1. Stairs
2. Roundabout
3. Footpath
4. Arterial Road
5. Distributor Road
6. Underground Arterial Road
7. Local Access Road
8. Access Only Road

A comparison of the MEPA Street Centrelines classification, with the TM TEN-T road network map, indicated that the TM network map contained the MEPA Arterial Roads, Distributor Roads, and some of the Local Access Roads. When this was discussed with TM it was confirmed that they were Local Access Roads with Linking Functions.

Following discussions with MEPA and TM it was agreed that the following approach would be used as a means of identifying the "major roads" referenced within Article 4 of the Regulations:

1. International roads - TEN-T classified Arterial Roads;
2. National roads - Arterial Roads which have not been classified as TEN-T roads;
and
3. Regional roads - Distributor Roads (including rural and urban roads with linking function from Local Access Roads).

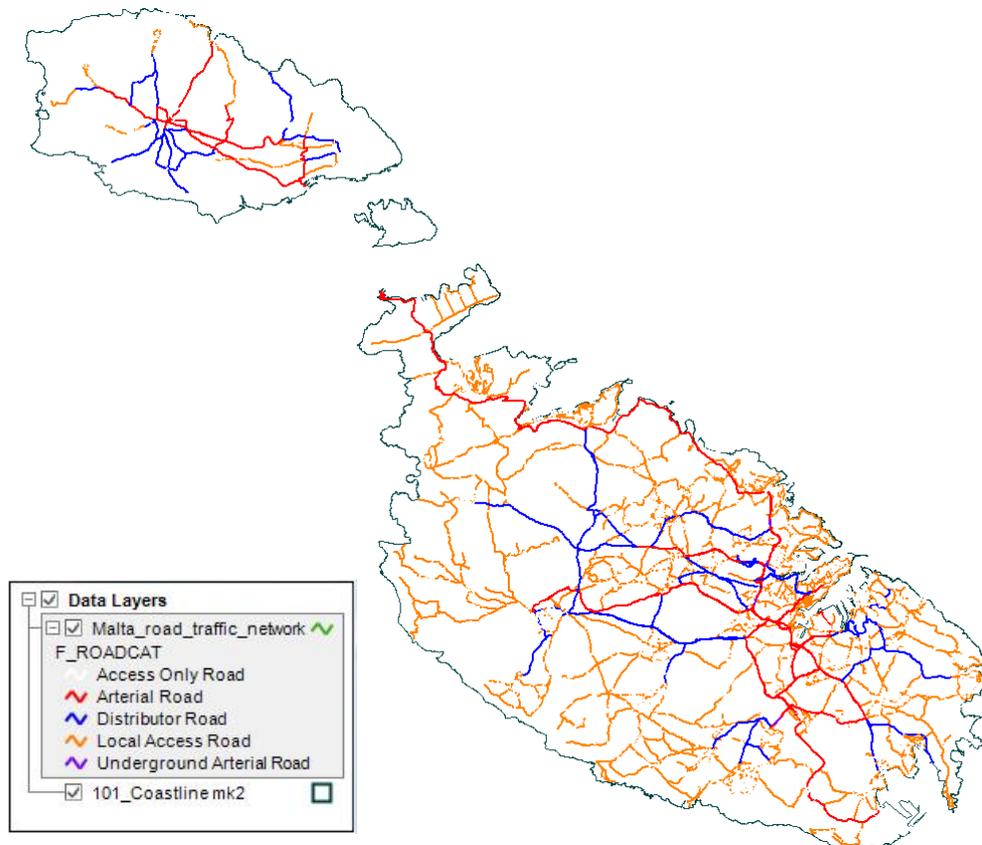


Figure 4.2: Road network used to identify 2006 major roads

4.4.2 Road traffic flow data

Following the above process to determine the road sections to be considered relevant as potential major roads, the task of identifying those roads with a 2006 annual traffic flow above 6 million vehicles was undertaken.

The Consultants were provided with three main sources of traffic flow data by MEPA, namely:

1. MT 2005 dataset - Data that Malta reported to EC in December 2005, which the Consultants assumed to be traffic flows data for the assessment year 2006. Information was delivered to the Consultants during May/June 2010.
2. AUTOCOUNT dataset - Traffic count data with short-term automatic traffic count data (up to one week duration) sites during the period from 1989 up to 2007. Information was delivered to the Consultants during June 2010.
3. TEN-T dataset – BCEOM report on Feasibility and Environmental Impact Studies for Transport Infrastructure Projects in MALTA – Final Feasibility Report. Information was delivered to the Consultants during January and March 2011.

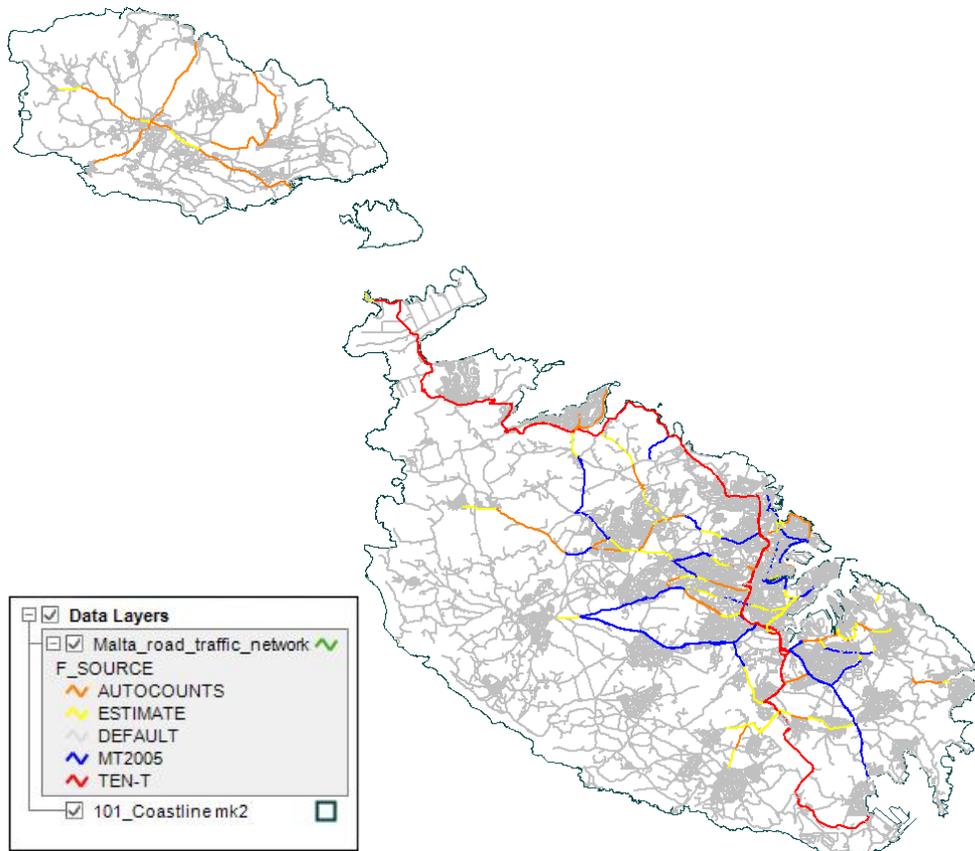


Figure 4.3: Assignment of road traffic flow source data

It was originally planned to also use the TRIPS traffic model, however unfortunately due to technical problems the TRIPS model was not delivered to the Consultants, therefore the traffic flow data contained within the TRIPS model has not formed part of the analysis.

The final assignment of traffic flow data source is shown in Figure 4.3.

4.4.3 *Extent of 2006 major roads*

Following the assignment of road traffic flow data, as described above, it was possible to identify the extent of the 2006 major roads network relevant to the first round strategic noise mapping.

Sections of road with an annual flow above 6 million vehicles, $AADT > 16,438$, were identified as first round major roads.

Sections of road with an annual flow above 3 million vehicles, $AADT > 8,219$, were identified as draft second round major roads. They only constitute a draft as the road traffic flow data was normalised to a 2006 assessment year, whereas the second round of the Directive is to be based upon a 2011 assessment year.

Figure 4.4 shows the first round major road network in red, and the additional roads identified in blue for the draft second round major roads network.

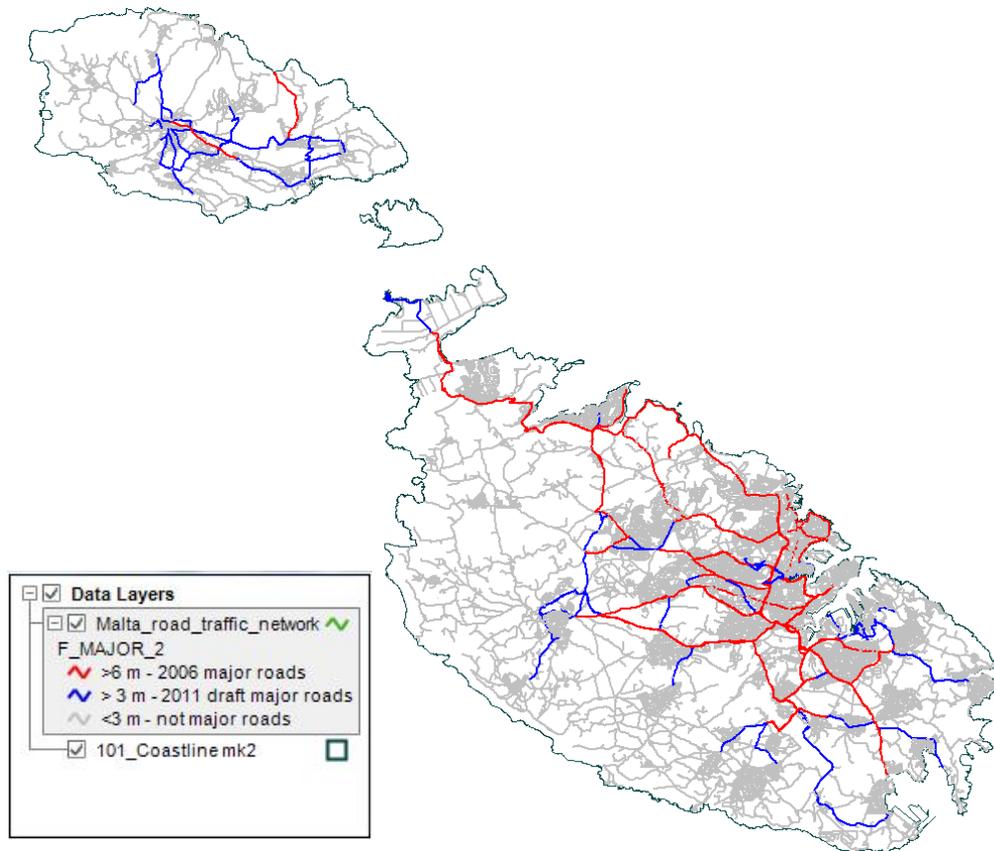


Figure 4.4: Major road network

4.5 Definition of Agglomeration

4.5.1 Introduction

As a means of monitoring the extent of environmental noise impact upon the population, the END requires Member States (MS) to undertake strategic noise mapping. This strategic noise mapping is not to be undertaken across the whole of the MS region, rather only within designated agglomerations, and in the vicinity of major road and rail transport corridors and around major airports.

4.5.2 Background

The Directive does not set out how an agglomeration is to be defined, rather that is left to the Member States to determine. Article 3 (k) of the END defines:

“‘agglomeration’ shall mean part of a territory, delimited by the Member State having a population in excess of 100 000 persons and a population density such that the Member State considers it to be an urbanised area;”

Under the first round of the Directive in 2007 a different threshold criteria applied, and agglomerations with a population of more than 250,000 inhabitants within their territories were to be mapped.

As per the Directive, the Regulations do not set out a definition for an agglomeration, nor do they describe how an agglomeration is to be determined. The definition for agglomeration is:

“part of a territory, delimited by the competent authority having a population in excess 100,000 persons, and a population density such that the competent authority considers it to be an urbanised area”.

Similarly to the Directive, the Regulations state that for the first round in 2007 a different threshold criteria applied. Only agglomerations with a population of more than 250,000 inhabitants within their territories were to be mapped for the first round.

The END also defines:

“‘quiet area in an agglomeration’ shall mean an area, delimited by the competent authority, for instance which is not exposed to a value of Lden or of another appropriate noise indicator greater than a certain value set by the Member State, from any noise source;”

This is backed up by the actions required under the Directive, which include:

“adoption of action plans by the Member States, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.”

Whilst the Scope includes:

“1. This Directive shall apply to environmental noise to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas.”

These provisions clearly set up contrasting requirements for the definition of an agglomeration under the END. Firstly it should be a built-up area, with a population density such that the MS considers it to be an urbanised area; and secondly it should include areas within the agglomeration which may be, or are, quiet, or where the noise quality is good, in order that they may be identified and preserved if desirable or necessary. By their very nature these public parks or other quiet areas will not be built-up, and will not have a high population density, and not be considered urban, although they may be surrounded, or bounded, by such areas.

As the Regulations define MEPA as the competent authority, it is therefore clear that MEPA is to define the area of the agglomeration, based upon the fact that the area has a population density such that it is considered by MEPA to be an urbanised area.

As discussed above, the Directive and Regulations do not define a means of determining an agglomeration, other than it should have a population density such that it is considered to be an urbanised area. This leads to two initial criteria, population density, and extent of urbanised area. In summary the agglomeration should meet the following requirements:

- Total population above 100,000 inhabitants from 2012 onwards;
- Total population above 250,000 inhabitants for 2007;

- Built-up area;
- Population density such that it is considered urbanised;
- Includes public parks, or other known or possible quiet areas; and
- Includes known or possible areas where environmental noise quality is good.

It is important to consider that the Directive aims to avoid, prevent and reduce the negative effects on human health from long term exposure to environmental noise. By implication this means that the agglomeration definition is to include residential dwellings and noise sensitive buildings and areas within a densely populated urbanised area. The agglomeration area does not need to encompass noise sources near to, but just outside, the boundary.

The noise sources which affect the agglomeration area can be located either inside or outside the agglomeration, it is not the location of the noise source per se, rather the location of the noise impact from the noise source, which is relevant. Therefore an industrial site, for example, located outside the agglomeration boundary may form part of the noise assessment, and may fall within the remit of the noise action plan, if the exposure inside the agglomeration due to the noise source is above any noise limit values, or other relevant criteria set out within the noise action plan.

4.5.3 Agglomeration Design

In order to develop a definition for the agglomeration area which met the requirements discussed above, a number of spatial datasets were collected:

- CORINE Land Cover (CLC) dataset
 - CORINE “urban fabric” layer, plus
 - Some of the adjacent CORINE “industrial, commercial and transport units” layer to overcome some of the inconsistencies found when only considering the “urban fabric” layer;
- Limit of Development dataset from MEPA Planning
 - As an indication of the extent of the urban fabric as viewed by Planning;
- Open Spaces dataset from MEPA MU
 - Public access utility spaces were included when they were partially or wholly within the agglomeration footprint;
- Population distribution data from NSO and MEPA IR to assess population density
 - Population statistics by Census Output Area (COA);
 - Geographical footprint of each COA;
- Reference data:
 - Air Quality agglomeration definition;
 - Coastline;

- Local Authority boundaries; and
- Satellite imagery.

As the CORINE data is a nominal 1:25,000 scale and the noise modelling is undertaken at a nominal scale of 1:1,000, the CORINE boundaries were used as an initial guide, rather than the definition. This CORINE layer was overlaid with the Limit of Development dataset, the Open Spaces dataset, the Coastline and the 2006 satellite imagery.

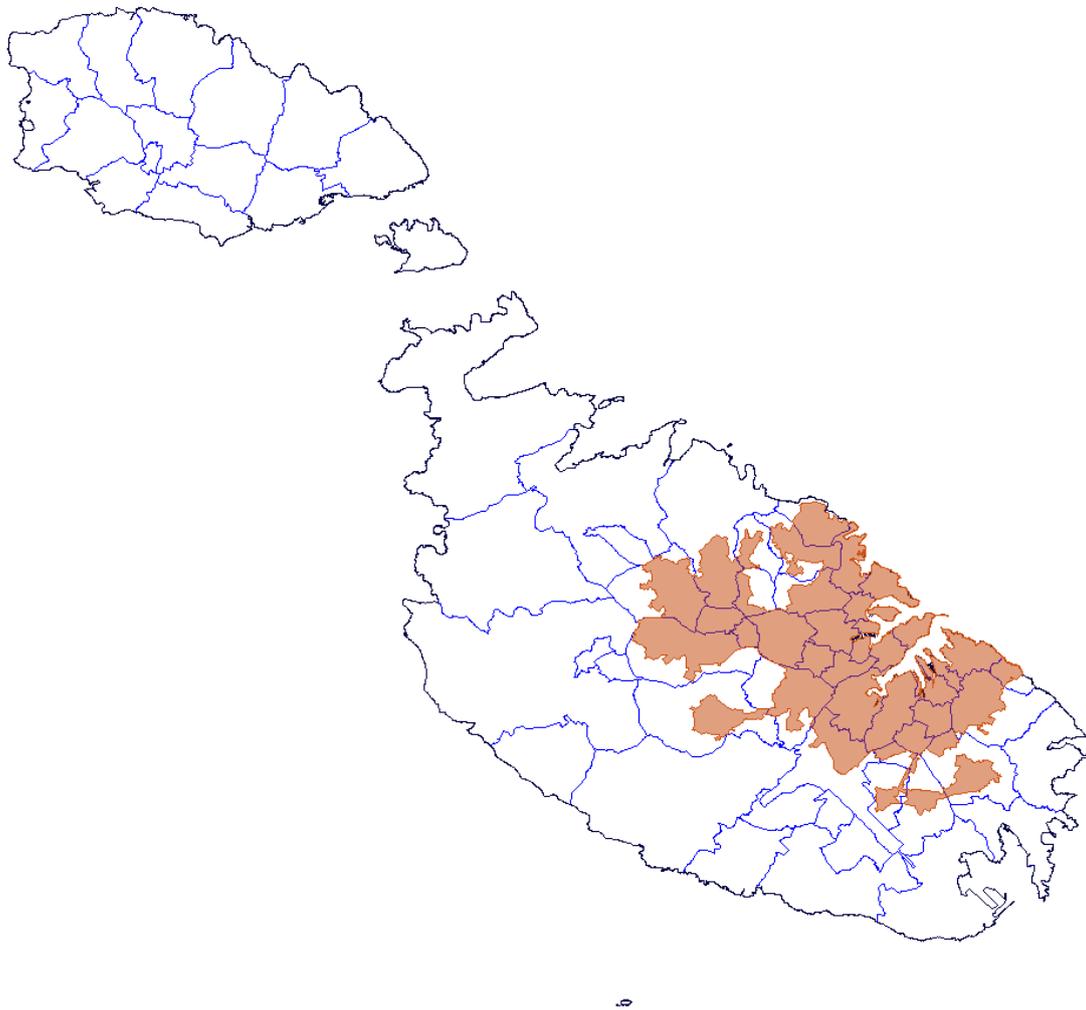


Figure 4.1: Environmental noise agglomeration definition

Using the satellite imagery and Limit of Development as the primary guides, the agglomeration outline was created using the coastline and the extent of development of residential areas, plus any enclosed or partially contained public amenity spaces from the Open Spaces dataset. Gaps between urban areas of less than 200m were closed, and any islands of open space within the outline were removed to become part of the agglomeration.

This results in the agglomeration area shown in Figure 6.1.

- Area: 65.8 km²
- Population: 243,746

This would not be an END agglomeration under the first round in 2007, and therefore would not need to be reported in 2007. It would be an agglomeration for the second and subsequent rounds, commencing with the reports in 2012.

For the second round of strategic noise mapping to be reported in 2012, the following noise sources are to be considered:

- Agglomeration with more than 250,000 inhabitants within their territories
 - All relevant aircraft;
 - All relevant IPPC industry;
 - All relevant railways; and
 - All relevant roads.
 - Sources are relevant to the agglomeration mapping if they produce a noise exposure inside the agglomeration boundary above 55 L_{den} or 50 L_{night}.
 - Any airports, industry, railways or roads outside the agglomeration boundary, including Malta International Airport and the Freeport, would be outside the scope of the mapping unless they produce noise exposure inside the agglomeration boundary above 55 L_{den} or 50 L_{night}.

4.6 Area Modelled

The above definition of extents has identified the area of the agglomeration for which noise results are required, and the extents of major noise sources.

Following this it was possible to determine the areas to be modelled, as this defined the areas for which input datasets were required for the strategic noise mapping process.

4.6.1 Agglomerations

There were no “agglomerations” within Malta under the first round of the Directive; therefore it was not required to determine the model areas for them.

4.6.2 Major Airports

There were no “major airports” within Malta under the first round of the Directive; therefore it was not required to determine the model areas for them.

4.6.3 Major Railways

There were no “major railways” within Malta under the first round of the Directive; therefore it was not required to determine the model areas for them.

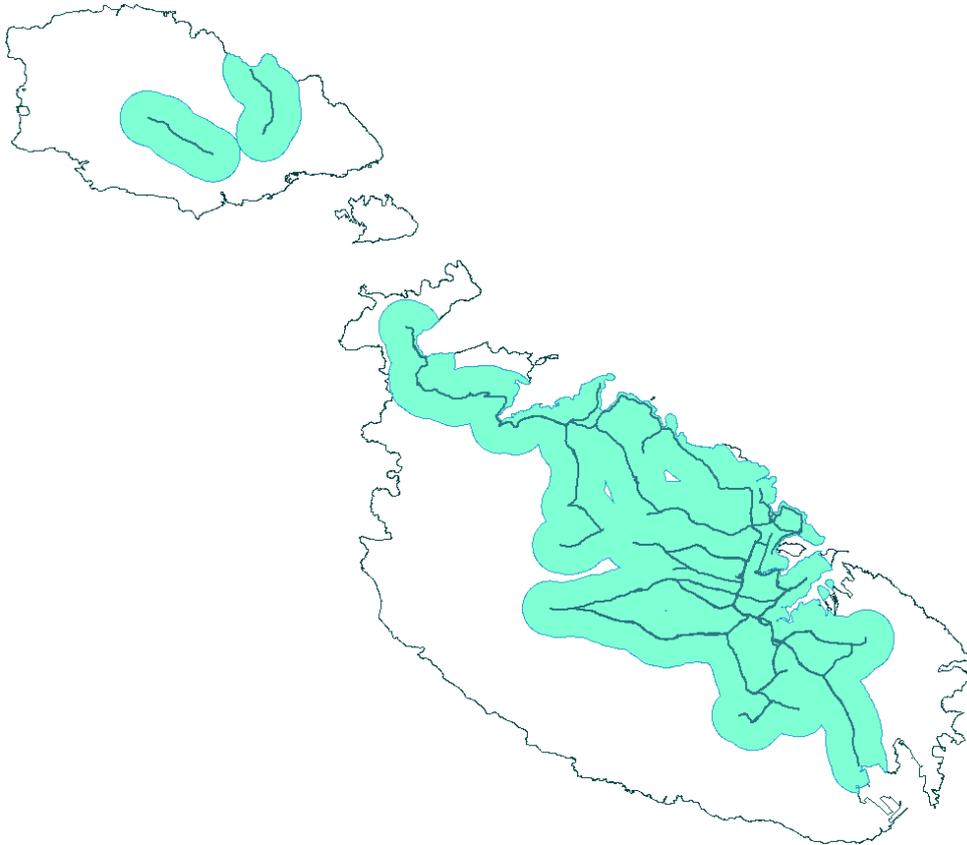


Figure 4.5: Model area for mapping of 2006 major road network

4.6.4 Major Roads

The extent of the first round major roads network is shown in Figure 4.5 above. The modelled area needs to include all locations which may be exposed to noise levels above 55dB L_{den} and 50dB L_{night} . Following a number of test calculations, it was determined that buffering the major roads network by 1 km would produce a suitable model area for the assessment. The model area used for the first round strategic noise mapping of major roads is shown in Figure 4.5.

4.7 Method of Assessment

For the assessment of road traffic noise from the first round major roads, the EC recommended Interim method was used, in line with the Regulations and Directive, as described within the following documents:

1. 'NMPB-Routes-96 (SETRA-CERTU-LCPCSTB)', referred to in 'Arrêté du 5 mai 1995 relatif au bruit des infrastructures routières, Journal Officiel du 10 mai 1995, Article 6' and
2. French standard 'XPS 31-133'.
3. For input data concerning emission, these documents refer to the 'Guide du bruit des transports terrestres, fascicule prévision des niveaux sonores, CETUR 1980'.

Used in accordance with the adaptations set out in:

4. Commission Recommendation 2003/613/EC of 6 August 2003.

The method of assessment including the recommended adaptations is referred to as XPS 31-133 Interim.

Guidance on the method and its application was also referenced from the AR-INTERIM-CM and NANR 93 project reports.

4.8 Collection of Data and Building the Noise Model

In order to be able to develop the datasets required for a 3D model environment to support the assessment of noise from roads, railways and industry, it was first necessary to develop a dataset specification. On a most basic level, the calculation of noise exposure using these methodologies takes place in three stages:

1. The assessment of the level of noise emitted from a source, the “source noise emission”;
2. The assessment of the attenuation of the emitted noise en-route from the point of emission to the receptor, the “propagation attenuation”; and
3. The assessment of the population exposure associated with the receptor locations.

4.8.1 Source Data

LimA noise mapping software models the emission of road traffic noise from a series of polyline objects that represents road centrelines. In this project the road emission line objects were modelled as 2.5D polylines. For each road the following information was collected from MEPA and TM:

- Road centreline.
 - Traffic volume of all light vehicles along centreline expressed as an annual average day, evening and night traffic flow for 2006. Due to the method of assessment the traffic volumes were expressed as annual average values per hour during day, evening and night;
 - Traffic volume of all Heavy Goods Vehicles (HGV) expressed as an annual average day, evening and night traffic values for 2006. Due to the method of assessment the traffic volumes were expressed as annual average values per hour during day, evening and night;
 - Direction of vehicle flow;
 - Average vehicle velocity for light and heavy vehicles, expressed as an annual average day, evening and night traffic speed in km/h.
 - Road surface type (Normal surface, smooth asphalt (concrete or mastic), rough surface, silent surface, porous surface, cement concrete and corrugated asphalt, smooth texture paving stone, rough texture paving stone);
 - Road gradient.

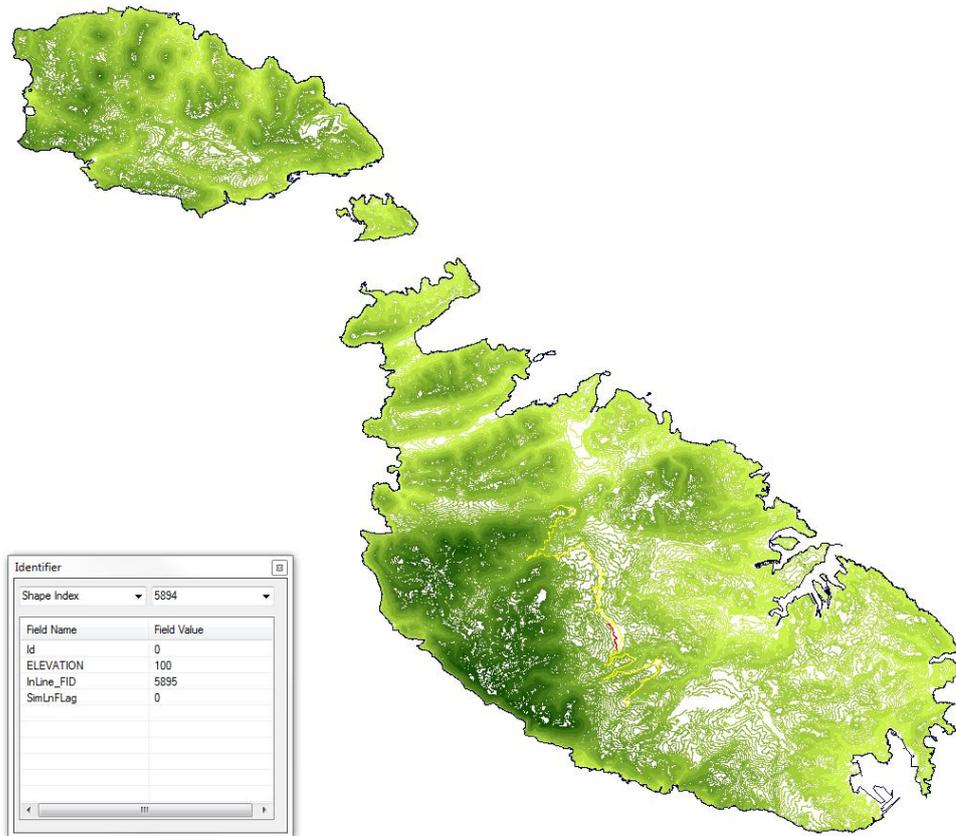


Figure 4.6: 2.5m contour data after manual height attribution

4.8.2 Pathway Data

The 3D environment which was required to support the assessment of noise from 2006 major roads consisted of the following datasets:

1. **Digital Terrain Dataset** – defining the height and profile of terrain;
 - a. MEPA MU 2.5m contour dataset was used, see Figure 4.6;
2. **Ground Cover Dataset** – defining the acoustic absorbency of the ground over which noise propagates from source to receiver.
 - a. CORINE 2006 land classification dataset was used;
3. **Buildings Dataset** – describing the location and height of buildings within the modelling extents;
 - a. MEPA BaseMap data was used;
4. **Barriers Dataset** – defining the location and height of noise barriers;
 - a. MEPA BaseMap data was used;
5. **Bridges Dataset** – defining the position and height of bridges carrying or supporting relevant sources;

- a. The Consultants developed a bridge dataset following a field survey study;
6. **Meteorological Dataset** – average meteorological conditions.
- a. Data from MIA and MEPA air quality monitoring stations was used.

4.8.3 Population Data

Following meetings with MEPA IR and the National Statistics Office, it was agreed that the number of people within dwellings would be estimated according to the latest Census of Population and Housing 2005 from the National Statistics Office, Malta.

The Census data was available at Census Output Area (COA) level, with a spatial extent for each area described by a polygon, and the number of people per COA listed in a spreadsheet.

4.9 Results of Noise Mapping

The results of the strategic noise mapping assessment for the 2006 major roads are shown in Figure 4.7 and 4.8.

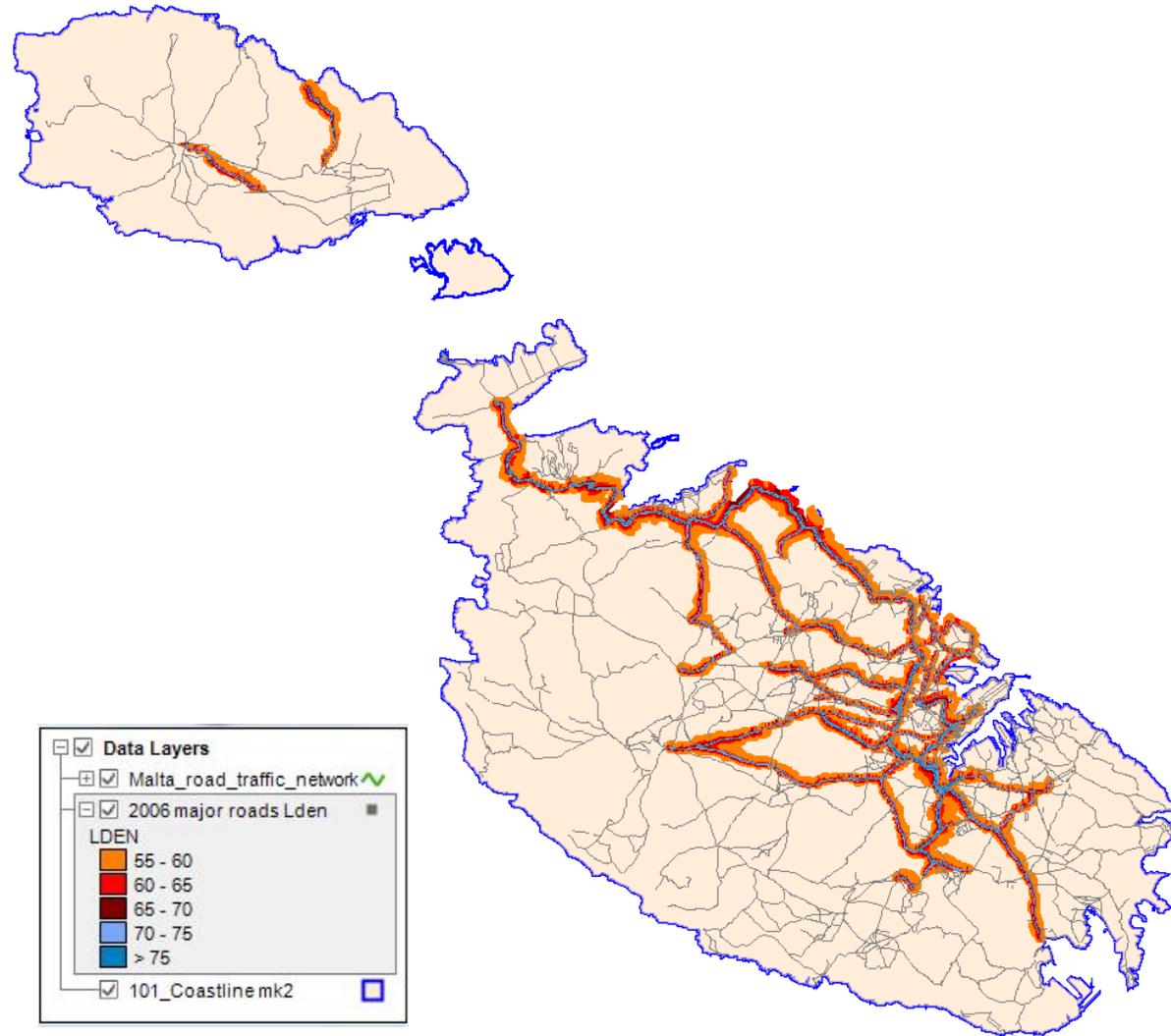


Figure 4.7: 2006 major roads noise map - L_{den}

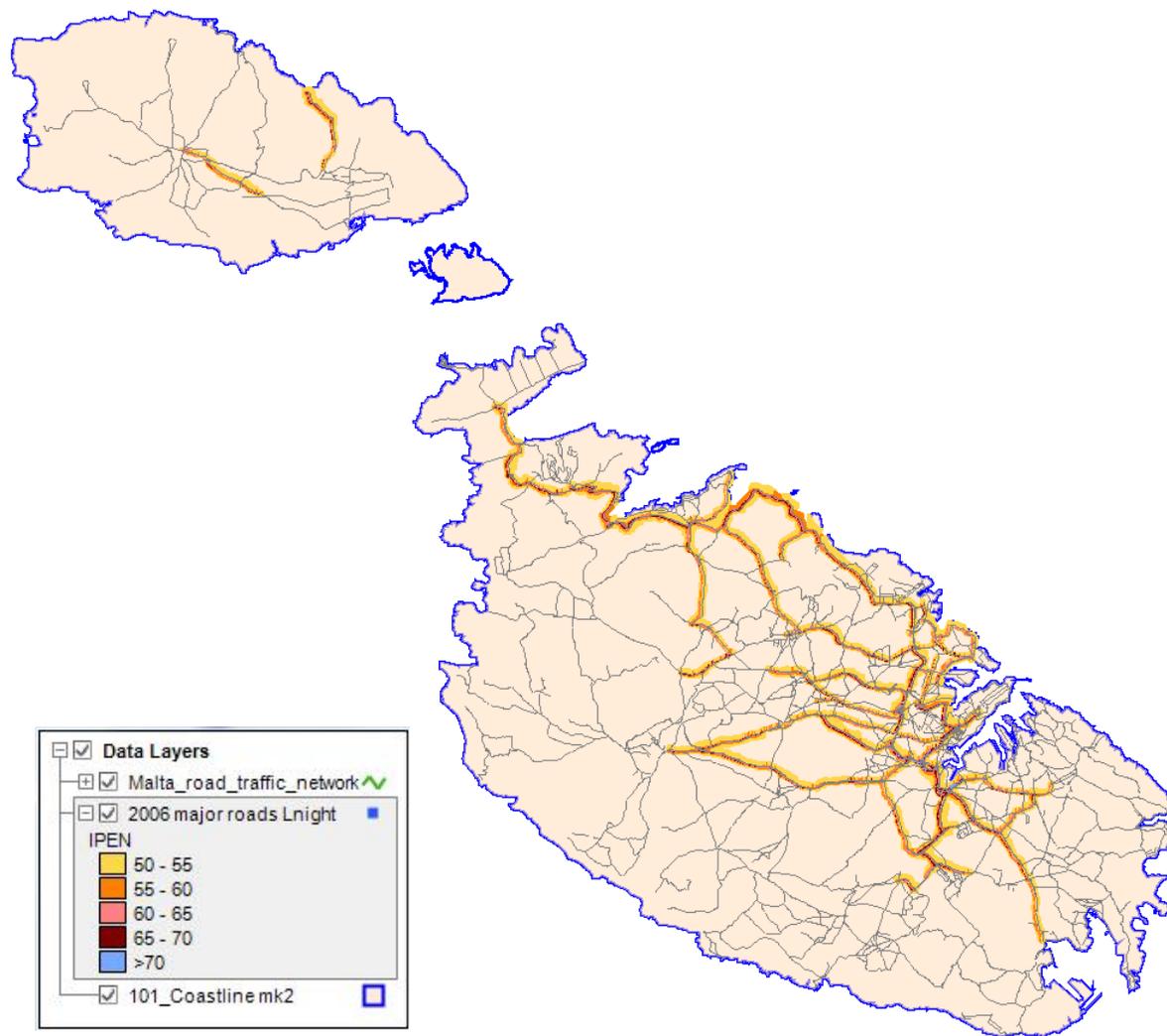


Figure 4.8: 2006 major roads noise map - L_{night}

4.10 Summary of Results of the Exposure Assessment

Following the assessment of noise levels, it was possible to undertake secondary analysis utilising the results from the noise calculation process.

4.10.1 Area Analysis

The Directive requires information on the estimated total area (in km²) exposed to L_{den} higher than 55, 65 and 75dB for major roads.

The results of the area analysis for the first round major roads across Malta are set out in Table 4.1 below.

Table 4.1: Area exposed to noise categories from first round major roads

Noise Scenario	Noise Category	Area (km ²)
L _{den}	>55	25.0
	>65	9.3
	>75	1.7

4.10.2 Dwelling Analysis

The Directive requires information on the estimated total number of dwellings (in hundreds) exposed to L_{den} higher than 55, 65 and 75dB for major roads.

The dwelling and population exposure assessment have been undertaken in line with the approach set out within “Preliminary Calculation Method for Determination of the Number of Persons Exposed to Environmental Noise” (VBEB), from the non-official version of the publication in the German Federal Gazette (Bundesanzeiger), No. 75 of 20 April 2007.

In order to undertake the assessment, the assessment of noise at the facades of the dwellings was undertaken using circulating point calculations within LimA, utilising the VBEB option in Lima_7, and the recommended spacing of receptor points around the building facades in line with the VBEB approach.

Following the completion of the circulating point façade calculations, analysis of the results was undertaken. The results of the analysis were disposed into a series of output files which were reviewed and summarised below.

The results of the dwellings analysis for the first round major roads across Malta are set out in Table 4.2 below.

Table 4.2: Dwellings exposed to noise categories from first round major roads

Noise Scenario	Noise Category	Dwellings
L _{den}	>55	8,700
	>65	3,800
	>75	300

4.10.3 Population Analysis

The Directive requires information on the estimated total number of people (in hundreds) living in dwellings that are exposed to L_{den} higher than 55, 65 and 75dB for major roads. The Directive also requires information on the estimated number of people (in hundreds) living in dwellings that are exposed to noise in 5dB bands for major roads. The results of the population exposure analysis for the first round major roads across Malta are set out in Table 8.3 and 8.4 below.

Table 4.3: Number of people living within dwellings exposed to noise categories from first round major roads

Noise Scenario	Noise Category	Population
L_{den}	>55	21,200
	>65	9,100
	>75	700

Table 4.4: Number of people living within dwellings exposed to noise categories from first round major roads

Noise Scenario	Noise Category	Population
L_{den}	55-59	7,000
	60-64	5,100
	65-69	3,900
	70-74	4,500
	≥ 75	700
	Total	21,200
L_{night}	50-54	5,200
	55-59	4,000
	60-64	4,400
	65-69	900
	≥ 70	0
	Total	14,500

4.11 Summary of Lesson Learnt

Within the current project the first strategic noise maps of Malta have been developed; and the results have been provided to the Commission. As is common across the EC the first round of strategic noise mapping brought together a wide array of stakeholders for the first time under one process. As has been discussed earlier, stakeholders included MEPA; planning, IR, Mapping and IPPC; Department of Health; the Police; Transport Malta and NSO.

The wide range of different datasets required in order to develop the strategic noise maps, and subsequent population exposure statistics, inevitable meant that gaps and uncertainties were identified during the process. This is mainly down to the fact that some of the questions being asked during the process have not previously been asked.

Whilst the strategic noise maps delivered meet the current requirements of the directive, namely to “*provide a representation of the noise levels perceived within that area*”³¹, the process of undertaking the assessment has identified a number of aspects which could be addressed in the future and would provide for a significant reduction in the uncertainty associated with the results. These lessons learnt include:

- Supporting the planned Mapping and IR switch to using the full coordinate system
 - Datasets across different stakeholders were found to be in a number of different coordinate systems, some with full coordinates, and others with truncated coordinates;
- Support Mapping and IR move towards positional accuracy, aligning the Malta coordinate system with the satellite navigation coordinate system;
 - Datasets across different stakeholders were found to be in a number of different projections;
- Support Mapping and IR in their planned development of an Inspire spatial data discover portal;
 - Finding the necessary data, its owners and release approval process was a lengthy and time consuming procedure;
- Use of the IR LiDAR survey currently being commissioned:
 - This would provide a more accurate, detailed and up to date elevation model for the maps than currently available from the contour datasets;
 - It could also provide building height data which is not currently available;
- Support Transport Malta and MEPA Air Quality team in developing a single emissions inventory, based upon the Mapping road centreline dataset, with traffic flow counts, speeds and traffic constitution assigned to each link;
- Support IR and NSO in developing the census output areas population datasets;
- Support IR and NSO in developing a developing a building use spatial dataset able to identify the location of residential dwellings;
- Investigate means of capturing road surface type data and mean traffic speeds;
- Support IPPC to integrate noise into licensing of scheduled activities to help provide information for screening of industrial sites; and
- Consider amendment of the Regulations to designate Transport Malta as the competent authority responsible for the strategic noise mapping and action planning of major roads and airports.

³¹ END Article 1(10)

5 Environmental Noise Management Strategy

5.1 Aims and objectives of Noise Management

Within the framework of the END, and the context of sustainable development, the overall aim of managing environmental noise is to avoid, prevent and reduce the harmful effects due to long term exposure to environmental noise, which would in turn promote good health and a good quality of life.

As indicated above, the emphasis of the END and the Regulations is on “important” areas as established by the strategic maps. Therefore MEPA should primarily design their Action Plans with the twin aims of:

- Avoiding significant adverse health impacts from noise; and
- Preserving environmental noise quality where it is good.

5.2 Strategy for Environmental Noise Management

The aims and objectives of the Directive state that the adoption of action plans should be concerned with:

“preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.”³²

This implies two scenarios which are to be addressed by the noise management strategy:

- Protection of the future noise climate; and
- Reduction of the existing noise climate where necessary.

In the context of sustainable development, noise management becomes an integral part of the process, both as an element to judge proposals against, but also because noise mitigation measures should be sustainable in design.

5.2.1 *Protection of the future noise climate*

In order to avoid harmful effects of environmental noise in the future it is necessary to put actions in place which will provide adequate protection from the potential impacts of new developments, and will preserve and maintain areas with environmental noise levels deemed to be good.

Measures to preserve the quality of environmental noise levels, or avoid harmful effects, may be required in two generalised scenarios:

- Designated quiet areas; and
- Areas not designated as Quiet Areas, nor considered as areas where reduction of the existing noise climate is necessary.

Below is a brief discussion on aspects associated with these two general scenarios.

³² END Article 1

5.2.1.1 Quiet Areas inside agglomerations

Under the Regulations MEPA is empowered to delimit quiet areas within agglomerations.

The strategic noise maps provide an assessment of environmental noise levels across the whole of the agglomeration for roads, industrial and air traffic noise sources; and therefore may assist with the identification of quiet areas. At present there is no universally accepted definition of what constitutes a Quiet Area within an agglomeration, and thus a policy approach and some form of definition needs to be developed by the MEPA and set out within the Action Plan.

There are a number of possible means of defining quiet areas within agglomerations, from purely noise related criteria to wider definitions which take into account related aspects such as land use, local amenity value, accessibility and historic usage.

It is suggested at this stage that consideration is given to a means of defining quiet areas within agglomerations. As an example, a possible means of identifying areas for consideration as Quiet Areas may be to cross reference the areas of the noise maps below 55 dB L_{day} with a dataset of public open spaces to produce a list of potential quiet areas.

Public open spaces could be considered to include areas such as:

- Recreational areas;
- Playing fields;
- Playgrounds;
- Public parks and gardens;
- Beaches;
- Nature reserves;
- Cemeteries; and
- River banks.

MEPA may also wish to consider a second category of locations such as the grounds around potentially noise sensitive premises such as:

- Places of worship;
- Hospitals, including nursing and convalescence homes;
- Educational institutions;
- Childcare\crèche facilities; and
- Offices.

In drawing up criteria and an approach for identifying Candidate Quiet Areas, MEPA will consider relevant research into urban quiet areas such as Symonds Group³³, Defra/TRL³⁴ and van den Berg³⁵.

It is also considered relevant to consider that some public open spaces, which MEPA may wish to protect through designation, may currently have low levels of environmental noise as indicated by the strategic noise mapping, yet have much higher existing noise levels due to other noise sources not considered within the scope of the mapping, such as recreation, entertainment or neighbourhood noise. Similarly there may be other areas which MEPA may wish to designate, due to usage and utility, despite having a reasonably high level of environmental noise as indicated by the strategic noise mapping. Should MEPA wish to include the designation of such areas within the category of Quiet Areas, it is suggested that the selection criteria or decision matrix developed is able to identify and propose such areas, and that a reasoned case for designation is developed for each area which may not initially be obviously Quiet.

The list of potential quiet areas could then be taken under consideration, given knowledge of the nature and usage of the locations identified, before being taken to consultation with the public, OPM, and other relevant stakeholders, as a list of Candidate Quiet Areas. Following the consultation process, a final list may be drawn up for designation.

Once designated an accompanying policy statement would be required within the Action Plan setting out to what extent they are to be protected from environmental noise, and how this protection could be delivered e.g. whether future noise reductions are proposed, or whether planning controls will be developed and exercised to prevent any increase in environmental noise. It would be appropriate that draft versions of this policy statement, and associated protection measures, form part of the consultation process on Candidate Quiet Areas.

Noise Action Plans for locations outside agglomerations, near major roads, do not have a statutory requirement to identify and delimit quiet areas within the areas covered by the noise action plans. MEPA may, however, form the view that some locations within the action plan area would benefit from identification as Quiet Areas. In such cases MEPA are at liberty to follow the approach set out above and delimit Quiet Areas within their Action Plans.

5.2.1.2 Quiet Areas in open country

Under the Regulations MEPA is empowered to delimit quiet areas in the open country³⁶.

The requirement for such an area is that it is “*undisturbed by noise from traffic, industry or recreational activities*”. In the context of the scope of the Regulations it can be seen that the strategic noise mapping undertaken as part of the first phase of the Regulations will not provide a resource which may be extensively used to help identify quiet areas in open country. This is partially due to the nature of the assessed noise sources, which do not include recreational activities, and partially due to the area of coverage of the

³³ Symonds Group Ltd. Report on the definition, identification and preservation of urban and rural quiet areas. Final Report 4E 59492, 2003. Symonds Group Ltd, East Grinstead, UK.

³⁴ Department for Environment, Food and Rural Affairs, Research into quiet areas - Recommendations for identification, (Authors TRL Limited), 2007.

³⁵ van den Berg M M H E and van den Berg G P. Quiet areas: health issues and criteria. Proceedings of Euronoise 2006, Tampere, Finland, 2006

³⁶ Article 4

strategic noise mapping, which is near to major sources, and therefore not locations which will be undisturbed by them.

Whilst the results of the strategic noise mapping may not provide a clear indication of the location of areas which would be usefully designated as quiet areas in open country, it is recommended as a useful provision within the Regulations for MEPA who may wish to offer a level of protection for undisturbed areas which provide public amenity.

When MEPA draw up an Action Plan for areas near major roads outside the agglomeration it may consider widening the scope of coverage of the Action Plan to include Quiet Areas in Open Country away from the major sources, and delimit such areas for approval. In such cases MEPA will wish to consider relevant research into rural quiet areas, and tranquillity, such as that by Waugh and Durucan³⁷, Symonds Group³⁸ and Campaign to Protect Rural England³⁹ amongst others.

In the context of the Regulations, it is recommended that any areas put forward for designation as Quiet Areas in Open Country would have low levels of environmental noise, and be predominantly free of long term noise effects from human activity.

5.2.1.3 Planning

The planning system can have a significant influence on the control of exposure to environmental noise, and may play a key role in the improvement of amenity. The appropriate use of the planning system can be used to help avoid, or minimise, the adverse impacts of noise without placing unreasonable restrictions on development.

There are two main scenarios in development where noise could be viewed as a material consideration:

- Bringing people to noise
 - New housing, hospital, school, nursing home etc developments near to existing road, rail, industrial or airport noise;
 - Noise levels outside the façade, in gardens, in public open spaces;
 - Noise levels inside the building.
- Bringing noise to people
 - New or altered roads, railways, industrial sites or airports or commercial developments which would alter the noise environment in the vicinity of noise sensitive locations.

Experience in other EU countries suggests that the guidance and/or limit values for the two types of scenarios are not necessarily the same, and that extent of change may be as relevant to the consideration of impact as the actual level of noise.

In order to successfully use the planning process to help avoid, or minimise, noise exposure in a consistent manner it is considered appropriate for guidance on noise

³⁷ Environmental Protection Agency, Environmental Quality Objectives – Noise in Quiet Areas (2000-MS-14-M1), Environmental RTDI Programme 2000 – 2006. (Authors Waugh, D., Durucan, et. al.), 2003.

³⁸ Symonds Group Ltd. Report on the definition, identification and preservation of urban and rural quiet areas. Final Report 4E 59492, 2003. Symonds Group Ltd, East Grinstead, UK.

³⁹ CPRE, Tranquillity Mapping: Developing a Robust Methodology for Planning Support - Technical Report on Research in England, January 2008 (revised).

exposure levels to be considered within the proposal and design stage of planning applications.

In the scenario where new residential properties, or other noise sensitive premises, are introduced into an existing climate of environmental noise, there is currently no clear guidance. Until specific planning guidance on noise is forthcoming from OPM or MEPA, it is recommended that MEPA take under consideration the planning policy guidance notes issued by the Department of Environment in England⁴⁰, and The Scottish Office⁴¹.

In the scenario where new, or altered, sources of noise are introduced to existing residential properties, or other noise sensitive locations, there are currently a number of guidance documents which cover some of the situations which may arise, as discussed in Chapter 3. However, existing guidance does not cover the majority of situations under which may arise and until such time a guidance is issued by MEPA, it is recommended to take under consideration the planning advice notes from Department of Environment in England⁴², The Scottish Office⁴³, and BS 4142⁴⁴ and any subsequent revisions.

It is recommended that the Noise Action Plans contain a review of the use of the planning system to help manage the effects of environmental noise within the noise management zones. It is also recommended that any evaluation criteria to be used are specified, or relevant documents referenced. As MEPA are empowered to develop planning policy, it is at liberty to determine that any approach to controlling environmental noise through the use of planning policy set out within the Action Plan, may be made relevant to the whole country, if considered appropriate, and not restricted solely to the noise management zones.

Whilst MEPA have it within their powers to set conditions relating to noise as part of a planning permission, there is currently no national policy or guidance which addresses the issue of noise during planning. This can lead to inconsistencies in relation to both the assessment and conditioning of planning applications.

The proposed Environment and Planning Act (CAP 504) provides a regulatory framework for controlling the environmental impact of noise through the planning process, however the powers provided will only be usable in practice once guidance or subsidiary legislation is put in place setting out the appropriate means of assessing impact, and the relevant levels of control.

5.2.1.4 Sound Insulation

Whilst the control of external levels of environmental noise constitutes one aspect of noise management, and aims to provide benefit to amenity spaces, the control of noise levels within residential properties, and other noise sensitive premises, may also play an important role.

To complement planning guidelines on exterior noise levels, it may be appropriate to consider aiming to achieve target internal noise levels within noise sensitive rooms such as living rooms and bedrooms, classrooms or patient rooms within medical establishments. In the case of new development, or conversions, these targets may be

⁴⁰ DoE, Planning Policy Guidance Note PPG24: Planning and Noise, September 1994.

⁴¹ The Scottish Office, Planning Advice Note PAN 56: Planning and Noise, April 1999.

⁴² DoE, Planning Policy Guidance Note PPG24: Planning and Noise, September 1994.

⁴³ The Scottish Office, Planning Advice Note PAN 56: Planning and Noise, April 1999.

⁴⁴ DoE, Planning Policy Guidance Note PPG24: Planning and Noise, September 1994.

introduced through the use of appropriate planning conditions, and possibly some form of pre-completion testing as used in a number of other EU countries.

BS 8233⁴⁵ provides guidance on suitable internal noise levels within residential properties, whilst further guidance on suitable internal levels in other noise sensitive premises may be sought from WHO Guideline values 2000, BS 8233:1999 and CIRIA/BRE⁴⁶.

When aiming to achieve target internal noise levels, it would normally be appropriate to request supporting evidence in respect of the façade's resistance to sound transmission, which could be in the form of suitable certified test results or calculations using the methodology within BS 8233 or EN 12354-3⁴⁷.

It may also be appropriate to discuss the layout of the development with the applicants, and consider façade orientation, location of noise sensitive rooms within the building and location of amenity open spaces. A number of approaches to building design and site layout are discussed by the Mayor of London⁴⁸, and Higgitt *et al*⁴⁹.

The draft Building (Regulation) Act of 2009 sets out a regulatory framework which enables sound insulation to become an integral part of building control. Furthermore, Schedule (Article 6(6)) sets out "*Matters for which building regulations may prescribe Standards or recommend Codes of Practice*", and includes item 10: "*Measures affecting the transmission of sound*". This approach is in the same structure as the English Building Regulations, which include Approved Document E on "Resistance to the passage of sound" which includes minimum standards for airborne and impact sound insulation between dwellings, approved details for construction and the requirement for pre-completion testing. In the interim prior to suitable Maltese guidance being developed this could provide a suitable basis for guidance.

5.2.2 *Reduction of the existing noise climate where necessary*

Within the noise management zones MEPA will primarily have two pieces of information available to them for action planning. These are:

- The current noise impact as shown by the results of the noise mapping ; and
- The current noise control measures which are in place.

When addressing the question of where noise reduction measures may be deemed necessary, the Action Planning process requires consideration to be given to a number of matters prior to proposing intervention measures for noise reduction. The Action Planning process is outlined in Chapter 5 of this report, and set out in detail in the annex "Noise Action Planning in Malta". This process represents the ongoing activities to help deliver any necessary noise reduction. These activities operate through the 5 year cycle of the Directive, and the delivered outcomes and benefits are then reported in the 5 yearly update of the Action Plan, and the summary sent to the Commission.

⁴⁵ BS 8233:1999. Sound insulation and noise reduction for buildings. Code of practice, British Standards Institution (BSI), London 1999.

⁴⁶ Miller, J, Sound control for homes (R127M), CIRIA/BRE, 1993.

⁴⁷ EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound, 2000.

⁴⁸ Mayor of London, Sounder City – The Mayor's Ambient Noise Strategy, March 2004

⁴⁹ Higgitt, J., Whitfield, A. and Groves, R., Quiet Homes for London: Review of Options an Initial Scoping Study – Final Report, Prepared for Greater London Authority, July 2004.

5.3 Methodology for Strategic Management of Environmental Noise

Set out above is a strategy for the management of environmental noise under the Directive. It is based upon the monitoring of environmental noise through strategic noise mapping, and management of environmental noise through the dual approach of protection of the future noise climate, and reduction of the existing noise climate where necessary.

In order to deliver on this strategy a methodology is proposed which sets short, medium and long term objectives to be delivered by MEPA over the coming years. This methodology includes the cyclical process of strategic noise mapping and noise action planning required under the directive and Regulations, but also includes objectives which help to develop the required baseline information, noise management controls and institutional capacity required to successfully deliver strategic management of environmental noise in Malta.

5.3.1 *Short term objectives*

Alongside the strategy and methodology, the Consultants have delivered the strategic noise mapping results for the first round of the Directive. These deliverables will enable MEPA to progress with delivering the remaining aspects of the first round of the Directive, and begin planning for the second round to be delivered in 2012 and 2013.

The project deliverables enable MEPA to achieve a number of the short term objectives by undertaking the following actions during the following 12 months:

- Use the reports delivered under the project to report DF4 of the Reporting Mechanism to the EEA;
- Use the agglomeration definition and identified major roads to report an update to DF1 of the reporting Mechanism, regarding first round agglomerations and major roads, to the EEA;
- Use the agglomeration definition and identified major roads to report an update to DF5 of the Reporting Mechanism, regarding second round agglomerations and major roads, to the EEA;
- Develop a summary of previous noise control programmes to be submitted to the EEA in line with DF6 of the Reporting Mechanism;
- Use the Action Planning Annex to the Strategy to develop a Draft Noise Action Plan for Malta;
- The Draft Noise Action Plan should then be taken to public consultation;
- The results of the public consultation should be used to develop the Final Noise Action Plan; and
- A summary of the Final Noise Action Plan should then be developed and delivered to the EEA in line with DF7 of the Reporting Mechanism.

At this stage, all deliverables associated with the first round of the Directive will have been reported to the EEA/EC.

Using the results of the strategic noise mapping delivered by this project, MEPA will be able to begin implementing the noise action planning process and start by undertaking an assessment to determine the most important areas. The action planning process should then be followed in order to access possible actions where mitigation is proved to be possible and cost effective.

5.3.2 *Medium term objectives*

In the medium term, envisaged to be 2012 through to 2017, MEPA will need to undertake the strategic noise mapping for the second round of the Directive. The output from the project delivered by the Consultants will enable MEPA to commence work on the second round of the Directive, due to be reported in 2012.

- The agglomeration noise exposure assessment delivered under Activity 4 of this project can be used as the basis of the agglomeration noise exposure assessment for the second round.
 - At present it is understood that the EEA/EC will issue further guidance on how the required population exposure assessment should be undertaken for the second round in a consistent approach to be applied across EC27.
 - Similarly EEA is proposing to issue a revised reporting mechanism to be used for the second round in 2012/2013. For these reasons MEPA will need to re-assess the population exposure, and re-compile the reports for the EEA using the updated Reported Mechanism following its publication.
- Due to the change in flow threshold between the first and second rounds of the Directive, there will be additional roads which are to be included in the major roads assessment for the second round.
 - The noise model delivered from this project will require further development to include these additional road links, and then noise calculations to produce the noise exposure data.

In order to meet the requirements of the Regulations and the Directive the following timetable should be met for the second round of the activities:

- **Date not specified** - MEPA shall set up a database of information on strategic noise maps in order to facilitate compilation of a report to assess the need for further actions on environmental noise, such as: medium and long term goals for the reduction of the number of people exposed; reduction of noise emission by specific sources; and protection of quiet areas in open country. The report shall contain strategies and measures, shall be reviewed every five years, include an assessment of the implementation of the Regulations, and propose amendments to the Regulations if appropriate⁵⁰.

⁵⁰ Articles 11 and 12

- **30 June 2012** – MEPA to have completed strategic noise maps for the preceding calendar year (2011) for all designated agglomerations, major roads, major railways and major airports⁵¹;
- **30 December 2012** - Report to be submitted to the EC by MEPA containing strategic noise maps related data as listed in Annex VI for major roads, railways, airports and agglomerations concerned by 2nd round in respect of the 2011 calendar year – ENDRM DF8;
- **18 July 2013** – MEPA to have draw up action plans designed to manage noise issues and effects, including noise reduction is necessary⁵²;
- **18 January 2014** - Report to be submitted to the EC by MEPA providing details of any noise control programmes that have been carried out in the past and noise-measures in place – ENDRM DF9; and
- **18 January 2014** – Report to be submitted to the EC by MEPA providing summaries of action plans related data as listed in annex VI for major roads, railways, airports and agglomerations concerned by 2nd round, and any criteria used in drawing up action plans – ENDRM DF10.

Additionally it is proposed that in the medium term MEPA should progress with the noise action planning process; develop institutional capacity, in order to handle the increasing level of technical workload; and develop planning guidance and controls, to help meet the strategic aim of protecting the future noise environment..

The steps envisaged include:

- Improve stakeholder engagement and improve collaboration by establishing a cross-departmental working group on strategic noise mapping;
 - Encourage the development of a national policy statement on noise;
 - Encourage the adoption of noise as a public health issue; and
 - Encourage the development of guidance on the assessment of neighbourhood noise, entertainment noise and noise nuisance.
- Utilise improved input data delivered via GIS enabling of Government agencies, the proposed Inspire portal and especially the wider environmental monitoring programme, specifically LiDAR survey results;
- Develop capacity within MEPA to deliver the requirements of the noise action planning process set out within the strategy,
 - Procure the noise measurement equipment and noise mapping software recommended under this project;
 - Introduce additional trained personnel who are required to undertake the specialised work set out; and

⁵¹ Article 8 (2)

⁵² Article 9 (2)

- Provide staff training to enable effective use of the technical measurement equipment and noise mapping software procured.
- Develop planning guidance to help protect the future noise environment:
 - Guidance on assessment of noise on proposed residential developments; and
 - Guidance on control of potential of noise impacts from proposed developments on existing residential areas.
- Work closely with the Planning section to ensure all applications with a noise aspect, either being a noise producer or noise recipient, are assessed by specialist staff within the noise team.

5.3.3 Long-term objectives

In the longer term, possibly looking over a 10 year period medium, the objectives should be three fold.

Firstly to continue to improve the baseline datasets used for the monitoring of environmental noise through the strategic noise mapping:

- Develop a unified spatial data infrastructure for sharing relevant datasets between stakeholders;
- Improve quality of underlying datasets;
 - Supporting the planned Mapping and IR switch to using the full coordinate system
 - Datasets across different stakeholders were found to be in a number of different coordinate systems, some with full coordinates, and others with truncated coordinates;
 - Support Mapping and IR move towards positional accuracy, aligning the Malta coordinate system with the satellite navigation coordinate system;
 - Datasets across different stakeholders were found to be in a number of different projections;
 - Support Mapping and IR in their planned development of an Inspire spatial data discover portal;
 - Finding the necessary data, its owners and release approval process was a lengthy and time consuming procedure;
 - Use of the IR LiDAR survey currently being commissioned:
 - This would provide a more accurate, detailed and up to date elevation model for the maps than currently available from the contour datasets;
 - It could also provide building height data which is not currently available;

- Support Transport Malta and MEPA Air Quality team in developing a single emissions inventory, based upon the Mapping road centreline dataset, with traffic flow counts, speeds and traffic constitution assigned to each link;
 - Support IR and NSO in developing the census output areas population datasets;
 - Support IR and NSO in developing a building use spatial dataset;
 - Investigate means of capturing road surface type data and mean traffic speeds;
 - Support IPPC to integrate noise into licensing of scheduled activities to help provide information for screening of industrial sites.
- Improve quality of mapping results through staff training,
 - Verification of the model through source emission measurements and medium term immission measurements;
 - Assess the potential for expanding the noise management zones to cover the whole of the Maltese islands to provide consistent protection for all inhabitants; and
 - Report results of strategic noise mapping to the EC on 5 yearly cycle in line with deadlines.

Secondly to implement noise control measures recommended through continued use of the action planning process.

Thirdly, to continue to develop the regulation of noise, to help protect the future noise client:

- Assess the potential for introducing noise limits to control impact on noise sensitive locations;
- Increase institutional capacity to become increasingly self sufficient for noise action planning and strategic noise mapping:
 - Develop expertise in strategic noise mapping through procurement of personnel and training;
 - Develop expertise in noise action planning and noise mitigation through procurement of personnel and training; and
 - Develop expertise on noise impact assessment, noise nuisance and noise control through procurement of personnel and training.
- Develop guidance on the management and control of industrial which may be used to assess noise complaints, or within the IPPC licensing process;
- Work closely with the IPPC section to ensure all applications are assessed by specialist staff within the noise team, and appropriately address noise within the licensing.

5.3.4 *Requirements for Noise Measurements*

The assessment of environmental noise is predominantly undertaken through the use of strategic noise mapping software using spatial datasets to develop a 3D model of the area of assessment. This model may then be used within the action planning process as a means of testing potential noise mitigation measures. Measurement of noise through field surveys has a supporting role within both the strategic noise mapping and the action planning processes.

Within the strategic noise mapping process, measurements may be used to help develop or validate the source emission levels used within the strategic noise mapping. In particular measurements can be used for:

- Checking source emission levels from traffic flows on roads;
 - It is best practice to record the weather data and count the traffic simultaneously to the noise measurements;
- Use acoustic techniques to determine the road surface correction, by using the statistical pass-by or close proximity methods; and
- Establishing the noise emission from industrial premises.

Within the action planning process there is a requirement to confirm the level of noise exposure prior to undertaking intervention actions, and a second requirement following any such action. As these measurements aim to verify the long term noise exposure of the location being assessed they require continuous measurements over a number of weeks covering a range of metrological conditions.

These differing types of noise measurements require different equipment if they are to be undertaken efficiently. Equipment suitable for drive-by tests is not generally suitable for measurements over a number of weeks, and visa-versa. In order to undertake the range of different noise measurements which would be required under the Directive, and number of different types of noise measurement, and accompanying metrological equipment would be required, from handle held equipment to mobile long term measurement stations. These requirements were used to feed into the procure specifications delivered as part of the project.

5.4 **Capacity Requirements for Delivery of Strategy and Methodology**

The strategy and methodology set out above represents a significant amount of ongoing workload, as well as the development of key guidance and regulatory documents.

The ongoing workload is largely created by the timetable of activities and reports required under the Directive, alongside the work activities associated with the ongoing noise action planning process. It is clear from the objectives set out above that there a number of reports which need to be produced and submitted to the EC at regular intervals, it is not just a case of delivering strategic noise mapping results once every five years. Similarly the action planning process, which is detailed in the technical annex, also creates an ongoing requirement for sites to be identified, noise levels to be measured, actions to be reviewed and proposal for intervention measures submitted.

The timetable and reporting requirements, coupled with the action planning process, demonstrates that whilst there may be a peak of activity preparing the strategic noise maps and then through to preparing the action plans, there remains an ongoing requirement to undertake work in connection with the Directive and Regulations in

order to meet the various national and EC requirements. It is apparent that the existing capacity within MEPA will be insufficient to meet the workload and technical requirements placed upon them going forward as this workload is considered to require one junior trained member of staff, with less than 10 years experience, and one senior more experience member of staff to manage the work, make the technical decisions and liaise with other stakeholders and the public.

In addition to these aspects, other overall objectives require the noise team to become more closely involved in supporting the Planning and IPPC sections in reviewing submissions, as well as the development of guidance and regulation, plus the possibility of become involved with entertainment noise, neighbourhood noise and noise nuisance issues. With this in mind it is considered that in the long term there is a requirement for a three to four person specialist noise team within MEPA which works across all the policy areas relevant to noise.

In the short term there is a requirement for specialist knowledge to help establishing capability, gaining experience and drawing up the proposed guidance and codes of practice. This additional requirement would be for high level expertise and advice, and one approach may be to contract in support from third parties until the requirements are met.

In the long term the required team would probably be for one senior, one or two intermediate and one junior role. The senior figure should ideally have over 20 years experience, and be capable of dealing with public liaison, briefing of Ministers and handling the press as well as making and interpreting regulations and policy.

Given the specialist nature of environmental noise management all three positions warrant graduates with specific acoustic primary or secondary engineering or science degrees. If these educational requirements prove challenging to match with available candidates, an alternative education path is for a physics or environmental health graduate, to transition into acoustics and noise control initially through training courses such as the UK Institute of Acoustics (IOA) “Certificate of Competence” training, following onto the UK IOA “Diploma in Acoustics and Noise Control”, and ultimately onto a suitable MSc in Acoustics such as those offered at University of Salford, University of Southampton, University of Derby and London South Bank University, some of which are available via distance learning.

The aim should be that all members of staff have suitable education to become Corporate Members of the Institute of Acoustics, or an equivalent level in another national society, which itself is a member of the European Acoustics Association (EEA), the International Institute of Noise Control Engineering (I-INCE) and the International Commission for Acoustics (ICA).

In order to competently undertake the roles, in addition to relevant education and training, the staff will need to be supported with a library of relevant technical documentation, including copies of all relevant ISO/IEC standards; EC DG and WG publications; national standards, guidance, codes of practice and other relevant documents from other EC Member States; reports from EC funded research projects across Europe; and proceedings from relevant European and International Acoustics conference, such as EuroNoise, Forum Acusticum, InterNoise, IIAV etc.

6 Conclusions and Recommendations

EC Directive 2002/49/EC relating to the assessment and management of environmental noise, commonly referred to as the Environmental Noise Directive (END), was established to pursue the Community objective to protect against the effects of environmental noise.

The Directive established a common approach to monitoring and managing environmental noise, including the use of common methods of assessment and common noise indicators. The objectives of the Directive are to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end the following actions are to be implemented in stages within each Member State:

- (a) Determine the exposure to environmental noise, through noise mapping, by common methods of assessment;
- (b) Ensure that information on environmental noise and its effects is made available to the public;
- (c) Adopt action plans, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.

The Directive also aims to provide a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery.

The Directive applies to environmental noise to which humans are exposed; in particular built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas; and in areas affected by noise from designated major road, railway or aircraft transport sources. This designation of urban agglomeration areas, and areas affected by major transport sources means that only certain areas within a Member State are covered by the Directive, not the whole country. Therefore, strategic noise maps and noise action plans are to be drawn up for areas inside designated agglomerations, and areas in the vicinity of major roads, major railways and major airports. It is not required to draw up strategic noise maps or noise action plans for locations outside these designated areas.

The Directive does not apply to noise that is caused by the exposed person himself, noise from domestic activities, noise created by neighbours, noise at work places or noise inside means of transport or due to military activities in military areas. This specifically excludes neighbourhood noise, entertainment noise, workplace noise and military noise; which are to be addressed by other means.

The Directive sets out specific information on the results of the strategic noise mapping which are to be reported to the EC every five years. The first round reports were to be submitted by 31 December 2007, the second round reports are due by 31 December 2012. The Directive also sets out specific information on the action planning which is to be reported to the EC every five years. The first round reports were to be submitted by 18 January 2009, the second round reports are due by 18 January 2014.

In Malta, the Directive was transposed by the “*Assessment and Management of Environmental Noise Regulations, 2004*”, L.N. 193 of 2004 (Regulations). The Regulations were made by the Minister for Rural Affairs and the Environment under the Environmental Protection Act, 2001 (CAP. 435), subsequently amended in 2005. The Regulations designate the Malta Environment and Planning Authority (MEPA) as the competent authority for the making of strategic noise maps, the publication of information on environmental noise, and the drawing up of action plans.

6.1.1 Conclusions

If the overall aims of noise action plans are to be realised, it is important that the planning of new residential properties, or other noise sensitive buildings, is carefully considered and suitable conditions applied to ensure that they do not just produce an increase in the population exposed to high levels of environmental noise. Aspects such as façade orientation, room usage, façade construction, window construction, use of passive or active air vents, site boundary noise mitigation, creation of quiet gardens or courtyards, could all be imposed as conditions during planning to help reduce the exposure of the population.

It is suggested that the framework of the Regulations and the Action Plans creates an opportunity to establish a cross departmental noise steering committee charged with a remit to set out design targets and guidance at national or local level in order to help ensure that future developments include provisions to protect the population from the effects of environmental noise. Planning guidance relating to noise would help to support the aims of the Environmental Noise Regulations and Noise Action Plans by providing tools for the planners to use when assessing and granting new developments. In order to

Coupled with this should be a broader collaboration between planning, environment and IPPC licensing teams within MEPA. As discussed previously noise impact, assessment and management crosses a number of departmental and regulatory boundaries and only by working in collaboration can best practice and consistent regulation be delivered. Planning and IPPC require noise impact assessment to be undertaken, and it should form part of the role of the MEPA noise section to provide support to Planning and IPPC to review, interpret and report on such submissions. There may be a question at present regarding the capacity and experience available within MEPA for such reviews, but the first step is to create the procedure, and provide the noise section with a reason to establish to capability in order to provide better management of noise.

Managing of noise impact during planning should not be seen as an inhibitor to development, rather an important aspect to delivering sustainable communities. If developments deliver a poor quality of life they do not help provide for a sustainable future.

6.1.2 Recommendations

The END requires Member states to collect information on long term noise exposure due to road, rail, aircraft and industrial noise sources through the use of strategic noise mapping. This noise monitoring does not cover the whole country, rather just the areas designated as being within an urban agglomeration, or in the vicinity of major transport routes above a defined flow threshold. These defined noise management zones therefore cover a part of the country, and a proportion of the population.

The required monitoring of environmental noise is undertaken with the aid of 3D noise assessment models and noise mapping software, and unlike air quality is not undertaken through the use of extensive measurement networks. Noise measurement equipment may be utilised to help capture or validate input data or source emission levels modelled with the strategic noise mapping process, and/or to validate the receptor immission levels at the noise sensitive locations within the action planning process, however it is not the primary tool used for monitoring environmental noise in line with the Directive, that is the role of the noise mapping software.

This report sets out the strategy for implementation of the END in Malta, and within two technical Annexes provides detailed processes to be followed when undertaking strategic noise mapping and noise action planning in the future.

The process for strategic noise mapping in Malta describes the use of measurements to validate the source noise emission levels used within the mapping. Part of the process for noise action planning in Malta requires validation of the receptor noise immission level at the noise sensitive location. These procedures lead to a proposal for equipment and staff requirements in order to undertake this work. The requirements for equipment were then used to form the basis of the procurement notice technical specification delivered in a separate report.

The project has included the drawing up of initial strategic noise maps for Malta in line with the requirements of the Directive. This work is detailed in a separate report. A summary of the lessons learnt and recommendations for the future which have come out of this work is set out within this implementation report.

The required equipment and personnel from the noise mapping and action planning processes were then combined with the recommendations coming out of the initial strategic noise mapping, and they were used to develop a series of high level medium and long term objectives for monitoring of environmental noise in Malta, these are set out below:

Medium term objectives

- Using the R1 strategic noise maps as a basis, meet reporting obligations for Round 2 in a timely manner, and deliver strategic noise mapping for Round 2 of the Directive to the EC by 30 December 2012;
- Improve stakeholder engagement and improve collaboration by establishing a cross-departmental working group on strategic noise mapping;
- Utilise improved input data delivered via GIS enabling of Government agencies, the proposed Inspire portal and especially the wider environmental monitoring programme, specifically LiDAR survey results;
- Develop capacity within MEPA to deliver the requirements of the noise action planning process set out within the strategy,
 - including additional personnel required to undertake the work set out; and
 - including staff training to enable effective use of the technical measurement equipment and noise mapping software procured.

Long-term objectives

- Develop a unified spatial data infrastructure for sharing relevant datasets between stakeholders;

- Improve quality of underlying datasets;
- Improve quality of mapping results through training, better input data and verification through source emission measurements and medium term immission measurements;
- Develop planning guidance to help protect the future noise environment:
 - Guidance on assessment of noise on proposed residential developments; and
 - Guidance on control of potential of noise impacts from proposed developments on existing residential areas
- Assess the potential for introducing noise limits to control impact on noise sensitive locations;
- Assess the potential for expanding the noise management zones to cover the whole of the Maltese islands to provide consistent protection for all inhabitants;
- Increase institutional capacity to become increasingly self sufficient for noise action planning and strategic noise mapping:
 - Develop expertise in strategic noise mapping through procurement of personnel and training;
 - Develop expertise in noise action planning and noise mitigation through procurement of personnel and training;
- Report results of strategic noise mapping to the EC on 5 yearly cycle in line with deadlines.

6.1.3 In Conclusion

This implementation report sets a strategy for the management of environmental noise in Malta. It is based upon the monitoring of environmental noise through strategic noise mapping, and management of environmental noise through the dual approach of protection of the future noise climate, and reduction of the existing noise climate where necessary.

A methodology for delivering the strategy is set out which includes a series of identified short, medium and long term objectives to be attained by the MEPA Noise team.

In support of the strategy and methodology there are two separate technical annexes which contain detailed processes to be followed in subsequent rounds of strategic noise mapping and noise action planning required under the Directive

The strategic noise mapping process will be followed on a five yearly cycle in order to produce and deliver the results required by the EC.

The action planning process is an ongoing approach to identifying and mitigating noise where necessary.

The long term objective include the introduction of planning guidance on noise, which will help to deliver long term management of environmental noise with the aim of reducing the potential for high noise exposure resulting from future development.

Through these three approaches; namely strategic mapping, action planning and development controls; the aims and objectives of the Directive can be delivered through the control and management of environmental noise.

Appendix A: Glossary of Acoustic and Technical Terms

Term	Definition
Agglomeration	Major Continuous Urban Area as set out within the Regulations
Attribute Data	A trait, quality, or property describing a geographical feature, e.g. vehicle flow or building height
Attributing (Data)	The linking of attribute data to spatial geometric data
Data	Data comprises information required to generate the outputs specified, and the results specified
dB	Decibel
DEM	Digital Elevation Model
DSM	Digital Surface Model
DTM	Digital Terrain Model
DVD	Digital Versatile Disk
EC	European Commission
END	Environmental Noise Directive (2002/49/EC)
ESRI	Environmental Systems Research Institute
GIS	Geographic Information System
INM	Integrated Noise Model
Malta National Grid (MNG)	The official spatial referencing system of Malta
ISO	International Standards Organisation
Metadata	Descriptive information summarising data
NA	Not Applicable
Noise Bands	<p>Areas lying between contours of the following levels (dB):</p> <p>L_{den} <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, ≥ 75</p> <p>L_d <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, ≥ 75</p> <p>L_e <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, ≥ 75</p> <p>L_n <45, 45-49, 50 – 54, 55 – 59, 60 – 64, 65 – 69, ≥ 70</p> <p>Notes:</p> <ol style="list-style-type: none"> 1) It is recommended that class boundaries be at .00, e.g. 55 to 59 is actually 55.00 to 59.99 2) The assessment and reporting of the 45 – 49dB band for L_{night} is optional under the Regulations
Noise Levels	Free-field values of L_{den} , L_d , L_e , and L_n at a height of 4m above local ground level
Noise Level - L_d - Daytime	L_d (or L_{day}) = $L_{Aeq,12h}$ (07:00 to 19:00)
Noise Level - L_e - Evening	L_e (or $L_{evening}$) = $L_{Aeq,4h}$ (19:00 to 23:00)
Noise Level - L_n - Night	L_n (or L_{night}) = $L_{Aeq,8h}$ (23:00 to 07:00)
Noise Level - L_{den} – Day/Evening/Night	<p>A combination of L_d, L_e and L_n as follows:</p> $L_{den} = 10 * \log 1/24 \{ 12 * 10^{(L_{day})/10} + 4 * 10^{(L_{evening}+5)/10} \}$

Term	Definition
	$+ 8 * 10^{((L_{\text{night}}+10)/10)}$
Noise Mapping (Input) Data	Two broad categories: (1) Spatial (e.g. road centre lines, building outlines). (2) Attribute (e.g. vehicle flow, building height – assigned to specific spatial data)
Noise Mapping Software	Computer program that calculates required noise levels based on relevant input data
Noise Model	All the input data collated and held within a computer program to enable noise levels to be calculated.
Noise Model File	The (proprietary software specific) project file(s) comprising the noise model
Output Data	The noise outputs generated by the noise model
Processing Data	Any form of manipulation, correction, adjustment factoring, correcting, or other adjustment of data to make it fit for purpose. (Includes operations sometimes referred to as ‘cleaning’ of data)
QA	Quality Assurance
RMR	The railway noise calculation method published in the Netherlands in ‘Reken- en Meetvoorschrift Railverkeerslawaaai '96, Ministerie Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, 20 November 1996’.
Spatial (Input) Data	Information about the location, shape, and relationships among geographic features, for example road centre lines and buildings.
WG - AEN	Working Group – Assessment of Exposure to Noise
XPS 31-133	The French road traffic noise calculation method published in ‘NMPB-Routes-96 (SETRA-CERTULCPC-CSTB)’, referred to in ‘Arrêté du 5 mai 1995 relatif au bruit des infrastructures routières, Journal Officiel du 10 mai 1995, Article 6’ and in the French standard ‘XPS 31-133’.

Appendix B: Bibliography and References

Legislation and Publications

Police

CAP 9 Criminal Code

CAP 10 Code of Police Laws

SL 10.09 Shops for the Sale of Wine, Beer or Spirituous Liquors (Licences, Good Order and Public Decorum) Regulations

SL 10.21 Registration of Clubs Regulations

SL 10.40 Maintenance of Good Order at Places of Entertainment Regulations

CAP 16 Civil Code

CAP 65 Traffic Regulation Ordinance

CAP 67 Traffic (Visibility) Ordinance

CAP 312 Dogs Act

Office of the Prime Minister

CAP 435 Environment Protection Act

SL 435.64 Strategic Environmental Assessment Regulations

Department of Health

CAP 94 Department of Health (Constitution) Ordinance

CAP 465 Public Health Act

Department of Health Publications

National Environmental Health Action Plan, 2006

National Environment and Health Action Plan – A Review, 2010

Department of Consumer Affairs

CAP 427 Product Safety Act

SL 427.19 Noise Emission in the Environment by Equipment for Use Outdoors Regulations

SL 427.61 Recreational Craft Regulations

MEPA

CAP 356 Development Planning Act

SL 356.04 Development Planning (Use Classes) Order

SL 356.09 Environmental Impact Assessment Regulations

CAP 435 Environment Protection Act

SL 435.05 Environment Protection (Preventive and Remedial Measures) Regulations
SL 435.47 Waste Management (Landfill) Regulations
SL 435.49 Integrated Pollution Prevention and Control Regulations
SL 435.59 Assessment and Management of Environment Noise Regulations
SL 435.61 Freedom of Access to Information on the Environment Regulations
SL 435.66 Plans and Programmes (Public Participation) Regulations
SL 435.79 Environmental Management Construction Site Regulations
SL 435.80 Prevention and Remedying of Environmental Damage Regulations
SL 435.82 Waste Management (Management of Waste from Extractive Industries and Backfilling) Regulations

CAP 441 Trading Licences Act

SL 441.07 Trading Licences Regulations

Draft Building Regulation Act, 2009

Draft Environment and Development Act, 2010

MEPA Publications

Code of Practise for Quarry Working and Restoration, 1993

Traffic Calming Guidelines, 1995

Environmental Impact Assessment, 1994 as amended 1996

Supplementary Planning Guidance for Shooting Ranges, Final Draft, October 2006

Development Control Policy and Design Guidance 2007

Planning Guidance for Micro Wind Turbines, Public Draft, July 2009

National Rural Development Strategy for the Programming Period 2007-2013, 2009

Malta Standards Authority

CAP 427 Product Safety Act

SL 427.23 EC Type-Approval of Motor Vehicles and their Trailers Regulations

SL 427.24 Indication by Labelling and Standard Product Information of the Consumption of Energy and other Resources by Household Appliances Regulations

SL 427.31 Interoperability of the Trans-European High-Speed Rail System Regulations

SL 427.33 Interoperability of the Trans-European Conventional Rail System Regulations

SL 427.36 Machinery Regulations

SL 427.38 Personal Protective Equipment Regulations

SL 427.43 Two or Three-Wheel Motor Vehicles (EC Type-Approval) Regulations

SL 427.59 Type Approval of Agricultural or Forestry Tractors Regulations

SL 427.70 Placing on the Market of Pyrotechnic Articles Regulations

Transport Malta

CAP 65 Traffic Regulation Ordinance

SL 65.11 Motor Vehicles Regulations

SL 65.15 Motor Vehicle Roadworthiness Test Regulations

SL 65.19 Motor Vehicles (Carriage of Goods by Road) Regulations

CAP 232 Civil Aviation Act

SL 232.11 Air Navigation (Noise Certification and Operation of Aircraft) Order

SL 232.21 Civil Aviation (Noise Related Operating Restrictions at Airports) Regulations

CAP 234 Merchant Shipping Act

SL 234.34 Merchant Shipping (Fishing Vessels) (Minimum Safety and Health Requirements) Regulations

SL 234.39 Merchant Shipping (Crew Accommodation) Regulations

CAP 352 Ports and Shipping Act

CAP 368 Motor Vehicles Registration and Licensing Act

CAP 499 Authority for Transport in Malta Act

SL 499.09 Air Navigation Order

SL 499.18 Air Navigation (Noise Certification and Operation of Aircraft) Order

SL 499.39 Civil Aviation (Noise Related Operating Restrictions at Airports) Regulations

SL 499.57 New Roads and Road Works Regulations

Occupational Health and Safety Authority

CAP 424 Occupational Health and Safety Authority Act

SL 424.26 Protection of Workers in the Mineral Extracting Industries through Drilling and Workers in Surface and Underground Mineral Extracting Industries Regulations

SL 424.28 Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from exposure to Noise) Regulation

SL 424.29 Work Place (Minimum Health and Safety Requirements for Work at Construction Sites) Regulations

Freeport Authority

CAP 334 Malta Freeports Act

Malta Tourism Authority

CAP 409 Malta Travel and Tourism Services Act

SL 409.15 Catering Establishments Regulations

Local Council

CAP 363 Local Councils Act

CAP 441 Trading Licenses Act

SL 441.04 Activities Requiring Permit by Local Councils Regulations

Office of the Data Protection Commissioner

CAP 440 Data Protection Act

Multi-Agency

CAP 65 Traffic Regulation Ordinances

SL 65.05 Traffic Signs and Carriageway Markings Regulation

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