Managing 'kaman' (noise) impacts and expectations in a changing city centre, Wollongong, Australia

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ABSTRACT

Wollongong is a city located 80 km from Sydney, Australia with a population of 211,000. Consistent with State capitals and other major centres, Wollongong has experienced significant population increases in its central business district. This population shift combined with a government desire to make these city centres more vibrant and liveable, has a high potential to result in land use conflicts between outdoor restaurants, bars, music venues, and high rise residential developments, with which they are often located in close proximity.

'Kaman' means noise to the local indigenous peoples and the present paper examines historical background noise levels, entertainment licencing and hours of operation, changes in population demographics and expectations, along with the measures that the local government authority is taking to assess, minimise and manage noise conflict. The positive results of these measures include architectural requirements to reduce the ingress of noise to residential apartments and limits on noise generation by commercial premises, and are presented in this paper.

BACKGROUND

'Kaman' means noise in the language of the original Aboriginal inhabitants of the Wollongong area of NSW Australia. The Wollongong Local Government Area (WLGA), covers approximately 72,100 ha in a narrow coastal strip stretching from south of Sydney for a further 50 km. In the year 2000, the WLGA had a population of 197,000 and by 2036 this has been predicted to grow to 254,000 [1].

The Wollongong Central Business District (CBD) is located close to two world class beaches and a picturesque fishing harbor which has traditionally been home to the highest apartment buildings and population density in the WLGA. In close proximity is the University of Wollongong, which is ranked in the top 50 emerging universities in the world, and has a student population of about 30,000.

Historically the CBD has been the domain of businesses and shops with no permanent accommodation. Consequently, the CBD was virtually deserted on Sundays and after 6pm on

week days apart from patrons of restaurants, pubs, night clubs, and the major entertainment centre. Consistent with the initiatives of a number of similar cities in Australia, Wollongong City Council (WCC) sought to increase the vibrancy of the CBD. This has largely been successful with the area becoming an increasing desirable cosmopolitan location to live. To accommodate this population growth there has been a significant increase over the last 10 years in the development of high rise residential apartments in the CBD area that has traditionally been sites for restaurants, night clubs, pubs and live entertainment venues.

Studies of the Sydney CBD [2] indicate that its population will increase by 1000% in 3 decades. These studies also show that students - primarily from overseas now make up 15-20 per cent of the CBD population. A further 55 per cent of the Sydney CBD population is now made up of young professionals without children who want to live and work in the city. The remaining 25-30 per cent are 'empty nesters' - older, sometimes retired people who have adult children and have chosen to downsize. It is expected that the Wollongong CBD would have similar statistics.

Encroachment and Changes to the Wollongong CBD Noise Catchment

Whilst office hours have basically stayed the same for the last 20 years, retail hours have increased mainly due to Sunday shopping. This impact has generally not resulted in significant impact, apart from some traffic related issues. The major changes to the noise catchment of the CBD has resulted from increased numbers of restaurants, bars, cafes and places of entertainment. This has been further exacerbated by these venues having later trading hours than were the norm 30 years ago.

The growth in high rise residential apartments in CBD area has occurred on what has traditionally been sites for restaurants, night clubs, pubs and live entertainment venues. The trend is that buildings in the heart of the CBD will be multi-purpose buildings, commonly with one or two levels of commercial space below around 10 floors of residential apartments. For obvious reasons, if the commercial space is for offices, there is a much less risk of internal noise transfer than if the space is used for a restaurant or entertainment venue, often with some outdoor area.

Buildings on the fringe of the CBD tend to be exclusively residential, whilst those with frontage to the foreshore tend to have one level of commercial (often occupied by a restaurant or coffee shop with outdoor dining) below three or four floors of residential apartments.

These residential apartments in or around the CBD are often either located in buildings which generate their own level of noise, or are in close proximity to existing or new venues that generate noise and often have late trading hours. Consequently, the potential for land use conflict is high and is often realised.

Figure 1. Commercial space for lease.

Figure 2. Integrated into apartment block.

Expectations of Noise Amenity

Traditionally there has been a 'polluter pays' philosophy associated with most environmental impacts in Australia, with only nominal recognition of order-of-occupancy. Whilst land use conflicts have always been an issue with entertainment noise, this has come to the fore in the past 30 years when venues began to open much later. In most cases, the approval for later trading hours came with a requirement to contain the noise within the building. This often ended up with mixed results, particularly in the 1990's when requirements to have separate outdoor smoking areas added to the difficulty of retrofitting such architectural mitigation to unsympathetic older venues. Consequently, growth in CBD residential populations combined with the gentrification of inner city and industrial zones has often led to venues being faced with complaints and legal action to reduce their noise levels. The combination of factors often resulted in the closure of venues, particularly live music venues, which was of concern to Government.

Economic Benefits

Whilst not all noise complaints are related to live music, they do make up a significant number of venue related complaints. The economic and employment benefits of the live music is estimated to contribute some $1.21 billion to the Australian economy, with NSW as the largest contributor (32 per cent). To support this, the NSW Government introduced a system in 2009 whereby restaurants and bars could have live entertainment as part of their main business, without the need for separate approval from council [4].

Appropriate Regulatory Authority

The appropriate regulatory authority for noise depends on a number of factors and can often be the responsibility of more than one Government Agency. A generalised list is as follows:

Local Councils - general neighbourhood noise (barking dogs, noise from building and construction, garbage collection, pool pumps and air conditioners, sporting and entertainment venues, etc)

Environment Protection Authority (EPA) – noise from scheduled premises (industrial complexes, key public infrastructure, etc);

NSW Police and Local Councils - for car alarms, and musical instruments in residential properties, noisy parties, etc;

NSW Police and Independent Liquor and Gaming Authority – noise from premises licenced to sell alcohol;

EPA and Department of Planning and Environment - Some major industrial sites such as mines and wind farms, State Significant Development and some government assets such as the Sydney Opera House.

Neighbourhood noise is usually covered by the *Protection of the Environment (Operations) Act 1997* and guidance on most aspects of this is given in the EPA's *Noise Guide for Local Government* [5]. In most instances, the default criterion is 5 dB above the background level. Some larger venues such as sporting stadiums will have site specific noise criteria along with limited hours of operation. The most applicable guidance on the assessment of entertainment noise is given by the Office of Liquor, Gaming and Racing (OLGR) criteria which applies to premises licenced to sell alcohol.

Noise Complaints to Wollongong City Council

For issues for which it is the appropriate regulatory authority, WCC received a total of 985 noise complaints during 2011-12 as shown in Table 1. The noise complaints included barking dogs, roosters, swimming pool pumps, air conditioning units, amplified sound equipment, childcare centres, as well as noise from entertainment venues [6].

Table 1. Noise complaints in the WLGA by year.

2008-09	2009-10	2010-11	2011-12
566	879	915	985

In 2011 – 12, around 70% of the complaints related to barking dogs. The present paper will focus on the approximately 5% of complaints that related to music, entertainment and patron noise associated with residential premises located in close proximity to a range of cafes' restaurants, pubs, clubs collectively known as 'venues'. The majority of these venues hold a licence to sell alcohol and are therefore 'licenced premises'.

REGULATION OF LICENCED PREMISES

In NSW, there are two relevant legal Acts (the NSW liquor laws), firstly the *Liquor Act 2007* that regulates and controls the sale and supply of alcohol and certain aspects of the use of premises on which alcohol is sold or supplied; and secondly, the *Gaming and Liquor Administration Act 2007* which establishes the Independent Liquor & Gaming Authority which was previously, and more well known as OLGR for the purposes of liquor regulatory functions, including determining liquor licensing and disciplinary matters. The Liquor Act states its objectives as being to:

> *regulate and control the sale, supply and consumption of alcohol in a way that is consistent with the expectations, needs and aspirations of the community; to facilitate the balanced development, in the public interest, of the liquor industry through a flexible and practical system of regulation with minimal formality and technicality; to contribute to the responsible development of related industries such as the live music, entertainment, tourism and hospitality industries.*

This does not however give the regulator a consistent and objective measure of what is an acceptable level of noise intrusion and often the noise objectives set by the superseded OLGR are mostly still referenced. This is an octave based criterion that is established relative to the background as follows:

- *The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz – inclusive) by more than 5dB between 07:00am and 12:00 midnight at the boundary of any affected residence.*
- *The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00 midnight and 07:00am at the boundary of any affected residence.*

** Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00am.*

In practice, these criteria are neither easy to meet nor measure, particularly the inaudible criterion.

Historical Levels of Noise in the Central Business District

Table 2 is an aggregation of some 60 data points collected in and around the Wollongong CBD since 2012 [7].

Table 2. Typical ambient outdoor night time noise levels around the Wollongong CBD.

Time	Range dB(A)			Typical Octave Band Analysis dB(lin)								
	Leq dB(A)	L10 dB(A)	L90 dB(A)	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
6.00 pm to midnight	52-55	57-59	42-46	54	55	50	44	46	40	36	38	24
After midnight	43-49	46-51	31-38	42	41	33	32	34	26	21	17	11

Noise Monitoring of Entertainment Venues

Wollongong CBD has more than 15 night-time entertainment premises that trade until early morning hours, with management of noise at some venues tending to be more problematic than at others. Noise monitoring has focused on six of these venues about which most noise complaints are received. At each location, seven background and seven intrusive 15 minute noise readings were taken between 9.00 pm and 12.00 midnight and 12.00 midnight to 3.00 am. A sampling period was used for assessing the environmental noise (Table 3). The monitoring was undertaken during summer / University holiday period of late November 2011 to late January 2012. A total of 112 noise monitoring data samples were collected, representing 56 samples of background and 56 samples of intrusive noise.

Procedure for Collecting Compliance Data

Compliance is assessed against the OLGR criteria discussed previously.

Establish the Background – The L90 data is collected in octaves at the boundary of the impacted residential building. This ambient L90 will contain typical urban sounds, such as traffic, conversations, shutting car doors etc which combine to make up general urban hum. Usually, it is not possible to exclude noise from the venue to make such a measurement once the venue has begun operating, so either a representative measurement must be made at a different location (i.e. further along the street with similar ambient levels), or the measurement must be made earlier in the night before the venue begins to fully operate (noting that this will usually produce a higher background level than would actually occur later in the night and particularly after midnight).

Establish the Criterion – Before midnight, the criterion is the L10 ≤ L90 + 5 dB. After midnight, the criterion is the L10 ≤ L90. Noting that the venues should not be audible internally in the residential apartment.

Measure the Intrusive Noise Level – The L10 in octaves is measured both outside the impacted residence and again internally with the windows and doors closed. Compliance is assessed on the external measurement in accordance with the OLGR criteria (unless other planning controls are in place – see following discussion).

Table 3 presents the typical data that is collected from complainant's residence where the general facades and glazing are not of a high quality.

Table 3 Noise level and compliance with the OLGR noise criteria from 30 events

Location	Typical Octave Band Analysis Hz								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
* External Background L90	39	44	38	36	36	31	25	19	12
External Objective									
Pre 12am L90 + 5dB	44	49	43	41	41	36	30	24	17
Post 12am L90 + 0dB	39	44	38	37	36	31	25	19	12
External Measurement L10	52	58	49	47	47	46	40	32	19
Exceedance Pre 12am	**8**	**9**	**6**	**6**	**6**	**10**	**10**	**8**	**2**
Post 12am	**13**	**14**	**11**	**11**	**11**	**15**	**15**	**13**	**7**
Internal Measurement L10	50	50	47	44	44	41	34	24	16

* established Pre 12am but conservatively applied to Post 12am.

Summary of Noise Measurements and Compliance

The data in Table 3 shows that the L10 OLGR noise level objectives are typically exceeded in all octave bands at residential receivers surrounding a range of venues in the Wollongong CBD. There are a number of lessons that can be learnt from the collection of entertainment noise data undertaken by WCC. The key lessons are listed below and are supported by data in Table 3 and are as follows:

- The use of a relative criterion such as the OLGR L90 + 5 dB is very difficult to establish and plan for;
- Setting an inaudibility criterion is subjective and likely to be an unrealistic expectation to have when living in a CBD;
- Whilst the background L90 level near entertainment venues may be reduced later into the night, the level of music / patron noise does not change;
- Without appropriate regulation, buildings will be often designed without regard for the surrounding noise catchment;
- Internal Leq levels will typically be greater than 40 dB(A) in the room facing the entertainment venue unless upgraded glazing has been installed.

Table 3 is generally representative of noise from the entertainment venues and night clubs in the Wollongong CBD. The noise includes music, patrons talking and laughing in smoking areas of the venues. The traffic on the streets and pedestrians talking has also contributed to the measured noise levels.

Difficulties in Managing Noise

Venue Design

Most major venues (night clubs, pubs) are pre 1970 and are naturally ventilated with some parts of venue air conditioned. Entry will usually be by a single door with no airlock and often higher floors will have windows opened (designed when smoking indoors was permissible). Due to changes in NSW legislation, even small open café can have live music in NSW. The music from these venues adds to the urban hum of the CBD.

During summer months, these venues generally operate with doors and window open, this allows music to escape and add to CBD noise. L10 music levels outside some of the venues are up to 90 dB(A) and the Leq is about 85 dB(A). The music from some these venues on Corrimal Street can be heard at distance 20 metres inside the residential apartments.

Outdoor Smoking Areas in Clubs, Pubs and Hotels

Under the *Smoke-free Environment Act 2000*, all smoking is banned in all enclosed public places and certain outdoor public areas. To accommodate patrons who smoke, most venues provide a designated smoking area. Because such smoking areas are often naturally ventilated they are usually architecturally the acoustic weak link. These areas are often identified in noise complaints from the nearest residents.

Patrons' behaviour

The majority of complaints regarding noise in the Wollongong CBD are received from relatively new apartment blocks in the Crown, Corrimal and Market Street areas. These complaints regularly identify patrons leaving venues as a source of most annoyance. To minimise the noise nuisance to local residents, every licensing venue in NSW is required to develop a Venue Management Plan, which amongst other things, seeks to minimise anti-social behaviour.

How Wollongong City Council has sought to Address Noise Issues

The following discusses the options that Wollongong City Council (WCC) has used to ensure an acceptable amenity for inner city residents without promoting unrealistic expectations or sterilising the city vibrancy.

CBD Strategy Planning

A strategy planning for Wollongong CBD was developed in consultation with community and other stake holders. The plan contains three precincts, being the Entry Gateway, the Retail Sector and the Entertainment Precinct as shown in Figure 2.

Figure 2. CBD Economic Precincts.

How Wollongong City Council manages expectations

Council has adopted a three step process i. Notation on Property Certificate; ii. Development Application stage; iii. Non compliance investigation along with the Licensing Police.

Property Certificate (Section 149 Certificate)

A 149 Certificate provides information about the zoning of a property, the relevant state, regional and local planning controls and other factors affecting the property such as land contamination and road widening. In addition, it also provides information about constraints such as noise, traffic and longer hours of business operation, which is considered part of living in/near an active commercial centre.

In 2015, WCC in consultation with the community, businesses and other stakeholders made a decision and informed current and future residents of the CBD through the "Property Certificate" for their property with the following wording:

- The Wollongong City Centre and Town Centres, play a key role in accommodation cultural, sporting and business uses.
- A key to the revitalisation of these centres is to build on these aspects through greater activation and investment beyond 5pm through an evening economy.
- Future residents should be aware that these uses may generate noise, odour, traffic and have longer hours of operation, which is part of living in/near a commercial centre.

Development Application Stage

When assessing a development application, the Council Planning Officer must take into consideration Section 79C of the Environmental Planning and Assessment Act 1979 matters that are of relevance to the development. Noise and vibration is one matter of relevance to the development.

Firstly, WCC considered various control mechanisms available and determined that there was no clear policy or planning direction that would assist it in its objectives [8]. Secondly, WCC sought to determine what appropriate internal noise targets would be. In this case *State Environmental Planning Policy – Infrastructure* (ISEPP) noise objectives of 35 dB in bedrooms and 40 dB in all other habitable rooms were considered reasonable, [9, 10]. Moreover, these levels had their basis in Australian Standard AS 2107 [11].

Table 5. Houses and apartments in inner city areas or entertainment districts or near major roads. Reproduced from AS 2107, Table 1 [11].

Type of occupancy / activity	Design sound level (LAeq,t) range
Apartment common area (e.g. foyer, lift lobby)	45 - 50
Living areas	35 - 45
Sleeping areas (night time)	35 - 40
Work areas	35 - 45

Compliance action

Undertaking compliance / regulatory action to ensure acceptable noise levels are being achieved.

Apartment performance to an Internal criterion

Table 4 considers the performance of two nearby residential apartment buildings. Apartments A are an 8 story residential building and represents the 5 individual apartments located on the first 5 levels. The building is less than 10 years old and was constructed using relatively standard construction and glazing. Apartment B is a single apartment located in a 2 story building. The building is more than 60 years old and had wooden framed openable windows with standard glazing and was acoustically not well designed. Apartment B underwent acoustic improvements including double glazing and acoustic seals on all windows and doors. Both blocks experience a similar level of road and entertainment noise. A number of readings were made internally in both buildings and returned the levels presented in Table 4. Whilst the test conditions included significant variabilities that precludes any type of quantitative comparison, it can be seen that neither Apartments A nor B were meeting the ISEPP noise objectives in the most exposed rooms (lounge rooms). Following treatment, Apartment B mostly meets the ISEPP objectives (as evidenced by the low L90 value).

Table 7. Internal noise levels.

Location	Leq	L10	L90
Apartments A	47 - 49	48 - 51	41 - 47
Apartment B Pre mitigation	55	56	51
Apartment B Post mitigation	42	43	29

It is recognised that use of a single dB(A) criterion is not ideal, particularly when seeking to control low frequency bass music. It would be preferable to have an additional entertainment specific criterion such as in the 63 Hz band. However, the ISEPP provides an established regulatory instrument that can be referenced and is supported by detailed design guidelines. Moreover, it has been shown that without a requirement, the ISEPP objectives are not being met, even though they do not represent a high level of architectural treatment.

A recent development of multistorey 300 apartments in the CBD in four blocks had the following consent condition to achieve the objectives of the ISEPP shown in Table 5. At the time of writing it was under construction.

Figure 4. New CBD Apartment Blocks.

Figure 5. Increased Glazing Requirements.

Table 6. Schedule of Typical Glazed Windows and Door Constructions

Unit/Room Description	Min Rw	Typical Glazing Specification
Blocks A & C *Typical for all glazing in units facing Corrimal Street (Levels 5 and below)*		
Living/dining and bedroom areas	38	12mm laminated glass
Typical for all glazing in units facing Corrimal Street (above Level 5)		
Living/dining and bedroom areas	36	10mm laminated glass
Typical for all glazing in units facing Crown Street and Burelli Street		
Living/dining and bedroom areas	32	6.38mm laminated glass
Blocks B & D *Typical for all glazing in units facing Crown Street and Burelli Street*		
Living/dining and bedroom areas	32	6.38mm laminated glass
Typical for all glazing in units facing rear and inward of property		
Living/dining and bedroom areas	29	5mm glass

CONCLUSION

Although the consequences of incompatible land uses in a CBD are well understood, the mechanisms for appropriately sharing the noise burden of inner city living are not well developed. In particular, residential developers are often reluctant to incorporate architectural measures such as improved glazing or judicious internal acoustic designs to mitigate noise ingress, despite the cost implications being relatively minor.

Similarly, venues are also reluctant to spend money on noise attenuation because of the high cost and uncertainties of their business. Complexity arises when a single venue is operated by different license holders. WCC must balance the economic development of the Wollongong CBD against the noise nuisance from licensed venues. These venues employ a large number of people who live locally and imposing onerous operating conditions is seen as the last option.

WCC has taken steps to ensure that new residential dwellings will share the responsibility for providing an acceptable level of internal noise amenity through the meeting of the internal noise objectives equivalent to a development exposed to moderately high external levels of transport noise. Whilst the ISEPP noise objectives are recognised as not being ideal for managing entertainment noise, they will result in significantly improved acoustic amenity for residential apartments being constructed in the Wollongong CBD. In this respect, WCC has taken a pragmatic and practical approach to the sharing of management responsibilities of entertainment noise. This is being achieved within the constraints of the regulatory framework and the need to balance residential requirements with a lively and vibrant city centre.

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