Noise pollution

Sound is the transfer of energy without transfer of mass. In the same way, sound travels through a medium such as air without a transfer of mass. Just as the stick has to move back and forth, so must air molecules oscillate in waves to transfer energy. The small displacement of air molecules creates pressure waves in the atmosphere.

Sound waves cause eardrums to vibrate, activating middle and inner organs and sending bioelectrical signals to the brain. The human ear can detect sounds in the frequency range of about 20 to 20,000 Hz, but for most people hearing is best in the range of 200 to 10,000 Hz.

The four important characteristics of sound waves are as follows:
- Sound pressure, the magnitude or amplitude of sound
- Pitch, determined by the frequency of the pressure fluctuations

Sound waves, which propagate away from the source
- Sound pressure, which decreases with increasing distance from the source

Noise simply is undesirable and unwanted sound. It is not a substance that can accumulate in the environment, like most other pollutants, but it can be diluted with distance from a source. All sounds come from a sound source, but not all sound is noise. What may be considered music to one person may be nothing but noise to another.

Noise pollution is unpleasant noise created by people or machines that can be annoying, distracting, intrusive, and/or physically painful.

Noise pollution can come from outdoor sources, such as road traffic, jet planes, garbage trucks, construction equipment, manufacturing processes, lawn mowers, leaf blowers, and indoor sources, including: boom boxes, heating and air conditioning units, and metal chairs scraping on floors.

Sources of noise

Industrial Noise: It is caused by machines used for the technological advancement. There exists a long list of sources of noise pollution including different machines of numerous factories, industries and mills.

Transport Noise: Main source is transport. In addition to adversely impacting urban air quality, heavy automobile traffic creates seemingly unbearable noise pollution. Ever since industrial revolution doubling of noise for every 10 years. Supersonic plane is very noisy, and some believe its sonic booms harm the environment.

Recreational (as loud music, discos, religious and social festivals, etc.).

Measurement of noise

The noise is usually measured either by i) Sound Pressure or ii) Sound Intensity. The Sound intensity is measured in Decibel (dB). Sound intensity level in dB is defined as

$$IL = 10 \log_{10}\left(\frac{I}{I_0}\right)$$

where I = sound intensity, in watts, and I_0=intensity of the least audible sound, usually given as $I_0 = 10^{-12}$ watts.

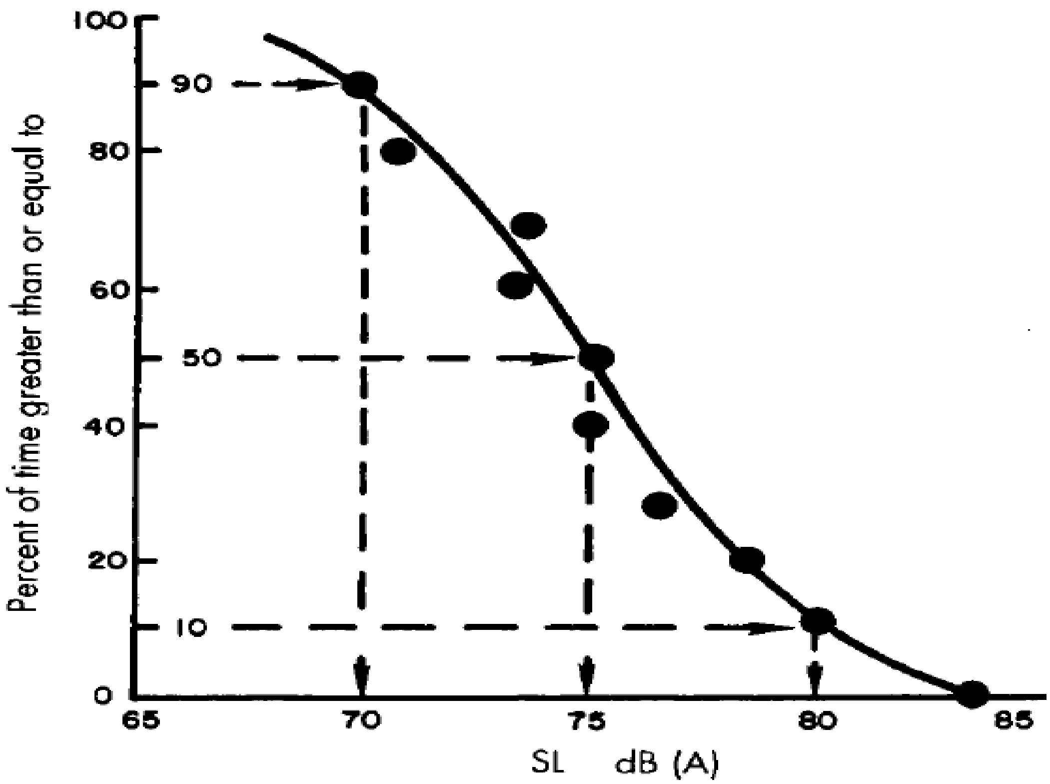
Measuring transient noise

Transient noise is measured with a sound level meter, but the results must be reported in statistical terms. The common parameter is the percent of time a sound level is exceeded, denoted by the letter L with a subscript. For example, L_{10} = 70 dB(A) means that 10% of the time the noise is louder than 70 dB as measured on the A scale. Transient noise data are gathered by reading the SL at regular intervals. These numbers are then ranked and plotted, and the L values are read off the graph.

Example: Suppose the traffic noise data in Table 1 are gathered at 10-second intervals. These numbers are then ranked as indicated in the table and plotted as in Figure 1. Note that since 10 readings are taken, the lowest reading (Rank No. 1) corresponds to an SL that is equaled or exceeded 90% of the time. Hence, 70 dB(A) is plotted vs. 90% in Figure 2. Similarly, 71 dB(A) is exceeded 80% of the time. Alternatively, we can calculate the frequency as [m/(n+1)]*100, where m is the rank and n is the number of observations. The frequency can be plotted as either (m/n)*100 or (m/(n + 1)*100. The error decreases as the number of data points increases.

TABLE 1: Sample Traffic Noise Data and Calculations

Time (sec)	*dB(A)*	*Rank*	*dB(A)*	*% of Time Equal to or Exceeded*
10	71	1	70	90
20	75	2	71	70
30	70	3	74	70
40	78	4	74	60
50	80	5	75	50
60	84	6	75	40
70	76	7	76	30
80	74	8	78	20
90	75	9	80	10
100	74	10	84	0



With reference to Figure 2, L_{10}, L_{50}, and L_{90} are 80 dB(A), 75 dB(A), and 70 dB(A), respectively. These may then be substituted into the equation, and the NPL may be calculated.
One widely used parameter for gauging the perceived level of noise from transient sources is the noise pollution level (NPL), which takes into account the irritation caused by impulse noises. The NPL is defined as

$$\text{NPL in dB(A)} = L_{50} + (L_{10} - L_{90}) + \frac{(L_{10} - L_{90})^2}{60}$$

Noise control

The control of noise is possible at four different stages of its transmission:
1. Reducing the sound produced
2. Interrupting the path of the sound, for example, planting vegetation to absorb and screen out noise pollution. Trees can act as a noise barrier.
3. Protecting the recipient
4. Careful city planning