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To cite this article: Zhang Xitong *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **512** 012044

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# Analysis on Influencing Factors of Urban Road Traffic Noise and Its Control

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**Abstract.** With the continuous improvement of people's requirements for a better life, the use of motor vehicles is also gradually increasing, thus road traffic pressure is also gradually increasing. Especially in recent years, urban construction has developed rapidly. Newly built and expanded streets and roads have turned the originally remote and quiet areas into bustling and noisy downtown, thus increasing the impact of traffic noise on the surrounding environment. Obviously, this goes against people's pursuit of a better life, so the optimization of urban traffic noise is particularly important. This paper analyzes the main factors that affect traffic noise and puts forward corresponding control measures.

## 1. Influencing Factors of Traffic Noise

Influencing Factors of Traffic Noise In recent years, with the continuous development of economy and the continuous improvement of people's income level, the use of motor vehicles has gradually become popular and generalized, thus bringing about increasingly serious problems such as traffic congestion and traffic noise. Obviously, this goes against people's pursuit of a better life. Therefore, the optimization of urban traffic soundscape is particularly important. Then we will analyze from the aspects of speed, power system, traffic flow and road conditions.

**Traffic noise and speed.** The speed of a car is fast and slow, and constant changes will cause friction between the ground and tires, the power of the engine, and changes in the acting force with the wind, thus causing changes in the noise value. According to the general physics theory, the noise will increase with the acceleration of vehicle speed, and how the vehicle speed affects the traffic noise. In this study, the vehicle speed and the corresponding noise data are collected and analyzed.

In order to ensure the accuracy of the obtained data and make the test data free of interference from other factors, the test weather was chosen to be conducted under the condition of sunny weather, with the wind force level 1 on that day. The sound level meter is selected to be fixed on the measuring tripod, which is placed between the motor vehicle lane and the non-motor vehicle lane, 1.2m above the ground to reduce the reflection effect as much as possible and to keep it away from other reflectors. Because this test is mainly to analyze the influence of vehicle speed and noise, the place of measurement is chosen on a quiet road, which is equipped with two motor lanes and one non-motor lane in the same direction. In order to prevent the mutual influence of vehicles coming and going, each test is conducted without interference from other vehicles.

In order to avoid the influence of different vehicle types on the test data, Toyota Corolla was selected for this test, and the test lane was selected near the non-motorized lane, which was closer to the sound level meter, so the test result was more accurate. In order to reduce the error of the test results, the test



involved three participants, including one driver with 6 years of driving experience. The main task is to control the gear and accelerator to make the vehicle speed at the required speed. One passenger. The main task of the passenger is to read the speed of the car when it passes through the terminal sound level meter on the mobile phone software. The test is about 200 meters away, and the sound level meter is set at the terminal of 200 meters. The test driver adjusts different speeds through the 200 meters, and tests 3 times each at the same speed, because the speed test of the same value may not be completely consistent 3 times. If a speed value of  $\pm 1$  appears, the test is considered successful. The test speeds are 30km/h, 35 km/h, 40 km/h, 45 km/h, 50 km/h, 55 km/h, 60 km/h, 65 km/h, 70 km/h, 75 km/h, 80 km/h, 85 km/h, 90 km/h, 95 km/h, 100 km/h respectively. The other tester is responsible for recording the data on the sound level meter. See Table 1 for the specific test data.

Table 1 Measured vehicle speed-noise value

Speed (km/h)	Noise value (db(A) )	Speed (km/h)	Noise value(db(A) )	Speed (km/h)	Noise value(db(A) )
30	56.8	31	56.2	30	56.4
35	60.4	35	59.5	34	58.3
40	59.4	41	61.7	41	60.5
45	63	46	60. 5	44	62.5
49	60.5	51	63	51	63.7
55	64. 5	55	68.3	55	64.6
60	66.3	61	67	60	67.6
66	69.1	65	69.2	66	68.7
70	69.4	69	71.3	71	72.4
74	75.3	75	71	75	72.1
81	74	80	73. 3	81	75.6
85	78.2	85	77.5	85	77.1
90	79.1	90	78.4	89	79.6
94	80.3	95	81.3	96	80.4
99	81.2	100	82.4	100	80.6

As can be seen from Table 1, the minimum vehicle speed for this test is 30 km/h, the noise values obtained are 56.8 dB(A) and 56.4 dB(A), respectively, and the maximum vehicle speed for the test is 100 km/h, and the noise values obtained are 82.4 dB(A) and 80.6 dB(A), respectively. At the same speed, the measured noise value is different, because the test will be more or less affected by wind, pedestrians in non-motorized lanes, etc. The data are not different and the error is within a reasonable range. The data obtained from this experiment are valid.

In this paper, SPSS19.0 software is used to analyze the relationship between car speed and traffic noise, and the correlation coefficient is 0.98, which is highly correlated. The experimental results show that the noise value gradually increases with the increase of vehicle speed in the range of 30-100 km/h.

**Traffic noise and automobile power system.** A long-term theoretical study shows that automobile noise is generated by engine noise. As far as the current situation is concerned, more and more people choose electric vehicles. Fuel cell vehicles are also pure electric vehicles, which convert chemical energy in the fuel cell into electric energy as the power of the vehicle when hydrogen and oxygen react. In daily life, whether electric cars are compared with ordinary cars or electric buses are compared with ordinary gasoline buses, the noise heard from people's ears is smaller than that of the latter. then, at the same speed, how much difference is there between the noise generated by the two, which will be verified by the following experiments.

#### (1) Preparation before testing

In the study of the influence of vehicle speed on traffic noise, Toyota Corolla was selected. In this section, the comparison of the influence of vehicle power system on traffic noise, the noise value of ordinary vehicles at different speeds was based on the previous Corolla data. In order to control the influence of irrelevant variables on the experimental results as much as possible, electric vehicles with similar vehicle length, width, height and shape are selected this time. In this experiment, on the same

day and at the same place as the last experiment, the sound level meter did not change its position, so the test conditions also meet the requirements, and the data obtained from the experiment is valid.

## (2) Testing process

There are three participants in this test, including one driver who has been driving for 6 years. The main task is to control the gear and accelerator so that the car can reach the required speed. The main task of the passenger is to read the speed of the car when passing through the terminal sound level meter on the mobile phone software. This test is about 200 meters away. The sound level meter is set at the end of 200 meters. The driver is tested to adjust the speed through the 200 meters. Three times for each same vehicle speed test, the test speeds are 30km/h, 40 km/h, 50 km/h, 60 km/h, 70 km/h, 80 km/h, 90 km/h, 100 km/h respectively. Another tester is responsible for recording the data on the sound level meter. the specific test data are shown in Table 2.

Table 2 Data table of vehicle speed-noise values for two types of vehicles

Toyota data		Electric vehicle data	
Speed of vehicle(km/h)	Noise value(db(A))	Speed of vehicle(km/h)	Noise value(db(A))
30	57	30	51.2
40	59.2	40	53.6
51	64	50	56.3
60	66.1	60	58.1
70	69.9	70	60
80	73	80	62.8
90	79.3	90	65
100	82.3	100	68.9

It can be seen from Table 2 that under the condition of the same vehicle speed, the noise value measured by electric vehicles is smaller than that measured by Toyota vehicles, and the difference between the noise values generated by the two vehicles gradually increases as the vehicle speed gradually increases. Therefore, the data obtained from the experiment are the same as the results felt by people in normal hearing. Electric cars produce less traffic noise than gasoline cars, and the power system of cars also has some influence on traffic noise.

**Traffic noise and traffic flow.** Every moving car is generating traffic noise. According to the logical reasoning of normal thinking, the greater the traffic flow, the greater the traffic noise. In order to verify the positive correlation between traffic flow and traffic noise, the following experiments were carried out.

## (1) Pre-test preparation

The experiment in this section is mainly to study the relationship between traffic flow and traffic noise. In order to test the accuracy of the test results, the same road section is selected for testing. So this section can meet the conditions of large traffic flow and small traffic flow. In some sections, the traffic flow varies greatly with different time, so the auxiliary road of South Outer Ring Road is selected.

The test was conducted on a sunny day with a wind force of 1~2. The sound level meter was still mounted on a tripod 1.2 meters above the ground. The tripod was placed in the green belt in the middle of the road.

## (2) Testing process

This test requires two testers. One tester is responsible for photographing the traffic flow of the road section, and the other tester is responsible for recording the data of the sound level meter. The two testers must set the test time in advance and turn on the machine at the same time. This test is from 7: 30 a.m. to 10: 30 a.m. and takes about 3 hours. It goes through the process of traffic flow from small to large and then from large to small.

## (3) Data analysis

It is not difficult to see the data curve of fig. 1 derived from the combination of video and sound level meter: when cars pass through the sound level meter one by one, the curve changes obviously, and the

fluctuation in instantaneous time is large; When two vehicles pass through the sound level meter at the same time or almost at the same time, the instantaneous fluctuation of the noise curve decreases, and the highest point of the noise curve is obviously higher than that of one vehicle. As the number of vehicles increases gradually, the fluctuation of the noise curve decreases obviously for a period of time, and the noise curve generally shows an upward trend. However, when 20 vehicles pass through the sound level meter every 10 seconds or so, the noise curve gradually tends to a high level and peaceful state. Therefore, it is believed that the noise value increases significantly with the increase of traffic flow in the initial stage. When the traffic flow reaches a certain amount, the noise value tends to a relatively stable value, and the increasing trend is not obvious, which shows that the two are logarithmically positively correlated.

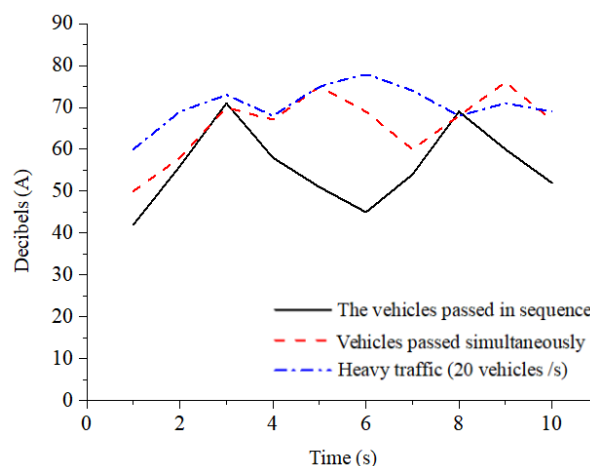


Figure 1 Graph of traffic flow and noise data

**Traffic noise and road conditions.** The influence of urban road conditions on urban traffic noise mainly includes the use of pavement materials and slope etc. At present, asphalt, cement concrete and flexible pavement are mainly used as pavement materials for urban traffic roads. The use of pavement materials for traffic roads will affect the rolling sound power level and vibration level of motor vehicles. Among them, the parameters in the rolling sound power level of motor vehicle tires are selected when building roads. The vibration level is mainly affected by pavement materials, including the total weight of motor vehicles and the running speed, etc. In addition, the road surface gradient of urban roads is also an important factor affecting urban traffic noise. Usually, there are transverse gradient and longitudinal gradient. The gradient will directly affect the running speed of vehicles, thus indirectly affecting the running noise of motor vehicles. The theory holds that if the width of the road surface is large and the number of lanes is large, the carrying capacity of the road will be relatively large, thus reducing traffic flow density and traffic noise. Therefore, widening the road surface and increasing the number of lanes are one of the methods to reduce traffic noise. We should also scientifically integrate greening and other methods to reduce noise, so as to achieve a pleasant state of mind.

**Traffic noise and green belts.** Green belts with a width of 30m were selected for the survey. In order to avoid interference, the test points should be as far away from other buildings as possible, with a distance of more than 2m. Use recording equipment to record a section of traffic sound source when the traffic flow is large, select 10 seconds with small fluctuation of sound pressure level from the recorded sound source, and use audio processing software Adobe Audition to repeatedly copy the 10 seconds of audio to make the 30-minute sound source required for the test. Because the test sound source is artificially synthesized, interference from other sound sources should be avoided as much as possible during the test, so the test time should be from 4: 30 a.m. to 6: 00 a.m. when the traffic volume is small. The test shall be conducted in clear, windless or breezy weather. If there is wind, the wind speed shall be below 3m/s. The equivalent continuous A sound level is used in the test. The measured parameters include  $Leq$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$  and  $L_{max}$ . The  $Leq$  and  $L_{max}$  are mainly used as reference values. The time

weighting characteristic of the sound level meter is "fast" response, with fast sampling rate and sampling time interval not more than 1s.

**Overview of each test point.** There are some wild weeds on the ground at measuring point 01. Most of the ground is yellow, and the main vegetation is peach trees. The lowest branch height is about 1.2 meters and the average plant spacing is 4.8 meters. The vegetation at point 02 is grass with an average height of 5cm. Shrub *Damascus Rose*, with an average height of 50 cm; The tree *Platanus acerifolia* has an average height of 9 meters, the lowest branch height is about 2.5 meters, and the plant spacing is 4.5 meters. The vegetation at measuring point 03 is grass with an average height of 5cm. No bushes; Trees are apricot trees with an average height of 4.2 meters, the lowest branch height is about 0.6 meters, and the plant spacing is 3.5 meters. The vegetation at measuring point 04 is lawn with a height of about 5cm. Shrub *Ligustrum lucidum*, 110 cm high; There are two kinds of arbor trees, purple leaf plum tree with a height of about 4.5 meters and locust tree with a height of about 10 meters. The lowest branching height of purple leaf plum is about 1.5 meters and the plant spacing is about 2 meters. The lowest branch height of *Sophora japonica* is about 3.8 meters and the plant spacing is about 6.8 meters. The surface vegetation at measuring point 05 is lawn with a height of 5cm and a width of 25m. No shrubs; There are two kinds of trees, the shorter one is *Hibiscus syriacus*, with a height of about 2 meters, plant spacing of about 3 meters, and the lowest branch height of about 1.5 meters. The taller is *Aesculus chinensis*, with a height of about 10 meters, plant spacing of about 4.5 meters, and the lowest branch height of about 4 meters. There are no lawns where there are low shrubs at measuring point 06, and there are no low shrubs where there are lawns. The measuring point is close to the roadside with shrub iris flowers, with an average plant height of 25cm, a bush width of about 3.5m, and poplar trees in the bush, with a plant spacing of about 3.5m, a minimum branch height of about 3.5m and a plant height of 7.5m. Inside is a lawn about 20 meters wide with a height of about 5 centimeters. The following is a lawn about 10 meters wide accompanied by arbor weeping willow trees, which are about 5 meters high, with a minimum branch height of 1.5 meters and a plant spacing of about 6 meters. Near the roadside at measuring point 07 is a lawn with a height of about 5 cm and a width of about 5 meters. No shrubs; Then came the arbor cedar, with a plant height of about 1.3 meters, a minimum branch height of about 8 centimeters, and a plant spacing of 1 meter. at a distance of about 3 meters from the cedar, there was the arbor purple leaf plum, with a plant height of about 4.5 meters, a minimum branch height of about 1 meter, a plant spacing of about 3 meters, followed by the locust tree, with a plant height of about 12 meters, a plant spacing of about 8 meters, and a minimum branch height of about 4 meters. The measuring point 08 has only lawns, the height of which is about 5cm, and there are no shrubs or trees. Weeds are found at measuring point 09; Shrub is *Iris tectorum* with average plant height of 35 cm and plant spacing of 40 cm. There is a tree, *Platanus acerifolia*, in the bush, with a plant height of about 8 meters, a plant spacing of 2.5 meters, and a minimum branch height of about 5 meters. The lowest layer of the measuring point 10 is the lawn, which is about 7 cm high and 30 meters wide. No shrubs; The lawn is planted with hibiscus, a tree with a plant height of 3.5m, a plant spacing of about 2.5m and a minimum branching height of 0.8m.

**Vegetation characteristics at each measuring point.**

Table 3 Summary of vegetation characteristics at each measuring point

Station	Plant species	Plant height /M		Diameter at breast height /CM	
		Crown width /M		Surface covering	
01	lucidum	2	3.3-4.5	14-23	2.4-3.2 Grass
02		5	7.8-11.3	23-30	3.6-5.2 Grass, Maersk Rose
03		2	3.6-6.8	19-30	3.8-4.5 Grass
04		4	3.8-12.3	7-38	2.4-7.8 Grass, Ligustrum
05					
06		3	2.8-11.8	9-18	0.8-2.2 Grass
07		4	4.8-6.4	16-26	2.9-3.8 Grass and iris
08		5	4.1-12	6-37	1.9-9.5 Grass

09	1	0	0	0	Grass
	3	7.8-9.6	12-18	3.8-5.4	Grass and iris
10	2	2.6-3.4	5-8	0.7-1.2	Grass

### Noise level parameters of each measuring point

Table 4 Summary table of noise level parameters at each measuring point

Station	Road edge distance/m	Leq/dB	Lmax/dB	Leq attenuation value/dB	Lmax attenuation value/dB
01	0	68.8	77.6		
	30	61.6	69.8	7.2	7.8
02	0	67.1	76.3		
	30	58.2	65.5	8.9	10.8
03	0	69.7	79.8		
	30	61.0	69.5	8.7	10.3
04	0	68.5	79.2		
	30	57.9	66.3	10.6	12.9
05	0	66.9	75.8		
	30	59.1	66.5	7.8	9.3
06	0	66.4	76.8		
	30	58.4	66.7	8.0	10.1
07	0	69.5	79.6		
	30	57.7	66.2	11.8	13.4
08	0	66.7	75.3		
	30	60.2	68.1	6.5	7.2
09	0	67.8	78.5		
	30	59	67.9	9.3	11.1
10	0	66.8	76.5		
	30	58.7	66.9	8.1	9.6

### Analysis of test results

For the data measured in Table 4, in order to make the analysis process simpler and clearer, and to make the comparison result more obvious, Lmax attenuation value and Leq attenuation value are compared to detect and evaluate the sound insulation condition of the green belt.

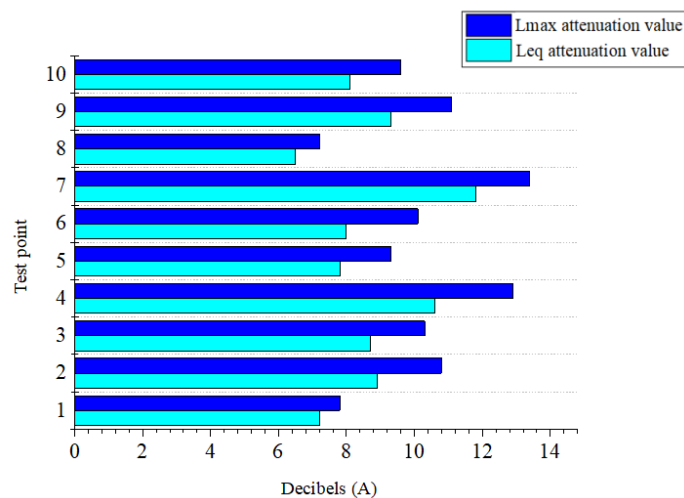


Figure 2 Lmax attenuation value and Leq attenuation value summary table

As can be seen from fig. 2, the Lmax attenuation value and Leq attenuation value of measuring point 8 and measuring point 1 are the smallest, while the Lmax attenuation value and Leq attenuation value of measuring point 7 and measuring point 4 are the largest. Lmax attenuation value and Leq attenuation value of other measuring points are centered. Next, analyze the situation of each measuring point one by one and the influence of different greening layout modes on traffic noise.

Based on the experimental data of each measuring point, it can be seen that the Lmax attenuation value of measuring point 8 is 7.2 dB(A) and Leq attenuation value is 6.5dB(A), while the Lmax attenuation value of measuring point 1 is 7.8dB(A) and Leq attenuation value is 7.2dB(A). The Lmax attenuation value and Leq attenuation value of these two measuring points are relatively small. Measuring point 8 has only one grassland, and there is neither shrub nor tree. On the bare ground of measuring point 1, there are a few weeds occasionally, and then there are several peach trees. Because peach trees have branches and leaves, and the branches and leaves are luxuriant and can absorb certain noise, and the lowest branch height is relatively low, the Lmax attenuation value and Leq attenuation value of measuring point 8 are smaller than those of measuring point 1. Comparing the common ground between measuring point 1 and measuring point 8, it is found that the number of plant species in measuring point 1 and measuring point 8 are 2 and 1 respectively, and the number of plant species is less than that in other measuring points.

However, the Lmax attenuation value of measuring point 7 is 13.4dB(A) and Leq attenuation value is 11.8dB(A), while the Lmax attenuation value of measuring point 4 is 12.9dB(A) and Leq attenuation value is 10.6dB(A). The Lmax attenuation value and Leq attenuation value of these two measuring points are relatively large. Compared with other measuring points, it can be seen that the plant species of measuring point 7 and measuring point 4 are relatively large, with 4 species and 5 species respectively. In addition, the plants at measuring point 7 and 4 have different plants at different heights and are distributed evenly. There is a lawn at the bottom of measuring point 7. The distance between cedar trees is only 1 meter, the plant height is 1.3 meter, and the lowest branch height of cedar is only 8 cm, which can be well connected with the lawn on the ground. The distance between the purple leaf plum trees is 3 meters, and the crown width is about 1.9 meters, which means that some of the two purple leaf plum trees will cross together, while the lowest branch height of the purple leaf plum tree is 1 meter, the height of the cedar tree is 1.3 meters, and the purple leaf plum tree is well connected with the cedar tree. The spacing between Chinese locust trees is 8 meters and the crown width is about 9 meters, then some of the two Chinese locust trees will also cross, with a height of about 12 meters and a minimum branch height of 4 meters, while the height of purple leaf plum is about 4.5 meters. The Chinese locust tree and the purple leaf plum are well connected in height. The measuring point 7 forms a continuous green sound barrier in both width and height, so the Lmax attenuation value and Leq attenuation value of the measuring point 7 are the largest. The lowest layer of measuring point 4 is also a lawn with a height of about 5 cm, followed by shrub *Ligustrum lucidum* with a height of 110 cm. There are two kinds of arbors. The height of purple leaf plum is about 4.5 meters, the lowest branch height is about 1.5 meters, the crown width is 2.4 meters, and the plant spacing is about 2 meters. The height of *Sophora japonica* is about 10 meters, the lowest branch height is about 3.8 meters, the plant spacing is about 6.8 meters, and the crown width is about 7.2 meters. From these data, it is not difficult to see that the height of *Ligustrum lucidum* is less than the lowest branch height of *Prunus salicina*, thus the green sound barrier with a height of 1.1m to 1.5m is missing. Therefore, the Lmax attenuation value and Leq attenuation value at measuring point 4 are slightly smaller than those at measuring point 7.

The planting distribution of measuring point 3 and measuring point 10 are similar, both of which are the combination of lawn and arbor, but the Lmax attenuation value and Leq attenuation value of measuring point 3 are slightly larger than the Lmax attenuation value and Leq attenuation value of measuring point 10. The trees at measuring point 3 are apricot trees with an average height of 4.2 meters, the lowest branch height is about 0.6 meters, and the crown width is about 4 meters. The trees at measuring point 10 are *hibiscus syriacus* with a height of 3.5 meters, the lowest branch height is 0.8 meters, and the crown width is about 1 meter. The Lmax attenuation value and Leq attenuation value of



measurement point 3 are slightly larger because the plant height of measurement point 3 is higher than that of measurement point 10, the lowest branch height is lower, and the crown width is larger.

The planting distribution of measuring point 02 is similar to that of measuring point 09, which is a combination of lawn, shrubs and trees. The vegetation of measuring point 02 is grass with an average height of 5 cm. Shrub *Damascus Rose*, with an average height of 50 cm; The tree *Platanus acerifolia* has an average height of 9 meters, the lowest branch height is about 2.5 meters, the plant spacing is 4.5 meters, and the crown width is between 3.6 and 5.2 meters. Weeds are found at measuring point 09; Shrub is *Iris tectorum* with average plant height of 35 cm and plant spacing of 40 cm. There is a tree *Platanus acerifolia* in the bush, with a plant height of about 8m, a plant spacing of 2.5m, a minimum branch height of about 5m, and a crown width of 3.8-5.4m. Based on the data of measuring point 02 and measuring point 09, it is found that the plant spacing is the largest difference, and other data are all close. Therefore, the plant spacing is also a factor that affects  $L_{max}$  attenuation value and  $L_{eq}$  attenuation value.

Through the comparative study of each measuring point, it can be found that the sound insulation effect of vegetation combination from low to high is as follows: only lawn without shrubs and trees; Trees with higher lowest branching height are more than shrubs. The combination of arbor and shrub whose lowest branch height is higher than that of shrub; The combination of arbor and shrub with the lowest branch height of arbor lower than that of shrub; Under the same combination condition, the green belt with better growth, dense branches and leaves and higher planting density has the best noise reduction effect.

## 2. Suggestions on the Control of Urban Road Traffic Noise

**Improve the information level of traffic management.** In order to reasonably control the speed of a city's main traffic arteries, it is not necessary to cause large noise due to too fast speed or serious traffic congestion due to too slow speed. Through reasonable adjustment of traffic flow, the traffic efficiency of motor vehicles is improved, and the impact of traffic peak on traffic noise is reduced. Through improvement of traffic efficiency, the impact of traffic noise on the surrounding environment of roads is reduced. Noise violation detection equipment can be installed in hospitals, residential areas and other places to regulate civilized driving of motor vehicle drivers and protect people's living environment by legal means.

**Strengthen the construction of urban road infrastructure.** Researchers should continue to study ways to reduce the noise of the car's power system and low noise tires to reduce the noise generated by the car itself. Advanced pavement materials are used to reduce the friction noise between the pavement and tires, while widening the width of the road and increasing the number of motor vehicles. We will improve the public transportation and subway systems, develop urban public transportation, encourage citizens to use public transportation modes, increase publicity on environmental protection and public welfare, and attract more citizens to change their modes of travel by lowering fares.

**Increase green belts and optimize traffic sound.** According to the principles of aesthetics and so on, do a good job in greening the city's main roads. When designing the road green belts, attention should be paid to the combination of deciduous trees and evergreen trees, so as to ensure that no matter what period a single plant is in, when combined, it can ensure a good sound insulation effect for one year.

Attention should be paid to the combination of surface vegetation, shrubs and trees to build composite green belts of different levels. As different vegetation has different attenuation effects on noise of different frequencies, a variety of plants should be planted.

The height of the grass on the ground should be reasonable, and the height of shrubs should be higher than the lowest branches of trees, so that the heights of different plants can be connected in space, thus forming a closed space, allowing the green belt to form a complete barrier, and playing a very good sound insulation and noise reduction function.

In order to make the leaves play a good sound-absorbing effect, it is necessary to select some porous and hairy trees with luxuriant branches and leaves. Broad-leaved trees and coniferous trees have

different frequencies of absorbing noise. Therefore, they can be combined and matched according to their advantages to play a more powerful function of reducing sound and noise.

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