Regulation Impact Statement

For Consultation

August 2012

Proposal to address the problem of intrusive external noise in new residential buildings

This Regulation Impact Statement (RIS), for consultation, accords with the requirements of *Best Practice Regulation: A Guide for Ministerial Councils and National Standard Setting Bodies*, as endorsed by the Council of Australian Governments in 2007. Its purpose is to inform interested parties of proposals to address external noise in residential buildings. Comments on this RIS are welcome.

The Australian Building Codes Board

The Australian Building Codes Board (ABCB) is a joint initiative of all levels of government in Australia, together with the building industry. Its mission is to oversee issues relating to health, safety, amenity and sustainability in building. The ABCB promotes efficiency in the design, construction and performance of buildings through the National Construction Code, and the development of effective regulatory and non-regulatory approaches. The Board aims to establish effective and proportional codes, standards and regulatory systems that are consistent between States and Territories. For more information see www.abcb.gov.au

Comments

Comments on this RIS are invited by 28 September 2012 and can be emailed to the ABCB at abcbris@iinet.com.au with the subject title "External Noise RIS".

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Summary

This RIS considers the problem of intrusive external noise from major roads and railways for prospective residents. The effect of external noise is considered on a range of new residential buildings: Class 1 (houses), Class 2 (apartments), Class 3 (hotels / motels), Class 4 (caretakers' rooms) and Class 9c (aged care facilities). These new residential buildings would be located in "noise affected areas" as designated under State and Territory legislation, essentially located close to major roads and railways. Around 13% of new residential buildings each year, or 50,000 prospective residents each year, are exposed to external noise which has the potential to become intrusive.

There is clear evidence that intrusive external noise is harmful to residents, both from the perceptions of prospective residents and the burden of disease analysis by the World Health Organisation (WHO). To an extent this harm is already anticipated in the market and reflected in discounted prices for new residential buildings without adequate noise attenuation. The key question is whether prospective residents' perceptions fully appreciate the potential harm from intrusive external noise and the noise attenuation features of the property they are considering purchasing.

The objective, primarily, is to achieve health and amenity outcomes for residents of new buildings in noise affected areas, so that any noise intrusion levels in the living and sleeping areas do not compromise their heath or amenity.

This RIS presents four alternative choices by decision-makers: the Status Quo plus three options to address the problem and achieve the primary objective:

1. New NCC provisions for a range of residential buildings: Class 1 (houses), Class 2 (apartments), Class 3 (hotels / motels), Class 4 (caretakers' rooms) and Class 9c (aged care facilities), to be enacted under State and Territory legislation in designated "noise affected areas".
2. New NCC provisions for Class 2 buildings (apartments) only, to be enacted under State and Territory legislation in designated "noise affected areas".
3. Handbook produced by the ABCB, providing a general performance objective and some suggestions for technical building solutions for a range of residential buildings, for reference and use on a case-by-case basis by State, Territory and Local Governments and the building industry.

The options are evaluated relative to the Status Quo baseline. If these options would result in negative net-benefits, then this RIS will recommend the Status Quo. If positive net-benefits are possible, then this RIS will recommend the option with the highest net-benefits.

Costings for Option 1, which are also utilised in Options 2 and 3, were prepared by a professional quantity surveyor (see Attachment 2). The assessment of costs simply multiplies these costings by the number of affected new residential buildings per year.

Benefits are determined on the basis of two conflicting forces. First, the extent to which the market has already internalised the potential harm from intrusive external noise, as observed in a price discount for residential buildings without adequate noise attenuation. This RIS estimates the value of this price discount in Australia to be around $200 million per year. Second, an objective assessment of the harm to residents of external noise from roads and railways, based on research into the burden of disease by the WHO. If estimates of the burden of disease exceed the estimated value of the price discount, then positive annual benefits can occur and each option will provide a positive net present value. If not, then the annual estimates of benefits for all three options will be zero; all harm as objectively measured by the burden of disease analysis will be fully anticipated by the market.

Hence the benefit estimates are very sensitive to the WHO burden of disease analysis. The WHO presented a central scenario for the impact of external noise, plus low and high scenarios to allow for uncertainty. Calculations in this RIS under the central scenario indicated a benefit of the avoided burden of disease to exceed the value of the price discount, resulting in net-benefits for the options. Calculations under the low scenario indicated the benefit of avoiding the burden of disease to be less than the value of the price discount, resulting in negative net-benefits for the options. On the basis of these results decision makers will make a judgement about the severity of the burden of disease:

- If the central scenario of the burden of disease is accepted then the option with the highest net-benefits should be supported – Option 1.
- If the low scenario is accepted as a better representation of the burden of disease, then the Status Quo should be supported.
- If decision makers consider the burden of disease to lie between the central and low scenarios, but more likely to be towards the low scenario, then the lower cost options should be considered – Option 2 (apartments) or Option 3 (handbook).

This RIS considers the WHO central burden of disease scenario to be significantly more robust than the low scenario, and therefore recommends Option 1.

This recommendation is preliminary and will be re-visited on the basis of stakeholder feedback, information and data. This RIS has sought stakeholder input on a range of issues, including:

- The extent that new residential buildings already attenuate external noise.
- The overall impact of current policy approaches in the private and public sectors to attenuate external noise.
- The overall impact of current external noise regulations in the jurisdictions.
- Whether prospective residents' perceptions fully appreciate the potential harm from intrusive external noise and the noise attenuation features of the property they are considering purchasing.

Stakeholder comments are invited on all issues contained in this RIS.

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Glossary

ABCB	Australian Building Codes Board
ABS	Australian Bureau of Statistics
AS	Australian standard
AS/NZS	Australian / New Zealand standard
BCA	Building Code of Australia, a component of the NCC
Class ( ) building	Class of building defined in the NCC
COAG	Council of Australian Governments
dB	Decibel: a measure of sound level
dB(A)	Sound levels in the human auditory frequency range
DTS	Deemed-to-Satisfy Provisions in the NCC
NCC	National Construction Code
NCC 2014	The 2014 edition of the NCC, effective from 1 May 2014
Noise Affected Areas	Residential areas near major roads or railways subject to external noise, as identified by each jurisdiction
NPV	Net Present Value (PV benefits less PV costs)
OBPR	Office of Best Practice Regulation
PV	Present Value (of a discounted future stream of costs or benefits)
RIS	Regulation Impact Statement

1 Introduction

Some noise from roads and railways can be characterised as "unwanted or harmful outdoor sound created from human activities"[1]. In recent years the problem of noise from roads and railways has become a pressing issue around Australia. Two State Governments – NSW and QLD - have responded by introducing regulation to comprehensively address the problem, and a third State – SA - has draft regulation under consideration for introduction soon. It is probable that over the next few years other jurisdictions will also strengthen their regulations to address intrusive external noise. In the context of an emerging Australia wide movement to respond directly to the problem of external noise, the Australian Building Codes Board (ABCB), with membership from all jurisdictions and the building industry, has directed that this consultation RIS be prepared to assess a range of options that address the intrusion of external noise into residential buildings, including new specific provisions to be included in the National Construction Code (NCC).

Specific NCC proposals were developed by a working group with membership from the ABCB Office, officials from some State and Territory jurisdictions and technical experts.

Scope of this RIS

This RIS examines effects of noise from major roads and railways – principal sources of continuous environmental noise. The term "continuous" for this kind of noise is descriptive, with the meaning of a steady, continuing background noise. It is used by the World Health Organisation[2] and the Australian Association of Acoustic Consultants[3] to differentiate it from intermittent and impulse noises.

Note that noise from aircraft is another continuous-type noise, but is not considered in this RIS because it has been recognised for many years as a problem in its own right and dealt with under airport planning and noise management mechanisms.

Other sources of external noise include sounds from private residences such as barking dogs or lawn-mowers, sounds from entertainment centres, late night revelry, and sounds from utilities such as garbage removal vehicles. These other noises are intermittent, to some extent can be anticipated, and often controlled under other legislation. The literature examining the link between external noise and medical conditions has focussed on continuous-type noise, especially from roads and railways. Hence this RIS also maintains a focus on the continuous-type noise from roads and railways.

The scope of these proposals is limited to new residential buildings; the stock of existing residential buildings will be unaffected by the proposals. Given that new

[1] EU Directive 2002/49/EU on the management of environmental noise.

[2] WHO (1999) *Guidelines for Community Noise*.

[3] AAAC (2010) *Guideline for Apartment and Townhouse Acoustic Rating*.

dwellings built in one year comprise around 1.8% of the total stock, the impact of the proposals will be significantly less than if they applied to all existing dwellings.

The scope is further limited to the number of new residential buildings being built close to major roads and railways and affected by external noise.

This RIS considers the effect of intrusive external noise from roads and railways on the following residential buildings:

Class 1 buildings – houses
Class 2 buildings – apartments
Class 3 buildings – hotels and motels
Class 4 buildings – caretakers' rooms in commercial/industrial buildings
Class 9c buildings – aged care facilities

The problem is the effect on residents when the continuous noise from roads and railways becomes intrusive over a prolonged period.

Consultation

This is a consultation document. Interested parties are invited to comment on any matter raised in the RIS and also to respond to specific questions included in the various chapters. Comments are invited by 28 September 2012 and can be emailed to the ABCB at abcbris@iinet.com.au with the subject title "External Noise RIS".

The ABCB Office will review all comments received and incorporate information and data provided by respondents into the regulatory analysis, as appropriate. The RIS as revised in the light of respondent comments will be forwarded to the Board of the ABCB for final decision.

2 Background

There are several aspects to the issue of external noise and information on them is presented in this chapter. Analysis is undertaken subsequently in this RIS and particularly in the next chapter regarding *The Problem of External Noise*.

Sound Levels in dB(A)

The following tables indicate a range of example sounds corresponding to decibel values, and what an increase in decibels sounds like.

Table 2.1: Sound levels in dB(A)

dB(A) Sound Level	Sound
20	Rustling leaves
30	Whisper in quiet library
60	Normal conversation
75	Vacuum cleaner
90	Lawn mower
115	Rock concert
125	Pain begins
140	Jet engine at takeoff

Table 2.2: Perceptions of incremental increases in sound level

dB(A) Increase	Perception
1	Imperceptible change
5	Noticeable change
10	Twice as loud
20	Four times as loud

Effect on Health and Wellbeing

The intrusion of external noise can affect the health and wellbeing of residents by generating annoyance, sleep disturbance and physiological responses linked to chronic health conditions. These issues have been researched internationally. Most research is subject to caveats, indicating the difficulty in undertaking research on this topic and less than a desirable number of research papers. Notwithstanding these caveats, the overall sense from the literature is that external noise, or

“environmental noise” as it is also known, is more than a nuisance and a concern for public health.

Definitive reports bringing the international research together have been prepared by the World Health Organisation (WHO) since 1999. Three WHO reports are summarised in this section that: describe the range of adverse health effects; indicate the level of scientific proof for these effects; and provide quantitative estimates of harm.

The WHO (1999) ***Guidelines for Community Noise*** describe the adverse health effects and provide some guideline sound pressure levels below which these effects will be minimal.

1. **Noise-induced hearing impairment**, where environmental noise is increasingly a risk factor. While intermittent and impulse noises are particularly damaging, continuous noise such as from road or rail is also a factor and its impact depends on duration and level. Tinnitus is an associated effect. The main social consequence of hearing impairment is an inability to understand normal speech under daily living conditions. Continuous noise above 70 dB(A) (very loud) can cause hearing impairment.
2. **Interference with speech** occurs when interfering noise renders speech incapable of being understood. In quiet surroundings the speech level is about 45-50 dB(A). Background noise levels above 35dB(A) interfere with the intelligibility of speech, particularly when listening to complicated messages, although in other circumstances background noise of up to 45dB(A) may be acceptable.
3. **Sleep disturbance** diminishes the value of sleep which is a prerequisite for good physiological and mental functioning of healthy persons. The primary effects are a difficulty in falling asleep, awakenings, and alterations of sleep stages or depth. Observed physiological effects include increased blood pressure, increased heart rate, changes in respiration and cardiac arrhythmia. Secondary effects include perceived reduced quality of sleep, increased fatigue, depressed mood and decreased performance. These effects are particularly noted in sensitive groups: shift workers, the elderly and persons vulnerable to physical or mental disorders. These effects can be avoided where continuous noise in the bedroom does not exceed 30 dB(A).
4. **Cardiovascular and physiological effects** have been observed after prolonged exposure to external noise by susceptible individuals, leading to permanent effects such as hypertension and ischemic heart disease. For the general population the evidence suggests an association between long term environmental noise and hypertension and ischemic heart disease, at continuous sound pressure levels above 65-70dB(A), although this association is weak. Other physiological effects such as changes in stress hormones, immunological indicators and gastrointestinal disturbances are also cited but are too inconsistent for conclusions to be drawn.

5. **Mental health effects** are not believed to be directly caused by environmental noise as psychiatric disorders are associated with noise sensitivity, not noise exposure.
6. **Effects on performance** may occur but no published studies were found on this topic.
7. **Annoyance**, "a feeling of displeasure", often associated with negative emotions such as anger, disappointment, dissatisfaction, withdrawal, helplessness, anxiety and agitation, can be triggered by continuous noise. However many effects involve interactions with non-auditory variables; for example provocation may also be required to trigger anger. The consequent relationship between annoyance and activity disturbance is not necessarily direct.

The WHO (2009) ***Night Noise Guidelines for Europe*** considered a range of environmental noises, including from roads and railways, their impact on a range of specific medical conditions, and described the strength of these relationships. The WHO defined "sufficient evidence" as "a causal relationship has been established" and "limited evidence" as "a relation between the noise and health effect has not been observed directly, but there is available evidence of good quality supporting the association". On this basis the report concludes:

1. Sleep is a biological necessity and disturbed sleep is associated with a number of adverse impacts on health.
2. There is **sufficient** evidence for the biological effects of environmental noise during sleep: increase in heart rate, arousals, sleep stage changes and awakening.
3. There is **sufficient** evidence that night noise exposure causes sleep disturbance, increase in medicine use and insomnia.
4. There is **limited** evidence that disturbed sleep causes fatigue, accidents and reduced performance.
5. There is **limited** evidence that night noise causes hormone level changes and clinical conditions such as cardiovascular illness.

The WHO (2011) ***Burden of Disease from Environmental Noise: quantification of healthy life years lost in Europe*** quantifies the effect of environmental noise from roads and railways on public health. Its purpose is to provide technical support to policy-makers and their advisors in the quantitative risk assessment of environmental noise. Estimates of the burden of disease were calculated by combining the following three elements:

- Environmental noise exposure levels, near roads and railways, measured in European settlements with populations greater than 50,000 and covering a total of 285 million people.
- The health impacts for selected medical conditions, quantified by an estimated exposure - response relationship relating the disease state to levels of environmental noise.

- A Disability Weight, derived for each medial condition, quantifying the time lived in various disease states and measured on a scale between 0 and 1: where 0 represents perfect health and 1 represents death. The Disability Weight allows estimates of the burden of disease to be expressed as the number of Disability Adjusted Life Years, or DALYs. DALYs measure the number of otherwise healthy life years lost due to each medical condition, taking into account the associated rates of mortality and morbidity.

The WHO examined a number of medical conditions with a known association with road and rail environmental noise. For some medical conditions the available evidence only indicated a potential causal relationship: cardiovascular disease; cognitive impairment in children; and tinnitus.

Definitive results were obtained for the relationships between environmental noise and two medical conditions: sleep disturbance and annoyance.

The WHO undertook a meta-analysis of the literature for each condition, determined a central estimate of the Disability Weight and, using this estimate, calculated the burden of disease in terms of DALYs as a central scenario. The WHO then determined an uncertainty interval around the central estimate of the Disability Weight, with the low / high estimates sourced from studies in the literature with low and high estimates.

For sleep disturbance, the central estimate of the Disability Weight was 0.07 with a confidence interval of 0.04 to 0.10. The central estimate of 0.07 was supported by an average over several studies of the mean and median Disability Weights, while the low and high ends of the confidence interval were regarded as extreme.

For annoyance, a limited number of studies meant the central estimate for the Disability Weight was regarded as tentative, at 0.02, with a large uncertainty interval of 0.01 to 0.12. The central estimate is close to the low end of the uncertainty interval and could be considered to be conservative.

Burden of disease estimates for the central scenario are presented in the following table. Under the low scenario for sleep disturbance and annoyance, the total burden of disease would be 45% less, at 757,700 DALYs. Under the high scenario the total burden of disease would be over 200% higher, at 4,500,000 DALYs.

Table 2.3 - Burden of disease estimates – central scenario (DALYs)

	Roads	Railways	Total
Sleep disturbance	800,023	43,300	**843,323**
Annoyance	487,448	64,160	**551,608**
Total	**1,287,471**	**107,460**	**1,394,931**

Overall the central scenario indicates a loss of 1,395,000 years of otherwise health life, per year, due to the impact of external noise on residents from roads and railways. Adjusting for the large European population in urban areas, of 285 million, the burden of disease per million urban people would be 4,895 years of otherwise healthy life lost, per year. Using the Value of a Statistical Life Year in Australian

dollars[4], the value of these 4,895 DALYs per million urban people would be, in Australian dollars, $835 million per year. In conclusion the WHO study shows that external nose from roads and railways in Europe has large adverse impacts on the health of urban people, with a commensurately large annual cost.

Price Discount of Noise Affected Properties

Studies carried out in Australia and Europe identified a 5% to 10% reduction in property value due to proximity to a noise source and inadequate noise treatment in place.[5] Residential property values suffer as a result of being located adjacent to noise sources such as busy roads and railways. Re-sale values and prospects of re-selling are lower due to consumer perceptions about excessive noise when there is inadequate noise attenuation.

In economic terms this is "revealed preference", where in a normal market situation, consumers reveal their preference for a particular characteristic of a good or service. In this case that preference can be valued by their willingness to pay a premium for adequate noise attenuation, or equivalently, the price differential that consumers associate with excessive external noise. The price differential represents a summary measure of all negative attributes as perceived by prospective residents.

The Australian and European studies found a relationship between the extent of intrusive external noise and a price discount on residential properties, of between 0.5% and 1.0% reduction in price per decibel of external noise. The overall value of the discount was calculated on this basis, taking account of the number of new dwellings in noise affected areas, building costs and the distribution of external noise across five noise categories using the survey results of Brown and Bullen.[6] The annual value of the price discount was estimated at between $170 million and $200 million per year (allowing for variation in building cost data), which corresponded to 4% of the value of new construction. As a check, the value of work done for new residential buildings in 2010-11,[7] of $40 billion, of which 13% are constructed in noise affected areas, then the 4% to allow for resident perceptions of external noise is valued at around $200 million. Hence these two approaches to estimating the value of the price discount indicate $200 million per year.

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[4] The Statistical Value of a Life Year is around $A170,600 in 2011 prices, sourced from an OBPR guidance document and adjusted for inflation.

[5] Victorian Transport Externalities Study (1994) quoted in South Australian Department of Planning and Local Government (August 2011) *Consultation Regulation Impact Statement: proposal to implement a Minister's Specification SA8 – construction requirements for the control of external sound in South Australia.*

[6] See following section in this chapter *Survey of Road Traffic Noise – capital cities* and Brown and Bullen (2003) *Road Traffic Noise Exposure in Australian Capital Cities*, Acoustics Australia

[7] ABS 8752 *Building Activity*

Australian Perceptions of External Noise

In the mid 2000s the ABCB became aware of concerns in the community regarding the level of external noise which is experienced within residential apartment buildings in inner city and suburban areas. The ABCB commissioned a survey of stakeholder perceptions of external noise and options to address the issue.[8] The stakeholders surveyed covered a range of pertinent industry associations and regulatory authorities. The survey found that 83% of respondents believed a review of the current controls was necessary in order to adequately reduce the intrusion of external noise. The respondents indicated a preferred solution with responsibility shared between the ABCB and State/Local Governments: "noise zones" could be identified by Local Governments while the ABCB could develop quantified Performance Requirements for the building envelope. This approach would reduce the intrusion of external noise into apartment buildings with many benefits: a corresponding decrease in annoyance and sleep disturbance; a consistent approach across the jurisdictions with a minimum of duplication; sound insulation requirements would be detailed in one document (the BCA); and implementation would produce easily demonstrable benefits – up to 75% perceived noise reduction compared with an approximate 4% increase in construction costs.

Effect of Land Use Planning

Land use planning may accentuate the problem of external noise where it encourages the development of new residential buildings close to major transport nodes and corridors. From a planning perspective this makes sense: limiting urban sprawl and more intensely utilising the existing public transport and services infrastructure. As an example, see *The 30 Year Plan for Greater Adelaide*.[9] While there may be a strong societal need to plan a city to achieve these objectives, an increasing concentration of people living near major transport routes will make the issue of external noise increasingly problematic.

Survey of Road Traffic Noise – capital cities

A survey of road traffic noise in five capital cities was conducted by Brown and Bullen.[10] It showed the proportion of dwellings affected by road traffic noise. A dwelling was defined as a detached house, a duplex, terrace house, unit, flat, apartment, or part of high rise complex – essentially the definition of dwellings used by the Australian Bureau of Statistics. The survey was undertaken in 1997/98. The results indicate that higher levels of external noise proportionately affect fewer dwellings. Sydney is significantly different from the other capitals with a higher proportion of dwellings subject to external noise over the first three categories. The

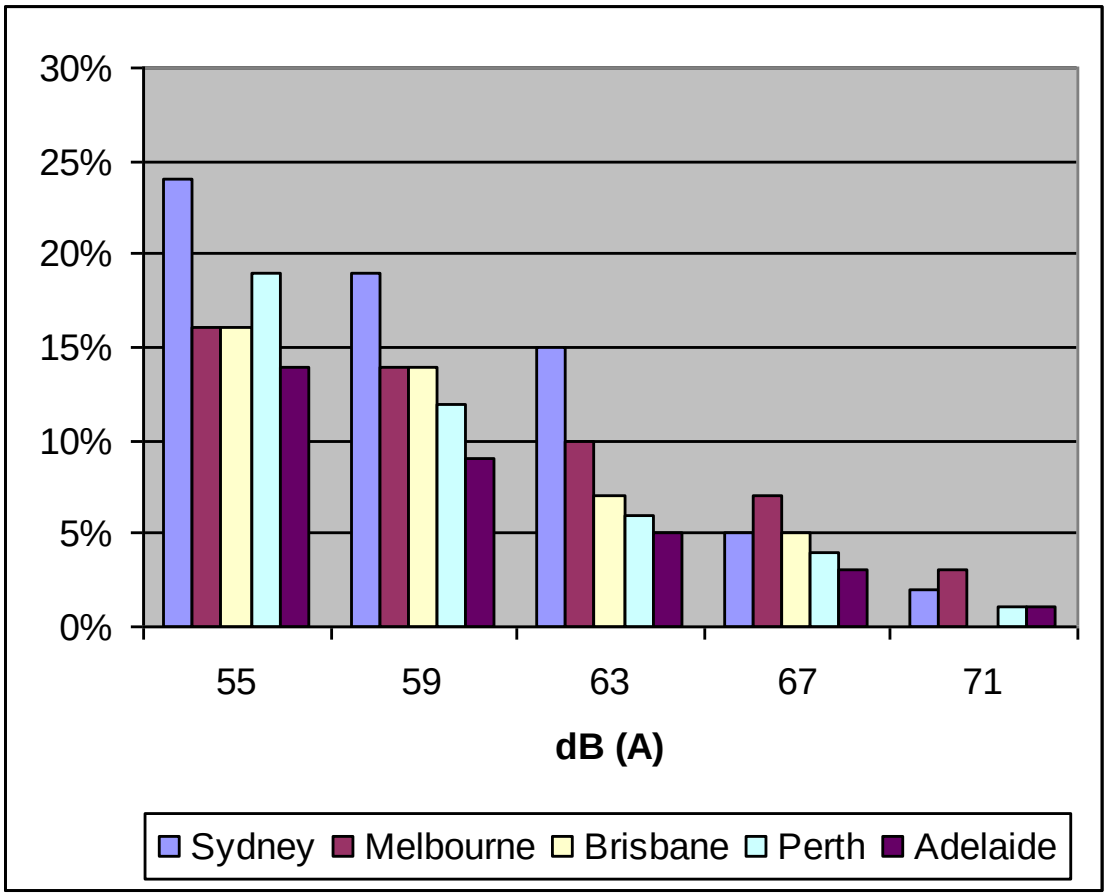
[8] Bassett (2007) *External Noise into Residential Apartment Buildings: scoping study report*.

[9] SA Government Department of Planning and Local Government (2011) www.dplg.sa.gov.au /plan4adelaide/index.cfm

[10] Brown and Bullen (2003) *Road Traffic Noise Exposure in Australian Capital Cities*, Acoustics Australia

authors suggest the different result reflects a different pattern of road location and use in Sydney, with its road system constrained by topography.

Chart 1 – Proportion of dwellings affected by road traffic noise



Source: Brown and Bullen (2003)

An important part of this chart is the first section showing the proportion of dwellings subject to at least 55 dB(A). These proportions are repeated in the following table, together with an estimate of the number of new dwellings that would be affected each year, taken from a five year average of building approvals data in each city.

Table 2.4 – New dwellings exposed to excessive external road noise

	(%)	(#)
Sydney	24%	4,590
Melbourne	16%	6,274
Brisbane	16%	2,399
Perth	19%	3,015
Adelaide	14%	1,185
Overall	**18%**	**17,464**

Source: Brown and Bullen (2003) and ABS 8731 *Building Approvals Australia*

Exposure to External Noise

The Brown and Bullen survey showed that 18% of dwellings in capital cities are exposed to potentially intrusive road traffic noise. This RIS also estimates the effect of external noise from railways; however a search for data on the separate impact of railways to external noise did not identify any new information. Data from the WHO analysis of the burden of disease indicated a contribution from railways in Europe to be 8% of the total burden from both roads and railways. While 8% seems low for the comparative impact of railways, it is the only data available and would add 1.4 percentage points to the overall exposure from roads and railways, lifting the percentage exposure in urban areas to 19.4%. Across Australia, the urban population accounts for 69% of the total population,[11] and if the geographic distribution of dwellings is similar to the distribution of people, then 13% of total new residential buildings would be exposed to potentially intrusive external noise each year. Equivalently, around 50,000 residents in new residential buildings per year, or around 500,000 people over a ten year period, will be exposed to potentially intrusive external noise.

Note that road and rail noise at levels of 55 dB(A) or more, measured at the external wall of dwellings, does not automatically mean that this noise will be intrusive. Whether the external noise is intrusive or not depends on the treatment of the external façade and its noise attenuation characteristics.

The Brown and Bullen survey provides a distribution of exposure to be calculated across the five external noise categories, as presented in the table below.

[11] See ABS 3218 *Regional Population*.

Table 2.5: Distribution of the exposure to external noise

	External Noise Category					
	1	**2**	**3**	**4**	**5**	
Road noise, cumulative - capital cities	18.0%	13.7%	8.8%	4.8%	1.4%	
Road Noise, per category - capital cities	4.2%	5.0%	4.0%	3.4%	1.4%	**18%**
Road and rail noise, per category - all regions	3.0%	3.6%	2.9%	2.4%	1.0%	**13%**

In the table above the cumulative percentages show the external exposure to road noise of 55 dB(A) or more for category 1, of 59 dB(A) or more for category 2, of 63 dB(A) or more for category 3, of 67 dB(A) or more for category 4 and 71 dB(A) or more for category 5. The road noise, per category row shows the distribution of the 18% of city dwellings exposed to external noise, across the five categories. The row sums to 18%. The exposure of dwellings in all regions of Australia, for road and rail external noise, across the five noise categories, is presented in the final row and sums to 13%.

The key feature of the table above is that exposure to external noise in categories 3 and 4 is significant and only slightly less than categories 1 and 2; hence a significant proportion of new dwellings and their residents are exposed to high levels of external noise.

QUESTIONS:

- ***Do you have any information that will be helpful in assessing the exposure of new residential buildings to external noise from roads and railways?***
- ***Do you agree with the exposure percentages presented in the table? If not, can you suggest percentages that may be more appropriate?***
- ***Can you suggest a procedure to more accurately estimate the exposure to external noise from railways?***

External Noise in the States and Territories

There is little data available from the States and Territories to provide another view of the extent of the problem. However two States provided data that enable some inferences to be drawn.

- Queensland indicated that 359,952 parcels of land are identified as affected by the current designations – that is, located within designated noise corridors. Non-residential uses would be included in these parcels of land and can be removed by applying the Queensland residential / total building

ratio of 61.5% from ABS building activity data[12]. Applying the ratio for new to existing dwellings, of 1.8%, to focus the calculation on new dwellings only, gives a total of 3,985 new dwelling units in designated noise corridors. Compared with year average dwelling approvals for Queensland, it can be inferred that 12% of new dwelling units in Queensland are located in the noise corridors.

- South Australia indicated that 69,705 dwellings in the greater Adelaide area are currently impacted by external noise from road or rail. Applying the new / existing stock ratio for dwellings of 1.8% provides an estimate of the number of new dwellings affected by external noise of 1,255 or about 15% of new dwellings in Adelaide.

These figures are similar to the survey results of Brown and Bullen.

QUESTION

- ***Do you have any further information on the extent of external noise impacts or noise affected areas in the States and Territories?***

Distribution of New Residential Buildings

Houses and apartments comprise most of the new residential units. For this RIS the annual total was calculated from a five year average of ABS building approvals, with the averaging eliminating the volatility in the building data. Caretakers' rooms were identified in the approvals data. The calculations were extended to include hotels / motels and aged care facilities on a "units" basis (i.e. similar to apartments) through inferences drawn from building activity data.

Table 2.6: New residential buildings by Class of building - Australia

	%	Per Year (#)
Class 1 - Houses	57%	93,000
Class 2 - Apartments	38%	62,000
Class 3 - Hotels / Motels	2.5%	4,050
Class 4 - Caretakers' Rooms	0.2%	230
Class 9c - Aged Care Facilities	2.3%	3,720
	100%	**163,000**

Source: ABS 8731 *Building Approvals Australia* and 8752 *Building Activity Australia.*

The composition of new residential buildings in noise affected areas may differ from the national average. Specifically, the proportion of apartments may be higher. This is intuitively appealing when considering that infill in the inner city areas could largely occur through apartments. However substantial housing developments are a continuing feature at the edge of urban areas, and they are often subject to external

[12] The ABS defines "residential" to mean "dwellings" in building activity data.

noise from major roads. Given these opposing arguments, and a lack of detailed data on the composition of residential buildings in noise affected areas, this RIS accepts that the broad proportions calculated at a national level (above) also apply to noise affected areas.

QUESTION

- ***Do you have any information on the distribution of building classes in noise affected areas?***

Current Policy Approaches to Abate External Noise

The problem of intrusive external noise has been recognised for many years in the private and public sectors which have responded with a range of policy approaches to attenuate the noise. The key areas of response are: good architectural design of buildings; public engineering works; and land use planning approaches.

Good Architectural Design

Architectural design of residential buildings can take account of the local topography and noise source and, in some cases, achieve acceptable internal sound levels. For example, new buildings may be oriented away from the noise source so only the non-habitable rooms with smaller windows face the noise. For developers this could be an attractive option compared with other ways to achieve adequate noise attenuation.

Of course noise attenuation will be only one of a number of factors in building design and, depending on the specific circumstances, may or may not be a priority.

Public Engineering Works[13]

This appraoch addresses noise from roads and railways at the source. These measures would be enacted at the discretion of each jurisdiction, based on that jurisdiction's judgement on effectiveness in the local circumstances.

- Barriers and landscaping close to roads and railways, to attenuate noise and achieve the performance objectives for adjacent residential buildings.
    - This measure may suit some situations more than others, for example housing developments at the edge of urban areas rather than the inner city (where there may be little space for barriers or landscaping), and would take account of local topography and winds, and the characteristic of sound waves directed above the horizon to "bend" back to the ground.
    - Barriers would have to be 4 m high to abate exhaust noise from trucks and rail freight locomotives. Barriers of 5 m can reduce noise levels by 10 dB(A) in suitable situations.

[13] Performance data referenced in the WA (2009) *State Planning Policy 5.4, Road and Rail Transport Noise and Freight Considerations in Land Use Planning: Implementation Guidelines*

- Timber is often used for barriers because it is cheaper than other materials, such as masonry and concrete, but is costly to maintain.

- Quiet roads and railways.
  - Quiet roads involve a choice of materials, special coatings and a grooved surface that will reduce the road / tyre noise by up to 5 dB(A). The voids in the road pavement bounce the tyre noise around and dissipate it.
    - Quiet roads are more costly to construct than normal roads and are much less durable, requiring res-sealing every four years compared with fourteen years for normal urban roads.
    - Governments will have several objectives for roads and quietness may rank below safety and low maintenance.
  - Quiet railways require smooth track joints and the elimination of crossovers and turnouts in urban areas.

Land Use Planning Approaches[14]

The following approaches may be useful or not depending on the merits of each location, and may involve conflicts with other land use planning objectives.

- Planning to separate noisy transport routes from noise sensitive areas.
  - A possibility in planning new housing developments, but likely to be difficult in inner city or suburban situations.
  - A doubling of the distance of separation from 20 m to 40 m will reduce noise levels by about 3 dB(A).
- Planning to shield housing by encouraging apartments to be built adjacent to major roads and railways.
- Road and rail traffic management, reducing the speed and / or the volume of traffic, also with time restrictions (e.g. 10pm to 7am), hence reducing the level of noise.
  - A 10% traffic speed reduction will produce a 1.5 dB(A) noise reduction.
  - Reducing the speed of trains around bends from 110-130 km/h to 80km/h will be effective in reducing the squeal of wheels against the rails.
- Planning to restrict the slope of roads and railways, to limit engine noise during ascent.
  - A 5% reduction in road gradient will produce a 1.5 dB(A) noise reduction.

[14] *Ibid*

- Planning to restrict the curvature of railways in unban settings, to reduce the squeal of the wheel against the rail in curved sections of track.

Limitations

There will be circumstances where each set of policy approaches identified above may not adequately attenuate external noise, as indicated below.

Limitations of Good Architectural Design

Where the building cannot be oriented away from the noise source, due to:

- the size, shape and orientation of the block
- a desire for the building to be north-facing
- multiple sources of noise
- lack of awareness of architects, developers and builders to give noise attenuation sufficient priority in building design

Limitations of Public Engineering Works

Where the space adjacent to roads and railways in urban areas is very limited, it may not be possible to erect barriers or provide landscaping. Where barriers would not suit the urban environment, as judged by local residents or the local council, then barriers may not be erected. Indeed, barriers will be unsuitable for many high traffic locations in urban areas.

Where the local council considers the cost of public engineering works to be high, and of lesser priority compared with other needs and demands on its budget, then the engineering works may not be undertaken. The costs will be borne by government but the benefits will be realised by residents, and if the benefits are considered by government officials to be too intangible then officials may not support these public works.

Quiet roads require re-sealing at a rate 3-4 times that of normal roads, which makes them an expensive option.

Quiet railways might be an option when new track is being laid or when existing track is being upgraded and re-laid, but not necessarily otherwise.

Limitations of Land Use Planning Approaches

Land use planning is most effective for new developments, but limited in existing built environments.

For example, separating a noise source from noise sensitive areas, moderating the gradients of roads and railways, and restricting the curvature of railways may be difficult or impossible in inner city areas.

Speed limits are already in place in urban areas and there may be little scope for further speed restrictions. In addition, the effectiveness of lower speeds in reducing noise may not be apparent to residents. For example, a reduction in night traffic speed on an arterial road in a major city, from 100kph to 80kph, was abandoned

when the lower speed limit was considered not to have delivered worthwhile noise reduction.

QUESTIONS

- ***To what extent are current policy approaches being used to address external noise?***
- ***Which areas are most effective in addressing external noise?***
- ***How significant are the limitations?***

Current Industry Standard

The Australian Association of Acoustical Consultants (AAAC) is a peak body representing professionals who are involved in delivering acoustic solutions for a wide range of clients. It produced a *Guideline for Apartment and Townhouse Acoustic Rating* (2010), a performance-based guideline for sound insulation. The guideline contains a star rating corresponding to the intrusion of external noise into bedrooms and habitable rooms. Once a client settles on a particular star rating to be achieved, a member of the association can then provide the solution including materials to be used.

The star rating guideline is presented in the table below.

Table 2.7: AAAC performance guidelines for acoustic rating

External Noise Intrusion	**2 Star**	**3 Star**	**4 Star**	**5 Star**	**6 Star**
(a) Bedrooms					
Continuous Noises	36dB(A)	35dB(A)	32dB(A)	30dB(A)	27dB(A)
Intermittent Noises	50dB(A)	50dB(A)	45dB(A)	40dB(A)	35dB(A)
(b) Other Habitable Rooms Including Open Kitchens					
Continuous Noises	41dB(A)	40dB(A)	37dB(A)	35dB(A)	32dB(A)
Intermittent Noises	55dB(A)	55dB(A)	50dB(A)	45dB(A)	40dB(A)

Current Regulation

To the extent that the problem is already addressed by current regulation, the need for further regulation is diminished. Hence this RIS presents a summary of the coverage of relevant regulations across Australia and the nature of such regulations.

National

The problem of external noise is not addressed at a national level. There are no provisions in the NCC that address external noise.

However, recent provisions introduced into the NCC to enhance the energy efficiency performance of residential buildings also enhance the attenuation of external noise. The energy efficiency provisions are not sufficient to fully achieve the external noise objectives, but they will reduce the cost of adjustment.

States and Territories

External noise is currently addressed by a variety of measures and regulations of the State and Territory governments. While there are common themes between some jurisdictions, differences remain. This would be problematic for industry and builders operating in more than one jurisdiction. It would also be problematic for residents in jurisdictions where the regulations do not adequately address external noise.

The following table summarises the current regulations of the States and Territories.

Table 2.8: External Noise Regulations of the States and Territories

	Coverage/ Classifications*	Noise Affected Area	Performance Standard	External Noise Classifications	DTS	Mandatory
NSW	Class 1 (Houses) Class 2 (Apartments) Class 3 (Hotels/motels) Class 4 (Residential) Class 9a (health care) Class 9b (public worship, child care facilities) Class 9c (aged care).	Areas around road ways with an annual average daily traffic volume of 40,000 vehicles or more Areas around railways	Bedrooms: **≤ 35 dB(A)** at any time between 10pm – 7am Other Rooms: **≤ 40 dB(A)** at any time		**Yes** A guideline is provided.	**Yes** State Environmental Planning Policy (Infrastructure) 2007, NSW
VIC	Cat A Class 1 (Houses) Class 2 (Apartments) Class 3 (Hotels/motels) Class 4 (Residential) Class 9c (aged care) Cat B Class 9b (schools, kindergartens, libraries and other noise sensitive community buildings)	Roads are to be designed to not exceed Cat A or Cat B noise levels. Where these are exceeded noise reduction measures are to be taken.	Buildings No performance req for buildings. Road Construction Noise levels from road (new or improved) Cat A: **≤ 63 dB(A)** for 10% exceedance between 6am and 12am (18hrs) Cat B: **≤ 63 dB(A)** for 10% exceedance		**Yes** Guidelines from the Environmental Protection Authority (VIC) have been developed.	**No**

	Coverage/ Classifications*	Noise Affected Area	Performance Standard	External Noise Classifications	DTS	Mandatory
			between 6am and 6pm (12hrs)			
QLD	Class 1 (Houses) Class 2 (Apartments) Class 3 (Hotels/motels) Class 4 (Residential)	Designated Transport Noise Corridors: - Road corridors (state and local government controlled) - Rail corridors	Level of transport noise reduction required for habitable rooms: Cat 1**: 25 dB(A)** Cat 2**: 30 dB(A)** Cat 3: **35 dB(A)** Cat 4: **40 dB(A)**	Noise Categories differ for road and rail. <u>Road</u> Cat 0: **≤ 57dB(A)** Cat 1**: 58 – 62 dB(A)** Cat 2**: 63 – 67 dB(A)** Cat 3**: 68 – 72 dB(A)** Cat 4: **73 ≥ dB(A)** <u>Rail</u> Cat 0**: ≤ 69dB(A)** Cat 1**: 70 – 74 dB(A)** Cat 2**: 75 – 79 dB(A)** Cat 3**: 80 – 84 dB(A)** Cat 4**: 85 ≥ dB(A)**	<u>Yes</u> Acceptable construction practice is provided in the Queensland Development Code Mandatory Part 4.4: Buildings in a transport noise corridor	<u>Yes</u> Building Act 1975; Queensland Development Code Mandatory Part 4.4: Buildings in a transport noise corridor
WA		Designated primary freight roads Designated rail routes		State planning policy 5.4 is triggered where outdoor noise is likely to exceed **60 dB(A)** during the day or **55 dB(A)** during night.	<u>Yes</u> Guideline provides two deemed-to-satisfy	<u>No</u> State Planning Policy 5.4 'Road and Rail Noise and

	Coverage/ Classifications*	Noise Affected Area	Performance Standard	External Noise Classifications	DTS	Mandatory
					packages.	Freight Considerations in land Use Planning'
SA**	Class 1 (Houses) Class 2 (Apartments) Class 3 (Hotels/motels) Class 4 (Residential)	Areas that can be designated as noise affected have been identified as:- Type A Roads 50,000 > vehicles per day or primary freight routes (up to 100m from source for 60kph speed zones or 200m for 110kph speed zones) Type B Roads 25,000 – 49,999 vehicles per day or secondary freight routes (up to 60m from source for 60kph speed zones or 130m for 110kph speed zones) Type R Roads rural freight routes through towns (Up to 35m from source for 60kph speed	Level of attenuation provided by the building envelope Bedrooms (10pm to 7am) Averaged over all bedrooms: **30 dB(A)** $L_{eq.\ 9hr\ (transport),\ 15min\ (people)}$ Individua: **35 dB(A)** $L_{eq.\ 9hr\ (transport),\ 15min\ (people)}$ Other habitable rooms (other than bedrooms) (7am to 10pm) Averaged over all habitable rooms: **35 dB(A)** $L_{eq.\ 15hr}$ Individual: **40 dB(A)** $L_{eq.\ 15hr}$	Noise exposure categories: Distance from a designated road Type A Road Type (60kph) Cat 4: 0 – 15m Cat 3: 15 – 35m Cat 2: 35 – 60m Cat 1: 60 – 100m Type B Road Type (60kph) Cat 4: 0 – 10m Cat 3: 10 – 20m Cat 2: 20 – 35m Cat 1: 35 – 60m Noise Categories	Yes Contained in Ministers Specification SA8	Yes (near future) Ministers Specification SA8: Construction requirements for the control of external noise. Triggered by overlay mapping of a designated area in a council development plan

	Coverage/ Classifications*	Noise Affected Area	Performance Standard	External Noise Classifications	DTS	Mandatory
		zones or 75m for 110kph speed zones) Rail in two categories of train (up to 50m from source) and tram (up to 20m from source) Mixed use areas identified in council development plans		<u>(night)</u> Cat 4: 55-58 dB(A) Cat 3: 58 – 62 dB(A) Cat 2: 62 – 66 dB(A) Cat 1: 66 – 70 dB(A)		
TAS* **		No areas identified	<u>Buildings</u> No performance req for buildings. <u>Road Construction</u> New road projects and major upgrades have a target to achieve noise levels not exceeding more than 63 dB(A) by more than 10% over a 18hr period		<u>No</u>	<u>No</u>
NT	Class 2 (Apartments) Class 3 (Hotels and supporting	Busy Roads Airport flight paths	<u>Buildings</u> No performance req for buildings.		<u>No</u>	<u>Yes</u> NT Planning Scheme clause

	Coverage/ Classifications*	Noise Affected Area	Performance Standard	External Noise Classifications	DTS	Mandatory
	accommodation)		Road Construction Target noise objectives for future roads not currently planned is 63 dB(A) for existing residential buildings and 58 dB(A) for existing noise sensitive buildings.			7.8
ACT	Class 2 (Apartments)	Designated roads, identified in a precinct code, or located in a commercial zone.	Buildings in designated zones must be built in accordance with AS/NZS 3671, AS/NZS 2107, and ACT Environment Protection Regulation 2005		Yes Via AS/NZS 3671, AS/NZS 2107, and ACT Environment Protection Regulation 2005	Yes ACT Territory Plan 2008 under the Planning and Development Act 2007

*** General type of building classifications include; attached or detached houses (Class 1), apartments (Class 2), hotels/motels (Class 3), caretaker flats (Class 4), health care facility (Class 9a), school/kindergarten/library/child care facility/community buildings (Class 9b), aged care facilities (Class 9c)**

**** SA provisions indicated in this table are currently draft; however the government does intend to proceed to regulation. Currently external noise is not regulated in SA.**

***** The Tasmania Environment Protection Agency has drafted an Attenuation Code for new planning schemes, however this has not yet been agreed to by local government and has not gone through a public consultation process.**

3 The Problem of External Noise

New residential buildings located close to major roads and railways can be subject to intrusive external noise, and so potentially may cause significant harm to residents. Around 13% of new residential buildings each year, or 50,000 prospective residents each year, are exposed to external noise which has the potential to become intrusive.

Rationale for Government Intervention

In principle there is a case for governments to act where an enduring problem, with potentially significant adverse consequences for society, is unresponsive to the normal operation of market forces. In the case of intrusive external noise, the market on its own is unlikely to provide sufficient incentives for adequate noise attenuation where:

- Prospective residents:
    - May be unaware of the real magnitude of noise from nearby roads and railways and the intrusion of noise into living and sleeping areas.
    - Will be unlikely to garner sufficient information from looking at plans or site inspections to understand whether a new building will have adequate noise attenuation characteristics.
- Builders:
    - Will have an incentive to build to the quality demanded by prospective residents, and in building to a competitive price to exclude expensive designs and materials that are not valued by prospective residents, such as those used for noise attenuation.
    - Where builders recognise a noise attenuation issue, without regulation it will be up to the judgement of each builder how to address the issue, and there is no guarantee that the builders' responses will be sufficient to properly attenuate external noise, particularly if they are also building to a competitive price.

Efficiency of the Market

These principles apply only to a limited extent to the problem of external noise.

Most if not all prospective residents would expect noise to be an issue in new buildings close to major roads and railways. Untreated buildings in noise affected areas have been observed in the market with a price discount reflecting prospective resident's perceptions of the buildings' negative noise attributes. This outcome indicates that the market is working efficiently and participants are processing relevant information. Essentially the residential buildings' negative noise attributes, as perceived by prospective residents, are being internalised by the market and expressed in the market price.

While the market appears to efficiently process relevant information, a restriction of consumer choice may mean that the market is not working quite as efficiently as it

appears. A restriction of consumer choice occurs when land use planning expressly restricts urban sprawl and actively encourages residential infill at urban nodes and along major transport routes. The demand for new residential buildings in noise affected areas is, to a degree, inflated by land use planning policy.

QUESTIONS:

- ***Are you aware of land use planning affecting prospective residents' location choices?***
- ***To what extent does land use planning affect the demand for new residential buildings around urban nodes and along transport routes? Currently? Likely over the next 10 years?***
- ***Do you agree that restricting urban sprawl and encouraging residential infill promotes a better functioning city?***

Indications of a Level of Market Failure

As noted above, the market would appear to be efficient in representing prospective residents' perceptions in residential building prices.

The issue is whether prospective residents' perceptions bear any resemblance to reality. For example, complaints about road noise are most common from new residents in noise affected areas, indicating that for a proportion of new residents the experience of living with external noise is quite different to their expectations.

Reality is more than a general discomfort with noise. Reality is understanding that external noise, when it becomes intrusive, can have significant adverse health impacts. Reality is knowing how quiet or otherwise a new building will be, assessing its noise attenuation features relative to the noise source. These understandings require technical knowledge that may be beyond most prospective residents. For example technical knowledge, or technical advice from a trusted source, is required about the glazing of windows to determine whether windows to be fitted to a new unit adjacent to a busy road will adequately attenuate traffic noise.

QUESTIONS:

- ***Have you recently purchased a unit adjacent to a busy road – if so, were you aware of the glazing properties of the windows and their intended noise attenuation performance?***
- ***In your experience do vendors of new buildings close to major roads and railways provide information about the building's noise attenuation? How good is this information? Is it easy to read?***
- ***What proportion of such buildings would be offered for sale with quality information on noise attenuation?***
- ***From a vendor's perspective, what proportion of prospective residents seek information about noise attenuation? Is noise front of mind when prospective residents are deciding to buy in a noise affected area?***

- ***Do you have any information about the number of complaints about external noise in new buildings? Is it a big issue for prospective residents generally?***
- ***Can prospective residents adequately evaluate the noise attenuation features of off-the-plan dwelling unit?***

Health Impacts

While residents' perceptions of the problem of external noise may be efficiently processed by the market, the actual adverse health impacts may be different, and larger. There is a possibility that the market price discount of untreated buildings in noise affected areas under-states the potential harm to residents.

An overview of the health impacts of external noise has only recently emerged in the international literature from research undertaken by the World Health Organisation (WHO). In 1999 the WHO produced *Guidelines for Community Noise* which indicated a series of thresholds above which environmental noise levels, including from roads and railways, could be harmful to residents. In 2009 the WHO produced *Night Noise Guidelines for Europe* which characterised the strength of relationships connecting external noise with specific medical conditions. In 2011 the WHO produced the *Burden of Disease from Environmental Noise – quantification of healthy years of life lost in Europe*, providing statistical relationships between continuous environmental noise from roads and railways and some specific medical conditions. There was sufficient evidence to quantify a causal relationship between external noise from roads and railways to sleep disturbance and annoyance.

The research indicated that external noise from roads and railways contributed to the burden of disease from sleep disturbance and annoyance, with a total of 1,395,000 years of otherwise healthy life lost, per year. Adjusting for the large European population in urban areas, of 285 million, the burden of disease per million urban people would be 4,895 years of otherwise healthy life lost, per year. Using the Value of a Statistical Life Year in Australian dollars[15], the value of these 4,895 DALYs per million urban people would be, in Australian dollars, $835 million per year. In conclusion the WHO study showed that external nose from roads and railways in Europe has large adverse impacts on the health of urban people, with a commensurately large annual cost.

Effect of Current Building Practices

The problem of external nose will be reduced to the extent that the current construction of residential buildings in noise affected areas already includes adequate nose attenuation.

[15] The Statistical Value of a Life Year is around $A170,600 in 2011 prices, sourced from an OBPR guidance document and adjusted for inflation.

This RIS does not have any information about current building practices that include noise attenuation features in design and construction, and stakeholders are encouraged to provide pertinent information on this matter.

QUESTIONS:

- ***Are you aware of new residential buildings in noise affected areas that are currently constructed with adequate noise attenuation? If so, please give examples.***
- ***What proportion of new residential buildings in noise affected areas, in each building class (1, 2, 3, 4 (caretakers' rooms only) and 9c), are currently constructed to adequately attenuate external noise? Please provide details of noise attenuation features.***
- ***To what extent are new residential buildings constructed to the minimum building provisions contained in the NCC?***

Effect of Current Policy Approaches

A range of policy approaches are already in place in the private and public sectors to abate external noise. Good architectural design can take account of the local topography and orient the building away from the noise source. Public engineering works such as barriers next to major roads and railways, quiet road materials and construction methods and quiet track construction, can attenuate or reduce external noise. Land use planning can also assist in separating noise sources from noise sensitive areas, or reducing traffic speeds to reduce the noise of traffic or railways. Clearly the effectiveness of these policy approaches will depend on the individual circumstances of each property development.

QUESTIONS:

- ***Do you have any information that would assist in determining the extent that current policy approaches are able to achieve a reduction in external noise impacting on residential buildings? In aggregate?***
- ***If so, which practices are most successful?***

Effect of Current Regulations

There are no regulations at the national level through the National Construction Code (NCC) to address the problem of external noise.

Regulations that address external noise do exist in some States and Territories, with considerable variation and a sharp distinction between jurisdictions with comprehensive regulation, and other jurisdictions with less well formed regulation. See Table 2.8 above.

Two States, NSW and Queensland, already address the problem of external noise in residential buildings through comprehensive regulations. These States account for 40% of new residential buildings constructed each year, which would be already protected from external noise, and from an Australian perspective the extent of the problem may be reduced by 40%.

Another State, South Australia, is preparing to introduce comprehensive external nose regulations but does not have any specific regulations now. The State accounts for 8% of new residential buildings each year. It is likely that in the near future the extent of the problem from an Australian perspective will be reduced by a further 8%.

The remaining States and Territories currently have little specific external noise regulation and residents in "noise affected areas" in these jurisdictions are likely to be exposed to intrusive external noise.

Overall around 50% of new residential buildings in Australia – the new buildings in NSW, QLD and SA - would be covered by comprehensive regulations to address external noise. A further 50% of new residential buildings – the new buildings in the other jurisdictions - would be covered by regulation that is insufficient to prevent the intrusion of external noise. Hence in broad terms the effect of current regulations in the States and Territories would be to reduce the extent of the problem Australia-wide by 50%.

QUESTIONS

- ***Do you agree that around 50% of new residential buildings – the new buildings in NSW, QLD and SA - are currently or will be adequately protected by regulation against the intrusion of external noise?***
- ***Do you agree that current regulations in the other jurisdictions are not sufficient to prevent intrusion of external noise into residential buildings?***

Effect of Incremental Policy Change

There does appear to be a staged response across the jurisdictions to the problem of external noise. Comprehensive regulation has been introduced into two States since the mid 2000s, and a third State is well advanced toward introducing the same kind of regulation. The outcomes, in terms of the effect on interior sound levels, are very similar in all three States. However the specific regulations themselves are different, requiring different compliance actions by industry. From an Australian perspective, the differences in the regulations between jurisdictions diminish the effectiveness of the national construction market. Additional compliance costs are imposed on businesses operating in more than one jurisdiction, in having to understand several sets of regulations and to keep abreast of changes in all regulations. Different regulations also impede the flexibility of the market to shift resources between jurisdictions and meet changing geographic patterns of demand. The greater efficiency of a national construction market has been recognised by COAG which is considering ways to harmonise technical qualifications across the jurisdictions and facilitate the mobility of labour in this sector. As the momentum builds to introduce comprehensive regulation in other jurisdictions, the fragmentation of regulation is likely to continue.

QUESTIONS

- ***Are you a business operating in more than one jurisdiction – if so, can you comment on the extent of additional compliance costs as a result of different requirements between jurisdictions?***
- ***Do you consider that the current difference in external noise regulations between the States matters, or not?***
- ***Do you agree that, without new NCC provisions, there is likely to be a continuing fragmentation of external noise regulations amongst the jurisdictions?***

The Nature and Extent of the Problem

There is clear evidence that intrusive external noise is harmful to residents, both from the perceptions of prospective residents and the burden of disease analysis by the WHO. To an extent this harm is already anticipated in the market and reflected in discounted prices for new residential buildings without adequate noise attenuation. The key issue is whether prospective residents' perceptions fully appreciate the potential harm from intrusive external noise and the noise attenuation features of the property they are considering purchasing.

Another important issue is whether the design and construction of new residential buildings in noise affected areas already incorporate adequate noise attenuation features. If so, residents will be protected from external noise. If not, external noise could be intrusive and harmful to residents.

A range of policy approaches are already in place by the private and public sectors; however their effectiveness will depend on the individual circumstances of each specific property development. They will reduce the extent of the problem of external noise, although their aggregate impact is as yet unquantified.

The extent of the problem is also influenced by current external noise regulations of the States and Territories. Two States – NSW and QLD – already have comprehensive regulations and a third – SA – is preparing to introduce similar comprehensive regulations. These three States account for about 50% of new residential building. Hence it is in the other jurisdictions, where regulations do not adequately address the potential harm from intrusive external noise, where there is a problem and where benefits may be obtained from a national regulatory approach.

On the basis of current information the nature and extent of the problem has the potential to be very significant. The key question is to what extent the potential harm of external noise is already anticipated by prospective residents and reflected in the prices of untreated new buildings, or to what extent an objective assessment of health impacts indicates greater harm. The issues raised in this chapter will be investigated further with the aid of stakeholder feedback and information.

4 Objectives

The ABCB is responsible for developing new provisions in the NCC. In so doing the ABCB must satisfy the following general objectives.

- To achieve standards that accord with strategic priorities established by Ministers from time to time, having regard to societal needs and expectations.
- To achieve nationally consistent, minimum necessary standards of relevant safety, health, amenity and sustainability objectives.
- These objectives are applied so that:
    - There is a rigorously tested rationale for the regulation.
    - The regulation is effective and proportional to the issues being addressed, and will generate net benefits to society.
    - There is no regulatory or non-regulatory (whether the responsibility of the Board or not) that would generate higher net benefits.

Specific Objectives

Specifically, in addressing the problem of external noise in new residential buildings, the objectives are:

- To achieve health and amenity outcomes for residents, with noise intrusion levels in the living and sleeping areas that do not compromise heath or amenity.
- To have regard to societal needs, particularly as expressed in planning objectives to encourage new residential development close to transport nodes and corridors - limiting urban sprawl and more intensely utilising existing pubic transport and services infrastructure – by promoting a built environment attuned to general community expectations in relation to acceptable levels of intrusion of external noise.
- To promote greater efficiency in the national construction market.

5 Options

This chapter identifies four alternative choices for decision-makers: the Status Quo plus three options to address the problem and achieve the objectives for residents in new residential buildings exposed to the external noise from roads and railways. In addition to the Status Quo the three options are:

1. New NCC provisions for a range of residential buildings: Class 1 (houses), Class 2 (apartments), Class 3 (hotels / motels), Class 4 (caretakers' rooms) and Class 9c (aged care facilities), to be enacted under State and Territory legislation in designated "noise affected areas".
2. New NCC provisions for Class 2 buildings (apartments) only, to be enacted under State and Territory legislation in designated "noise affected areas".
3. Handbook produced by the ABCB, providing a general performance objective and some suggestions for technical building solutions for a range of residential buildings, for reference and use on a case-by-case basis by State, Territory and Local Governments and the building industry.

Details are provided below. Stakeholders are invited to comment on each option.

QUESTION

- ***Are there any other options that this RIS should include?***

The Status Quo

The status quo is the default choice for decision-makers in considering alternatives to achieve the objectives. Where the incremental impacts of other options would result in more costs than benefits, or would be ineffective in addressing the problem or achieving the objectives, the RIS would recommend the Status Quo.

The Status Quo will be regarded as a baseline, as a basis to determine the incremental impacts of the other options.

Option 1: New NCC Provisions

New provisions in the NCC for a range of residential buildings: Class 1 (houses), Class 2 (apartments), Class 3 (hotels / motels), Class 4 (caretakers' rooms) and Class 9c (aged care facilities), to be enacted under State and Territory legislation in designated "noise affected areas".

Performance Requirement

The new Performance Requirement would limit the intrusion of external noise into residential buildings:

- For a bedroom, to an A-weighted sound pressure level of 35 dB(A) L_{Aeq} from 10pm to 7am.

- For other spaces, to an A-weighted sound pressure level of 40 dB(A) L_{Aeq} at any time.

The focus is on living and sleeping areas – the habitable rooms. Kitchens, bathrooms and laundries are already sources of noise and so would be excluded from these requirements (unless they open onto a living or sleeping area).

DTS Provisions

The NCC would also include Deemed-to-Satisfy (DTS) Provisions, where compliance with these detailed building provisions would automatically be deemed to satisfy the Performance Requirement. There would be no obligation for builders to use the DTS provisions and they could use their own designs and materials provided compliance with the Performance Requirement can be demonstrated. Five categories of DTS provisions correspond to increasing levels of noise at the external wall of the building:

Category 1: from 55 to 58 dB(A)
Category 2: from 59 to 62 dB(A)
Category 3: from 63 to 66 dB(A)
Category 4: from 67 to 70 dB(A)
Category 5: from 71 to 74 dB(A)

Details of the DTS provisions are contained in Attachment 1. They cover roofs, walls, windows, doors and floors including sealing of these elements; and other fittings to the wall exposed to the noise impacts, such as pipes, ducts, equipment like air conditioners and ventilators and cables. The higher the noise category, the higher the specifications for each DTS provision.

An Issue of Implementation

For Option 1 to be effective each jurisdiction must identify and designate all "noise affected areas" and map them in detail according to the five proposed categories of external noise. This work has yet to be done by any jurisdiction.

The two States with comprehensive external noise regulation, and the State with draft comprehensive regulation, have indicated a preference to keep their respective definitions of "noise affected areas" and not re-jig the definition and mapping of noise affected areas to suit the proposed NCC five specific categories of external noise, given the high cost of the exercise. Other jurisdictions have indicated that as the cost of mapping noise affected areas would be high, they have no plans to undertake this activity in the near term.

Last year the Planning Officials Group – an informal group that met prior to meetings of the COAG Local Government and Planning Ministerial Council - considered a detailed nation-wide mapping of the exposure of residential buildings to external noise, a project that would have well complemented Option 1. However from July 2011 the Local Government and Planning Ministerial Council was abolished under a COAG review of Ministerial Councils, and the informal Planning Officials Group was also disbanded at that time, so this planning project did not proceed.

Overall it seems possible that implementation of Option 1 could be slow.

QUESTIONS

- ***Do you agree that implementation of Option 1 will be slow?***
- ***Are there cost effective methods of identifying "noise affected areas"? Can these be extended to incorporate the five specific noise categories?***
- ***Should the five specific categories be broadened in some way to be less restrictive? If so, how?***
- ***Is mapping necessary? Is there a simpler approach to trigger the external noise provisions of Option 1?***

Option 2: New NCC Provisions for Apartments

This option would be very similar to Option 1, in terms of the Performance Requirement and DTS Provisions, but only apply to Class 2 buildings (apartments).

Option 3: Handbook

The ABCB Office, in collaboration with the jurisdictions and industry experts, has developed a set of technical building solutions that address the problem of external noise for a range of residential buildings. Under this option these technical building solutions and a general performance objective would be released as a handbook for reference and use on a case-by-case basis by State, Territory and Local Governments and the building industry.

An advantage of this option is that governments and industry could target the new residential buildings where these solutions would be particularly effective. Other less noise-sensitive buildings, even in designated noise affected areas, would not require such high specifications and hence this option would provide savings to industry and residential building occupants. Savings may also accrue to governments where a precise mapping of the five proposed external noise categories under Option 1 may not be needed, where governments have broadly equivalent measures of external noise that can be implemented at the local level.

A risk of Option 3 would arise from inconsistent use of the technical solutions among local councils and between jurisdictions. Gaps in coverage of appropriate regulation could mean a proportion of the population would be exposed to unnecessarily high levels of intrusive external noise.

QUESTIONS

- ***To what extent would the handbook be used in noise affected areas? Can you estimate a proportion of new residential buildings in nose affected areas where it would be used?***
- ***Could the quality of noise attenuation features be audited by a building certifier?***

- ***Do you consider that the advantages outweigh the risks? Any information on this issue will be helpful.***

6 Impact Analysis

Groups Affected by the Options

Three broad groups will be affected by the proposed amendments to the NCC:

- Prospective residents of new residential buildings in noise affected areas.
    - This group is directly affected by external noise. It will bear the harm from intrusive external noise, benefit from greater noise attenuation in living and sleeping areas and will pay the cost of adequate noise attenuation through higher building prices or rental payments.
- The building industry, including architects, designers, builders, developers and private building certifiers.
    - The building industry will initially incur the cost of improved attenuation features, but these costs are expected to be passed on to the purchasers of new buildings. Industry will benefit from a move to national consistency benefiting particularly businesses that operate in more than one jurisdiction.
- State and Territory Governments oversighting compliance with new NCC provisions.
    - Compliance activity in relation to external noise may be required to increase in some jurisdictions.
    - Planning activity will need to be undertaken at the State and Territory and Local Government levels.

Business Compliance Costs

Industry will incur a once-off education cost to become aware of the proposed NCC provisions for external noise, and to reflect how to respond to them and their objectives. The ABCB seeks to effectively communicate changes to the NCC, and hence minimise education costs, by holding annual seminars in each jurisdiction to explain the changes. The building industry takes time and effort to become familiar with the changes each year, including through strong participation in the ABCB seminars (about half a day). As an indication of the size of the once-off education costs, the incremental contribution of the external noise provisions would be a small part of this annual education exercise, around 10 minutes in a half-day seminar.

QUESTIONS

- ***The ABCB invites industry stakeholders to provide information on compliance costs experienced by their company or sector.***
- ***What compliance costs would typically be expected for Options 2, 3 and 4?***

Government Implementation Costs

Several jurisdictions have indicated that the cost of mapping the urban areas exposed to external noise is very high. Some jurisdictions do not intend to undertake mapping in the near term due to the high cost; others that have mapped noise regions do not intend to re-map the regions on the basis of the NCC five specific noise categories, again due to the high cost.

The high cost of mapping noise affected areas appears to be a factor that may delay the implementation of Option 2.

QUESTIONS

- ***Can you describe the activities involved and the resources required to map "noise affected areas", and provide an estimate of the cost?***
- ***Can "noise affected areas" be identified at the local government level? Without a comprehensive State / Territory map?***
- ***Are there other cost-effective methods to identify "noise affected areas"?***

Effect on Competition

There are no foreseeable competition effects associated with the option to introduce new external noise provisions into the NCC. Note that the proposed provisions include a Performance Requirement, in addition to the specific DTS provisions, and hence architects and builders have the flexibility to meet the Performance Requirement through their own alternative building solutions. Such flexibility aids competition in the building industry.

There are three principal questions that are asked in relation to competition issues.

Does the proposal affect the number and range of suppliers?

This proposal would be unlikely to have any effect on the number or range of suppliers of building materials, of construction businesses, architects and designers, or other ancillary businesses in the residential building industry. The proposal does not involve licences, permits, or grant exclusive rights to any supplier, or significantly alter the costs of entry or exit of any supplier.

Does the proposal change the ability of suppliers to compete?

The proposal does not influence the price at which building materials or services are sold, affect the ability of suppliers to advertise, or alter costs of some businesses relative to others.

Does the proposal change suppliers' incentives to compete vigorously?

The proposal does not exempt any building activity from general competition law, or have any effect on the mobility of customers between suppliers.

QUESTION

- ***Do you agree that the options, if implemented, will not affect competition?***

Unit Costs of Option 1 – New NCC Provisions

The following analysis of costs is based on the proposed DTS provisions. However due to the performance based nature of the NCC, alternatives to the DTS provisions can be developed to meet the Performance Requirements. These alternatives may be able to provide more cost effective solutions, however there would be additional costs in developing and gaining approval for them.

Unit Costs of the DTS Provisions

Costings were undertaken by professional quantity surveyors of the changes required to satisfy the proposed DTS provisions, compared with the current provisions in the NCC. See Attachment 2 for their report. Costings were prepared for Class 1, 2, 3 and 9c buildings (houses, apartments, hotels / motels and aged care facilities. Class 4 buildings (caretakers' rooms) were not separately costed but are assumed to be the same as an apartment unit. The costings measured the additional costs to comply with all five external noise categories. The quantity surveyors selected a current building design for each building class constructed in Canberra, calculated the additional cost, and extended this analysis to other capital cities using regional indices based on an in-house national cost database. This approach provided a broad indication of the increase in unit costs associated with the DTS provisions, for each capital city.

This RIS also presents a building approvals weighted average of unit costs for Australia.

Table 6.1: Estimates of the increases in unit costs

Building Class	External Noise Category				
	1	2	3	4	5
Sydney					
1 - dwellings	$4,793	$6,456	$17,111	$24,195	$25,803
2 - apartments	$4,685	$6,058	$13,079	$23,529	$24,977
3 - hotels / motels	$416	$416	$511	$2,243	$4,107
4 - caretakers' rooms	$4,685	$6,058	$13,079	$23,529	$24,977
9c - aged care	$2,831	$3,622	$4,256	$8,891	$12,329
Melbourne					
1 - dwellings	$5,232	$6,831	$17,077	$23,889	$25,435
2 - apartments	$4,505	$5,825	$12,576	$22,625	$24,018
3 - hotels / motels	$400	$400	$491	$2,157	$3,949
4 - caretakers' rooms	$4,505	$5,825	$12,576	$22,625	$24,018
9c - aged care	$2,722	$3,483	$4,092	$8,549	$11,855

Building Class	External Noise Category				
	1	2	3	4	5
Brisbane					
1 - dwellings	$4,914	$6,618	$17,542	$24,804	$26,452
2 - apartments	$4,803	$6,210	$13,408	$24,121	$25,606
3 - hotels / motels	$426	$426	$524	$2,299	$4,210
4 - caretakers' rooms	$4,803	$6,210	$13,408	$24,121	$25,606
9c - aged care	$2,902	$3,713	$4,363	$9,115	$12,639
Perth					
1 - dwellings	$5,251	$7,073	$18,746	$26,506	$28,267
2 - apartments	$5,133	$6,637	$14,328	$25,776	$27,363
3 - hotels / motels	$456	$456	$560	$2,457	$4,499
4 - caretakers' rooms	$5,133	$6,637	$14,328	$25,776	$27,363
9c - aged care	$3,101	$3,968	$4,662	$9,740	$13,506
Adelaide					
1 - dwellings	$4,680	$6,303	$16,706	$23,621	$25,191
2 - apartments	$4,574	$5,914	$12,769	$22,971	$24,385
3 - hotels / motels	$406	$406	$499	$2,190	$4,009
4 - caretakers' rooms	$4,574	$5,914	$12,769	$22,971	$24,385
9c - aged care	$2,763	$3,536	$4,155	$8,680	$12,036
Hobart					
1 - dwellings	$4,828	$6,502	$17,234	$24,369	$25,988
2 - apartments	$4,719	$6,102	$13,173	$23,698	$25,157
3 - hotels / motels	$419	$419	$515	$2,259	$4,136
4 - caretakers' rooms	$4,719	$6,102	$13,173	$23,698	$25,157
9c - aged care	$2,851	$3,648	$4,286	$8,955	$12,417
Darwin					
1 - dwellings	$5,563	$7,494	$19,861	$28,083	$29,950
2 - apartments	$5,438	$7,032	$15,181	$27,310	$28,991
3 - hotels / motels	$483	$483	$593	$2,603	$4,767
4 - caretakers' rooms	$5,438	$7,032	$15,181	$27,310	$28,991
9c - aged care	$3,285	$4,204	$4,940	$10,320	$14,310
Canberra					
1 - dwellings	$4,540	$6,115	$16,208	$22,917	$24,440
2 - apartments	$4,438	$5,738	$12,388	$22,286	$23,658
3 - hotels / motels	$394	$394	$484	$2,124	$3,890
4 - caretakers' rooms	$4,438	$5,738	$12,388	$22,286	$23,658
9c - aged care	$2,681	$3,431	$4,031	$8,422	$11,678
Australia					
1 - dwellings	$5,014	$6,684	$17,386	$24,501	$26,115
2 - apartments	$4,706	$6,084	$13,136	$23,632	$25,087
3 - hotels / motels	$418	$418	$513	$2,253	$4,125
4 - caretakers' rooms	$4,706	$6,084	$13,136	$23,631	$25,086
9c - aged care	$2,843	$3,638	$4,274	$8,930	$12,382

Note that the increases in unit costs become much larger in moving across the table to the higher external noise categories.

QUESTIONS:

- ***Are the figures presented in the table above an appropriate indication of the increases in unit costs? If you consider otherwise, please provide costings and supporting information.***
- ***Do you agree that the quantity surveyor's report (see Attachment 2) provides a reliable basis to assess the likely increases in unit costs?***

Assessment of Costs

Costs of Option 1 – New NCC Provisions

The annual cost estimates of Option 1, for all States and Territories, were calculated by multiplying the unit costs, above, with estimates of the number of new residential buildings per year for each building class and external noise category, incorporating data from ABS *Building Approvals* and ABS *Building Activity*. The estimated annual costs are presented in the table below.

Table 6.2: Annual cost estimates of Option 1 – all States and Territories

Building Class	External Noise Category					Total
	1	2	3	4	5	
NSW						
1 - dwellings	$2,952,569	$4,688,530	$10,016,129	$12,361,575	$4,708,259	**$34,727,062**
2 - apartments	$1,536,117	$2,341,665	$4,074,941	$6,398,437	$2,425,787	**$16,776,947**
3 - hotels / motels	$10,333	$12,182	$12,061	$46,209	$30,218	**$111,003**
4 - caretakers' rooms	$9,281	$14,148	$24,621	$38,659	$14,657	**$101,367**
9c - aged care	$64,712	$97,605	$92,444	$168,559	$83,478	**$506,797**
	$4,573,013	**$7,154,131**	**$14,220,196**	**$19,013,439**	**$7,262,398**	**$52,223,176**
VIC						
1 - dwellings	$5,156,768	$7,937,337	$15,993,863	$19,528,255	$7,425,731	**$56,078,487**
2 - apartments	$2,363,386	$3,602,603	$6,269,232	$9,844,282	$3,732,280	**$25,831,228**
3 - hotels / motels	$15,897	$18,741	$18,543	$71,100	$46,489	**$172,242**
4 - caretakers' rooms	$14,279	$21,767	$37,878	$59,479	$22,550	**$156,071**
9c - aged care	$99,553	$150,175	$142,211	$259,320	$128,429	**$781,043**
	$7,649,884	**$11,730,623**	**$22,461,727**	**$29,762,435**	**$11,355,479**	**$83,019,072**
QLD						
1 - dwellings	$3,027,107	$4,806,179	$10,268,420	$12,672,722	$4,826,682	**$35,623,943**
2 - apartments	$1,574,807	$2,400,419	$4,177,445	$6,559,425	$2,486,876	**$17,211,125**
3 - hotels / motels	$10,582	$12,475	$12,368	$47,363	$30,976	**$114,683**
4 - caretakers' rooms	$9,515	$14,503	$25,240	$39,632	$15,026	**$103,990**
9c - aged care	$66,335	$100,058	$94,768	$172,805	$85,577	**$520,390**
	$4,688,346	**$7,333,634**	**$14,578,241**	**$19,491,946**	**$7,445,136**	**$53,574,131**

Building Class	External Noise Category					Total
	1	2	3	4	5	
WA						
1 - dwellings	$2,264,229	$3,595,528	$7,681,020	$9,479,341	$3,610,403	**$26,646,503**
2 - apartments	$1,178,168	$1,795,926	$3,125,025	$4,906,898	$1,860,361	**$12,874,885**
3 - hotels / motels	$7,936	$9,355	$9,261	$35,463	$23,192	**$85,852**
4 - caretakers' rooms	$7,196	$10,970	$19,088	$29,972	$11,363	**$78,641**
9c - aged care	$49,524	$74,708	$70,749	$129,012	$63,891	**$388,475**
	$3,507,053	**$5,486,487**	**$10,905,142**	**$14,580,686**	**$5,569,209**	**$40,074,356**
SA						
1 - dwellings	$1,153,212	$1,831,012	$3,911,720	$4,827,443	$1,838,681	**$13,571,201**
2 - apartments	$599,861	$914,359	$1,591,268	$2,498,562	$947,273	**$6,556,184**
3 - hotels / motels	$4,034	$4,756	$4,711	$18,047	$11,799	**$43,715**
4 - caretakers' rooms	$3,625	$5,525	$9,615	$15,097	$5,724	**$39,614**
9c - aged care	$25,263	$38,115	$36,100	$65,823	$32,598	**$198,238**
	$1,785,995	**$2,793,767**	**$5,553,414**	**$7,424,973**	**$2,836,073**	**$20,408,952**
TAS						
1 - dwellings	$297,384	$472,147	$1,008,713	$1,244,924	$474,155	**$3,499,605**
2 - apartments	$154,755	$235,911	$410,499	$644,559	$244,372	**$1,691,313**
3 - hotels / motels	$1,047	$1,235	$1,223	$4,682	$3,062	**$11,342**
4 - caretakers' rooms	$1,007	$1,535	$2,671	$4,193	$1,590	**$11,003**
9c - aged care	$6,517	$9,831	$9,310	$16,977	$8,407	**$51,126**
	$460,710	**$720,658**	**$1,432,415**	**$1,915,336**	**$731,586**	**$5,264,389**
NT						
1 - dwellings	$171,413	$272,225	$581,524	$717,684	$273,356	**$2,017,345**
2 - apartments	$89,167	$135,933	$236,536	$371,401	$140,808	**$974,453**
3 - hotels / motels	$604	$712	$704	$2,698	$1,764	**$6,528**
4 - caretakers' rooms	$497	$758	$1,319	$2,071	$785	**$5,434**
9c - aged care	$3,704	$5,589	$5,294	$9,652	$4,780	**$29,061**
	$265,385	**$415,217**	**$825,377**	**$1,103,506**	**$421,493**	**$3,032,820**
ACT						
1 - dwellings	$419,535	$666,177	$1,423,226	$1,756,410	$668,977	**$4,937,750**
2 - apartments	$218,310	$332,758	$579,055	$909,232	$344,717	**$2,385,895**
3 - hotels / motels	$1,465	$1,727	$1,710	$6,550	$4,284	**$15,875**
4 - caretakers' rooms	$1,353	$2,062	$3,588	$5,633	$2,136	**$14,782**
9c - aged care	$9,152	$13,807	$13,075	$23,844	$11,808	**$71,812**
	$649,815	**$1,016,530**	**$2,020,654**	**$2,701,669**	**$1,031,922**	**$7,426,114**
All States & Territories						
1 - dwellings	$15,442,217	$24,269,136	$50,884,614	$62,588,355	$23,826,243	**$177,010,564**
2 - apartments	$7,714,573	$11,759,573	$20,464,001	$32,132,796	$12,182,474	**$84,253,417**
3 - hotels / motels	$51,897	$61,182	$60,581	$232,112	$151,783	**$557,555**
4 - caretakers' rooms	$46,753	$71,267	$124,019	$194,737	$73,830	**$510,607**
9c - aged care	$324,759	$489,888	$463,949	$845,991	$418,967	**$2,543,555**
	$23,580,199	**$36,651,047**	**$71,997,166**	**$95,993,990**	**$36,653,296**	**$264,875,699**

The major cost drivers are the high unit costs of noise categories 3 and 4, together with a significant exposure of new residential buildings to these categories of external noise.

An assessment of Option 1 should take account of current comprehensive external noise regulation in NSW and QLD, and comprehensive regulation that is proposed for

SA. In broad terms it is likely that the regulations in these jurisdictions would already meet the Objectives. These regulations fall within the status quo and hence their calculated incremental costs should be excluded from the cost of Option 1. Removing the costs of NSW, QLD and SA the estimated annual cost of Option 1 would be around $130 million.

QUESTION:

- ***Do you agree that calculated costs are broadly the right order of magnitude? If not, please provide alternative cost estimates and supporting information.***

The cost of Option 1 will also be affected by two factors: the proportion of new buildings that already attenuate external noise; and by current activity of State, Territory and Local Governments to undertake engineering works (such as barriers next to freeways) and planning approaches (such a separating noise generating activities from noise sensitive areas). There is insufficient information to assess these two factors.

QUESTIONS:

- ***To what extent do new residential buildings already attenuate external noise? Information by building class will be helpful.***
- ***Does current noise attenuation cover the range of the five external noise categories?***
- ***To what extent do current engineering works and planning approaches reduce the exposure of new residential buildings to external noise?***

Costs of Option 2 – New NCC Provisions for Apartments

The annual cost estimates of Option 2, for all States and Territories, are a sub-set of Option 1, and are presented in the following table.

Table 6.3: Annual cost estimates s of Option 2 – all States and Territories

	External Noise Category					Total
	1	2	3	4	5	
NSW	$1,536,117	$2,341,665	$4,074,941	$6,398,437	$2,425,787	**$16,776,947**
VIC	$2,363,386	$3,602,603	$6,269,232	$9,844,282	$3,732,280	**$25,811,783**
QLD	$1,574,807	$2,400,419	$4,177,445	$6,559,425	$2,486,876	**$17,198,972**
WA	$1,178,168	$1,795,926	$3,125,025	$4,906,898	$1,860,361	**$12,866,378**
SA	$599,861	$914,359	$1,591,268	$2,498,562	$947,273	**$6,551,323**
TAS	$154,755	$235,911	$410,499	$644,559	$244,372	**$1,690,097**
NT	$89,167	$135,933	$236,536	$371,401	$140,808	**$973,845**
ACT	$218,310	$332,758	$579,055	$909,232	$344,717	**$2,384,071**
All States & Territories	**$7,714,573**	**$11,759,573**	**$20,464,001**	**$32,132,796**	**$12,182,474**	**$84,253,417**

An assessment of Option 2 should take account of current comprehensive external noise regulation in NSW and QLD, and comprehensive regulation that is proposed for SA. In broad terms it is likely that the regulations in these jurisdictions would already meet the Objectives. These regulations fall within the status quo and hence their

calculated incremental costs should be excluded from the cost of Option 2. Removing the costs of NSW, QLD and SA the estimated annual cost of Option 2 would be around $40 million.

QUESTIONS:

- ***Can you estimate the proportion of new apartments that attenuate external noise?***
- ***Does current noise attenuation cover the range of the five external noise categories?***

Costs of Option 3 – Handbook

The unit costs of Option 3 should be as for Option 1. However the scale of impact of Option 3 will be lower, allowing for the discretion of governments and industry on when and where to employ the technical solutions in the handbook.

For example (and purely as an example) if governments and industry voluntarily applied the Handbook to 10% of new residential buildings in noise affected areas, and after allowing for the effect of current regulations in the States and Territories, the annual cost of Option 3 would be around $13 million.

QUESTIONS

- ***Is it possible to reliably determine a proportion of all new residential buildings, in noise affected areas, where the technical solutions contained in the handbook would be used?***
- ***Can you suggest a probable or reasonable level of costs for Option 3 – over and above the status quo baseline?***

Assessment of Benefits

Benefits of Option 1 – New NCC Provisions

Benefits are achieved by addressing the problem. The new NCC provisions are designed to comprehensively abate external noise in new residential buildings and so avoid harm to residents. The benefits can be estimated as the avoided costs of the harm of intrusive external noise.

The methodology rests on the burden of disease estimates for Europe by the WHO and applied to the Australian population. The obvious question is why the European experience would be relevant to Australia. There are two reasons. First, the WHO gathered data from settlements of 50,000 people or greater, covering 285 million people overall and 58% of the European population. In Australia the urban population is indicated by the number of people living in "major cities" as defined by the ABS, which accounts for 69% of the total Australian population.[16] Hence on a *per capita* basis it appears Australia is more urbanised than Europe. Second, the average

[16] ABS 3218 *Regional Population Growth*.

noise attenuation of noise-facing facades is 21 dB(A) in Europe, as it is in Australia. European windows in the colder regions are well glazed and hence the facades can attenuate noise of 35 and 40 dB(A), but this superior performance is offset by the windows currently in use in the warmer regions. This RIS presents the WHO European results as a broad indication of the likely burden of disease impacts in Australia.

In Chapter 3 the burden of disease from roads and railways was quantified by the WHO under the central scenario as 1,395,000 DALYs, per year. This is equivalent to 4,895 DALYs per million urban people. Allowing for Australia's population of 22.9 million people, of which 69% live in urban areas, and that the scope is restricted to new residential buildings which comprise 1.8% of the stock of existing residential buildings, means that the contribution of intrusive noise from roads and railways in Australia to the burden of disease would be around 1,400 DALYs per year. The cost of this burden of disease, using the Value of a Statistical Life Year, would be around $240 million, per year.

An initial estimate of the benefits of Option 1, under the WHO central scenario, would be $240 million per year. Some allowance musty be made for the efficiency of the market in incorporating prospective residents' perceptions of intrusive external noise. In the discussion of the price discount in chapter 2, an estimate was provided of the overall value of the discount applying to new dwellings in noise affected areas, of between $170 million and $200 million per year. Taking the higher estimate, conservatively, the estimate of the benefits of Option 1 would be revised down to $40 million per year. One further adjustment to the benefits estimate is required, to allow for the current regulations of the States and Territories where half of new residential buildings are (or will be) required to incorporate adequate noise attenuation. The benefit of Option 1 will occur in the jurisdictions that currently do not have comprehensive external noise regulations. Hence under the WHO central scenario of health impacts the final estimate of benefits would be $20 million per year.

Under the WHO low scenario of health impacts, the annual estimate of benefits would be zero. Under the WHO low scenario the burden of disease is estimated at 2,660 DALYs per million urban people. Allowing for Australia's urban population, confining the impact to new residential buildings and applying the Value of a Statistical Life Year, the annual benefit of avoided external noise harm would be $130 million. This is significantly less than the $200 million valuation of the price discount for untreated buildings in noise affected areas. Hence under the low WHO scenario the negative attributes of external noise are fully internalised by the market and there are no benefits from government action.

The estimate of benefits would be adjusted to the extent that new residential buildings in noise affected areas are currently constructed with adequate noise attenuation. At present this RIS does not have any data on this matter and a question has specifically sought this information from stakeholders in an earlier chapter. The current estimate of benefits does not include any allowance for building practices that might already provide noise attenuation in new residential buildings, but this situation will change as information and data become available

and an updated estimate of benefits will be calculated for the final RIS. Note that to the extent that building practices already provide noise attenuation, the estimates of both the avoided burden of disease and market efficiency will be reduced.

QUESTIONS

- ***Can you suggest alternative approaches to calculating the benefits?***
- ***Do you have any views on the similarity or otherwise of urban areas in Europe and Australia?***

Benefits of Option 2 – New NCC provisions for Apartments

The quantified benefits estimate of Option 2 is based on the estimate of for all new residential buildings, in Option 1, adjusted by the proportion of residents that occupy apartments. As 20% of new residents are expected to occupy units in new apartment buildings,[17] the benefits are estimated to be $4 million per year.

It is possible that apartments may become the building class of choice by industry and governments to facilitate residential infill at urban nodes and along major transport routes. If so, then these apartments will be subject to external noise. From a policy perspective residents in these new apartments should be protected from the intrusion of external noise, as a pre-requisite for a successful residential infill plan. Hence Option 2 would provide the benefit of supporting a successful residential infill policy.

Note that once an apartment building is constructed, residents cannot upgrade the façade to improve noise attenuation. This aspect differs from new housing where new residents can respond to the experience of external noise and upgrade doors and windows if they consider it necessary. The inability of new residents in new apartment units to respond to their experience of external noise means that the initial construction is binding, and hence the initial construction decision is more critical than for housing. In these circumstances it would be prudent to ensure that all new apartments in noise affected areas adequately attenuate external noise. Option 2 will deliver this benefit.

QUESTION:

- ***Are there any other benefits of Option 2?***

Benefits of Option 3 – Handbook

The quantified benefits estimate of Option 3 is based on the estimate for all new residential buildings, in Option 1, adjusted by an estimate of the probable application of the Handbook by industry and governments.

For example (and purely as an example) if governments and industry voluntarily applied the Handbook to 10% of new residential buildings in noise affected areas, the benefit of Option 3 would be estimated at $2 million per year.

[17] ABS 4130 *Housing Occupancy and Costs* 2009-10

The benefit of the Handbook is its flexibility, to be used by industry and governments where the individual circumstances of a property development warrant it. To the extent that builders already construct new residential buildings with noise attenuation features, the Handbook will provide a means of quality assurance and may be a selling point to prospective residents.

QUESTIONS

- ***Can you suggest an alternative methodology to quantify the benefits of Option 3?***
- ***Is it possible to reliably determine a percentage of all new residential buildings in noise affected areas where industry will use the technical solutions contained in the Handbook?***
- ***If so, what do you consider the figure to be? Is there any information that supports a particular figure?***
- ***Are there any other benefits of Option 3?***
- ***Can you suggest an overall level of benefits for Option 3?***

Comparison of Costs and Benefits

The annual estimates of costs and benefits may be revised with further information from stakeholders. Hence the current set of numbers should be regarded as preliminary.

The tables below present the estimates of annual costs and benefits, and the present values of the costs and benefits, for each option. The present value of costs is calculated over a 10 year period. The present value of benefits based on new residential construction over a 10 year period, with each new residential building expected to survive without any need for major refurbishment for at least 30 years, hence providing noise attenuation services to residents for at least a 30 year period. The present values were calculated using a discount rate of 7%.

The tables below are based on two scenarios: the WHO's central burden of disease scenario and the WHO's low burden of disease scenario.

Table 6.4: Estimates of costs and benefits – WHO central scenario

	Costs ($million)	**Benefits** ($million)	**Net-benefits** ($million)
Annual Estimates			
Option 1	130	20	
Option 2	40	4	
Option 3	13	2	
PV Estimates			
Option 1	977	1,996	1,019
Option 2	301	399	98
Option 3	98	200	102

Table 6.5: Estimates of costs and benefits – WHO low scenario

	Costs ($million)	Benefits ($million)	Net-benefits ($million)
Annual Estimates			
Option 1	130	0	
Option 2	40	0	
Option 3	13	0	
PV Estimates			
Option 1	977	0	-977
Option 2	301	0	-301
Option 3	98	0	-98

Under the WHO central scenario all options return positive net-benefits, with the greatest net-benefit accruing to Option 1. Under the WHO low scenario all options return negative net-benefits and hence the Status Quo would be preferred.

Given a constant valuation of external noise in the market, of $200 million, where an objective assessment of harm from the WHO exceeds this figure, there are net-benefits from government intervention. Where an objective assessment of harm is less than this figure, there are no net-benefits from government intervention.

Hence the critical question for decision makers is: which WHO scenario represents the most reliable guide to the harm caused by intrusive external noise in Australia?

7 Consultation

The ABCB invites comments from stakeholders on any mater raised in this report. Stakeholders may express views on issues, generally, or provide details of how the options may affect them directly. The ABCB particularly encourages detailed information and data from stakeholders. Stakeholders are also asked to consider the specific questions throughout this report. Stakeholder responses and comments will be recorded in the next version of the RIS, in this Consultation chapter, and as appropriate may also be incorporated into RIS analysis. The next version of the RIS will be considered by the ABCB Board for decision.

Stakeholder comments on this RIS are invited by 28 September 2012 and can be emailed to the ABCB at abcbris@iinet.com.au with the subject title "External Noise RIS".

The ABCB believes meaningful consultation can promote trust between industry, the community and government. Transparency allows stakeholders to see and judge the quality of government actions and regulatory decisions. Consultation also provides an opportunity for stakeholders to participate in the development of policy solutions and encourages broad ownership of those solutions. For more information on the ABCB's consultation philosophy and objectives, visit www.abcb.gov.au/consultation

8 Implementation and Review

Options 1 or 2 would be implemented by introducing the new external noise provisions into the NCC 2014, to be effective from 1 May 2014.

For Options 1 or 2 to be effective each jurisdiction must identify and designate all "noise affected areas" and map them in detail according to the five proposed categories of external noise. This work has yet to be done by any jurisdiction.

The two States with comprehensive external noise regulation, and the State with draft comprehensive regulation, have indicated a preference to keep their respective definitions of "noise affected areas" and not re-jig the definition and mapping of noise affected areas to suit the proposed NCC five specific categories of external noise, given the high cost of the exercise. Other jurisdictions have indicated that as the cost of mapping noise affected areas would be high, they have no plans to undertake this activity in the near term.

Last year the Planning Officials Group – an informal group that met prior to meetings of the COAG Local Government and Planning Ministerial Council - considered a detailed nation-wide mapping of the exposure of residential buildings to external noise, a project that would have well complemented Option 1. However from July 2011 the Local Government and Planning Ministerial Council was abolished under a COAG review of Ministerial Councils, and the informal Planning Officials Group was also disbanded at that time, so this planning project did not proceed.

Overall it is possible that implementation of Options 1 or 2 could be slow.

Prior to commencement of the new provisions in the NCC, under Options 1 or 2, the ABCB would conduct information seminars in all jurisdictions on changes to the NCC, including the external noise provisions, for the benefit of industry including building certifiers, architects and designers, builders; government agencies; and interested parties in the community.

There is no fixed schedule for reviewing provisions in the NCC. However the ABCB maintains regular and extensive consultation relationships with a wide range of stakeholders. It relies on this process to identify emerging concerns.

Option 3 would be implemented by publishing the Handbook on the ABCB website; a paper copy might also be available for sale.

9 Conclusion

This RIS considered the problem of intrusive external noise from major roads and railways for prospective residents. The effect of external noise is considered on a range of new residential buildings: Class 1 (houses), Class 2 (apartments), Class 3 (hotels / motels), Class 4 (caretakers' rooms) and Class 9c (aged care facilities). These new residential buildings would be located in "noise affected areas" as designated under State and Territory legislation, essentially located close to major roads and railways. Around 13% of new residential buildings each year, or 50,000 prospective residents each year, are exposed to external noise which has the potential to become intrusive.

There is clear evidence that intrusive external noise is harmful to residents, both from the perceptions of prospective residents and the burden of disease analysis by the World Health Organisation (WHO). To an extent this harm is already anticipated in the market and reflected in discounted prices for new residential buildings without adequate noise attenuation. The key question is whether prospective residents' perceptions fully appreciate the potential harm from intrusive external noise and the noise attenuation features of the property they are considering purchasing.

The objective, primarily, is to achieve health and amenity outcomes for residents of new buildings in noise affected areas, so that any noise intrusion levels in the living and sleeping areas do not compromise their heath or amenity.

This RIS presents four alternative choices for decision-makers: the Status Quo and three options to address the problem and achieve the objectives:

1. New NCC provisions for a range of residential buildings: Class 1 (houses), Class 2 (apartments), Class 3 (hotels / motels), Class 4 (caretakers' rooms) and Class 9c (aged care facilities), to be enacted under State and Territory legislation in designated "noise affected areas".
2. New NCC provisions for Class 2 buildings (apartments) only, to be enacted under State and Territory legislation in designated "noise affected areas".
3. Handbook produced by the ABCB, providing a general performance objective and some suggestions for technical building solutions for a range of residential buildings, for reference and use on a case-by-case basis by State, Territory and Local Governments and the building industry.

The options are evaluated relative to the Status Quo baseline. If these options would result in negative net-benefits, then this RIS will recommend the Status Quo. If positive net-benefits are possible, then this RIS will recommend the option with the highest net-benefits.

Costings for Option 1, which are also utilised in Options 2 and 3, were prepared by a professional quantity surveyor (see Attachment 2). The assessment of costs simply multiplies these costings by the number of affected new residential buildings per year.

Benefits are determined on the basis of two conflicting forces. First, the extent to which the market has already internalised the potential harm from intrusive external noise, as observed in a price discount for residential buildings without adequate noise attenuation. This RIS estimates the value of this price discount in Australia to be around $200 million per year. Second, an objective assessment of the harm to residents of external noise from roads and railways, based on research into the burden of disease by the WHO. If estimates of the burden of disease exceed the estimated value of the price discount, then positive annual benefits can occur and each option will provide a positive net present value. If not, then the annual estimates of benefits for all three options will be zero; all harm as objectively measured by the burden of disease analysis will be fully anticipated by the market.

Hence the benefit estimates are very sensitive to the WHO burden of disease analysis. The WHO presented a central scenario for the impact of external noise, plus low and high scenarios to allow for uncertainty. Calculations in this RIS under the central scenario indicated a benefit of the avoided burden of disease to exceed the value of the price discount, resulting in net-benefits for all options. Calculations under the low scenario indicated the benefit of avoiding the burden of disease to be less than the value of the price discount, resulting in negative net-benefits for all options. On the basis of these results decision makers will make a judgement about the severity of the burden of disease:

- If the central scenario of the burden of disease is accepted then the option with the highest net-benefits should be supported – Option 1.
- If the low scenario is accepted as a better representation of the burden of disease, then the Status Quo should be supported.
- If decision makers consider the burden of disease to lie between the central and low scenarios, but more likely to be towards the low scenario, then the lower cost options should be considered – Option 2 (apartments) or Option 3 (Handbook).

This RIS considers the WHO central burden of disease scenario to be significantly more robust than the low scenario, and therefore recommends Option 1.

This recommendation is preliminary and will be re-visited on the basis of stakeholder feedback, information and data. This RIS has sought stakeholder input on a range of issues, including:

- The extent that new residential buildings already attenuate external noise.
- The overall impact of current policy approaches in the private and public sectors to attenuate external noise.
- The overall impact of current external noise regulations in the jurisdictions.
- Whether prospective residents' perceptions fully appreciate the potential harm from intrusive external noise and the noise attenuation features of the property they are considering purchasing.

Stakeholder comments are invited on all issues contained in this RIS.

Attachment 1

See pdf document available on the ABCB webpage:

Attachment 1 – Proposed NCC Provisions for External Noise

Note that the proposals are shown as changes to the existing provisions to NCC 2012 volumes 1 and 2. The changes are identified by strike-through and underlining.

Attachment 2

See pdf document also available on this webpage:

Attachment 2 – Cost Impact Analysis