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Assessing The Role of Natural Soundscapes in Urban Areas and Role of Landscape in Bringing Back the Lost Voices of Nature

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Abstract
Nature made every living being on earth to communicate and get lost in its voices. Imagining a nature without its voices is impossible as everything in this world communicates and is interconnected. Landscape acts as a connecting link for the sounds of nature and organisms. “Cities” the hubs for the noises in this world are muting the nature’s hum. By muting un-wanted noises one can re-hear the nature’s sounds. The inter-dependency of everything in this nature, either a living or a non-living thing is making these sounds possible. The ecological settings for any ecosystem are organised which enable to communicate to the other. When the system is disturbed, it faces an immense affect and create communication gap between the living and the non-living things. The study focusses on the sources of nature’s sounds, noise causes that deplete natures' voices and the proposals of possibilities to overcome the loss of Natural-Soundscapes.
Keywords: Nature’s Muted voices, Landscape and Soundscape, Noise pollution, Nature's voices, Sounds from the woods.

1. Introduction

Aim: To study the nature of natural sounds and the way they are missing in the urban context. Arriving at possibilities to bring back the lost sounds of nature into cities.

Objectives:

- To study about sound and its role in nature.
- To find the causes for the muting or missing of the natural sounds in cities.
- To also know how the dominating noises of urban life made the natural voices mute.
- To study few Soundscapes projects in the world that will be set as a good example and to revive the lost voices of nature in cities.
- To co-relate how landscape can help to bring back those lost sounds and make cities more Soundscape friendly by creating natural spaces.

Scope and Limitations:

Scope: I in my research paper will be talking about the relation of nature and its sounds, issues thinning these sounds. By taking the example of Delhi's situation I will arrive at strategies to bring back those lost sounds of nature.

Limitation: I limit my study to the natural soundscapes that are there in the world by considering landscape as an anchoring point.

2. Methodology

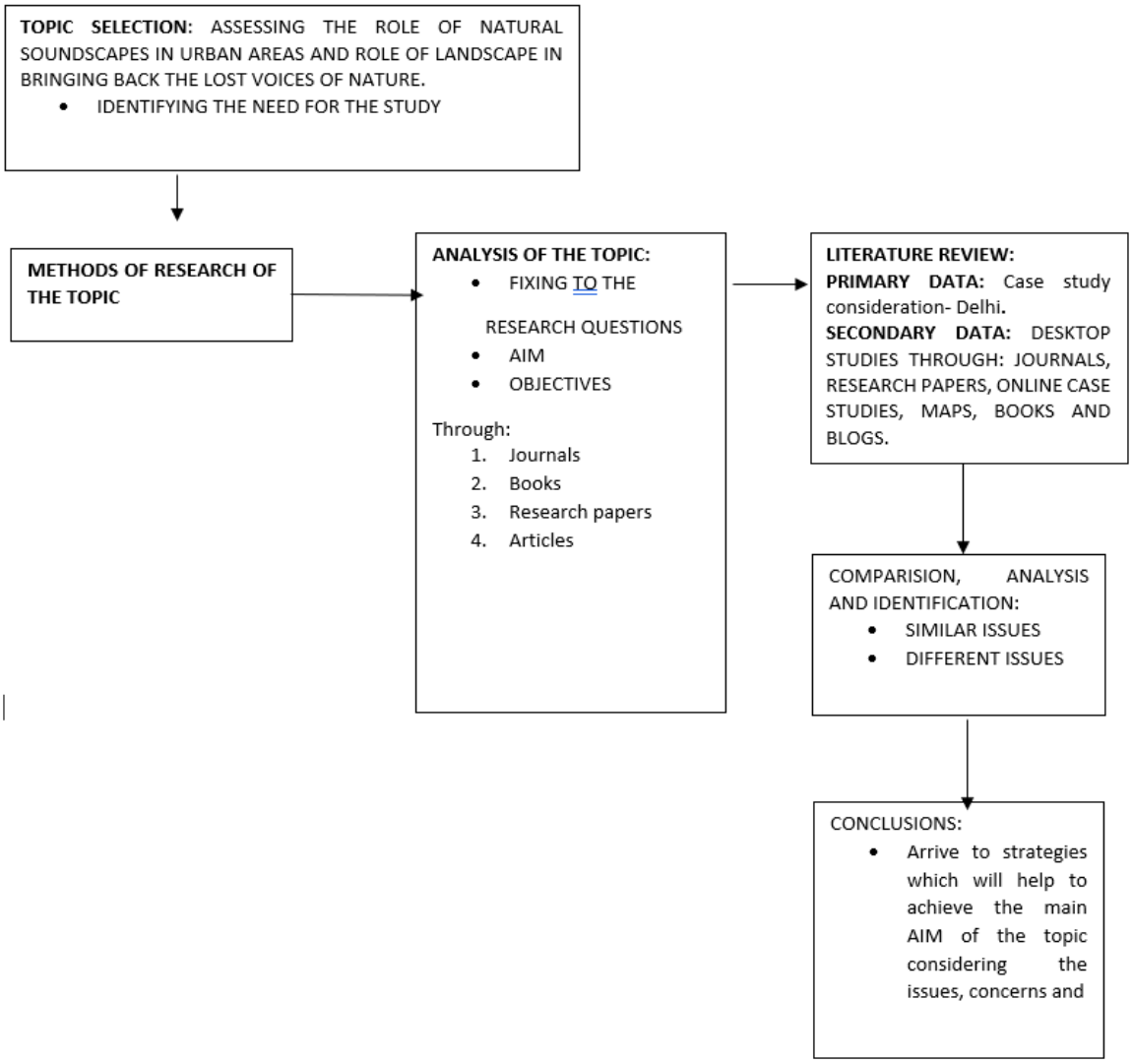


Figure 1. Structure or Methodology of the Study

3 Definitions

3.1 Soundscape

Sound, which is one of the five senses of humans, acts like an anchoring joint to connect many things in this world. Soundscape as a broad study is defined as a component of acoustical environment which can be heard and perceived by various living beings. Soundscapes has its varied history which is depending upon the discipline it has been used, (ie) it is ranging from its use in urban design to wildlife ecology. Though acoustical environment is a much wide and a broader study whereas the term soundscapes is just a part of it. In any given area one can identify a wide combination of various acoustical resources which are again divided in to Natural and Human made sounds as directed by the environment. This is called acoustical environment. Looking into its history the term soundscapes was framed by R.Murray Schafer , who was a Canadian composer and an active environmentalist and is considered as a Father or Soundscape. According to him Soundscape is a final resultant sound of the combination of various sounds that comes from an immersive environment. Sound is a study of Acoustic ecology. According to Schafer Soundscape is basically composed of three main elements:

- Natural acoustic sounds
- Human created sounds
- Machinery sounds.

Bernie Krause, musician, and bio acoustician, in his terms reframed the elements of Soundscape as three:

Geo-phony: The name itself defines it's as the sounds that are emerged from the Soundscape sources that generate non-biological natural sources wind in the trees, water in a running stream and waves of an ocean etc.
Bio-phony: As the name denotes from its prefix "Bio" which means life. The sounds that are generated from the non-human and non- domestic biological Soundscape sources of sound.
Anthrophony: These are the sounds created by the humans.
If we consider the Soundscapes and the environment there are two distinct verities of Soundscapes created by the environment. They are

- Hi-fi
- Lo-fi

Hi-fi system of sounds are basically the sounds which possess a positive signal-to-noise ratio. Which means in this system of sounds the settings that are there will let one possible to hear the discrete and specific sounds without any distance created by the background noises. For examples, if we consider the rural areas, the rural landscapes will generate more hi-fi frequencies than the city because of the natural settings of a landscape will create an opportunity to hear the sounds from far and near. Whereas in Lo-fi soundscapes the sound signals are very close and compact, in which one can listen to immediate sound encounters. In many cases even ordinary sounds must be highly amplified in-order to be heard. However, all sounds are unique in nature, and they are generated in one time in one place and can't be repeated or replicated. (https://en.wikipedia.org/wiki/Soundscape)

3.2 Soundscape Ecology

Soundscape ecology is basically defined as a study, in which the sound in a landscape and its effect on organisms are studied. These sounds that are generated may be from the sources of biophony, geophony and anthrophony. The variations in soundscapes will have its effects on various organisms in obtaining information's from the environmental sounds which range widely. Around the world many of the active soundscape's ecologists are investigating in various ways in framing structure of soundscapes and explain how the sounds are generated from their respective sources. Along with these studies they are understanding how this will affect various organisms. (https://en.wikipedia.org/wiki/Soundscape_ecology)

Figure 2. The sounds generated from the natural landscape elements like running water will account for a natural Soundscape (Source: https://www.patriotdirect.org)

The sounds that are created by any organisms are generated with an intension of creating an acoustical niche among that species of organisms. This enables those organisms to communicate in that acoustical niche. Any disturbances created in the frequencies of these acoustical niche affects the organisms and their functions too. On another hand these affects signal the thinning of the species number or acts a sign of their extinction. Of all the soundscapes Anthrophony, which means sounds created by humans, dominates other soundscapes in cities particularly which creates noise and leads to noise pollution. As this led to the muting of biophony and geophony voices of nature there came a need to concentrate on conservation of natural soundscapes which is recognized as a conservation goal by many active environmentalists. Acoustical ecology emerged as a separate science in which most of the environmentalists had involved in restoring and conserving the ecology which is directly helping in conserving the acoustical niche created by these organisms.

3.3 Noise pollution

The annoying or the disturbing sounds created by any sound source, which is unpleasant is called Noise. Noise pollution is the excessive and disturbing noise that is created which on other hand disturbs the ecological systems and is harm to humans and other animal life. The source of most of the noises is mainly human created through the machines he uses and the vehicles he drives. The sources of the noise pollution is mainly from factories through their machines and vehicles like motor cycles, airplanes, trains and other transportation systems. Industrial revolution which led to the birth of machines and increase in number of factories is one of the main reasons of creation of noise pollution in urban areas. The crowd that migrates to cities from villages in search of employment gave rise to urbanization and thus to transportation which resulted in more urban noises and noise pollution. Moreover, a poor urban planning also plays its major role in creating such unhealthy and unpleasant environments to live to its dwellers in residential areas when the industrials areas and major highways are close to their residential areas (Amen,2022). The indoor noises that are created in-between few walls spreading to a very small area don't show its major negative impact on the environment.

4. Landscape and Soundscape

4.1 Nature's Sounds

Nature has its own unique way of connecting various species in various manners. Sounds are one of many such ways that the nature made its various kinds of species to identify, connect and communicate among themselves. Geologically and biologically nature has a wide variety of sounds which are created by many natural elements like wind, water, animals, birds etc. As we had already discussed that Biophony consists of sounds created by various biological and non-human elements like organisms and Geophony consists of the sounds which are made by non-living elements of nature like sounds of splashing and flowing water in a stream, sound of wind, crunching of leaves on a mulch and trees. Sound being one of the five senses acts as an anchoring point for a human to enjoy these nature's sounds and connect to the natural world. A walk or by sitting in a park, noticeably or un-noticeably makes one to hear to many sounds like a buss of a bee, sounds of wind, the blowing wind that moves the leaves, sounds of various birds. All the sounds made by various elements of nature are connected to other elements in the nature itself. For example, if we consider a bee buzzing it need flowers which store nectar for it. If in case a flowering plant isn't there, the sound of buzzing of a bee wouldn't have been there. The acoustical niche that are created by various animals and birds helps them to communicate in migrating, defending, reproducing etc., should never be disturbed. Cities which stood as a hub for noise pollution has its effect on the lower organisms.

Figure 3. The humming of the birds (Source:http://manythoughtsoncewritten.blogspot.in/)

In a study it's shown that grasshoppers are getting extinct in few cities where noise pollution is there, as their mating calls are being disrupted by the heavy vehicular and machinery sounds. This which in turn will directly show the reduction in reproduction of these organisms and reduce the number. This is not the story of only one species but most of the species that is directly affecting their habitat. The natural setting of any area will let the water get collected at a low point called watershed and thus it will lead to a stream. The sound of running water is very soothing. If one takes a walk in the woods where there is a stream, can hear splashing water in a stream. The habitat that it created supports vegetation that will give shade and act as a place of shelter to the birds to nest. Topographical conditions including the slopes, the soil conditions and the climate of that place will manage habitat. If anyone gets disturbs that shows the downfall of the other. The bird that is humming, the bee that buzzes, the water that splash while flowing, the leave that crunch when the wind passes on and the wind that blows all these are the sounds that nature had set for us to enjoy and rejoice. Rachel Carson named this a "Nature's Music". Yes, the music that the nature is singing for us. It's a communication that will lead one to a different world. In another way to tell the nature

speak with us through these sounds. These deeply nourishing natural sounds are the signs that acts like a kind or window or an aural portal into the complexity and the diversity of living and non-living things that are there around us. The Geophones and the bio phonies together contribute to the natures sounds. These sounds will represent the biodiversity and the complexity that the nature has. The change in seasons and the climatic conditions again has an impact on the migration of these bird and animal species. The ecological conditions thus, will how sustain a habitat, the organisms in it, their sounds, and the natural soundscapes.

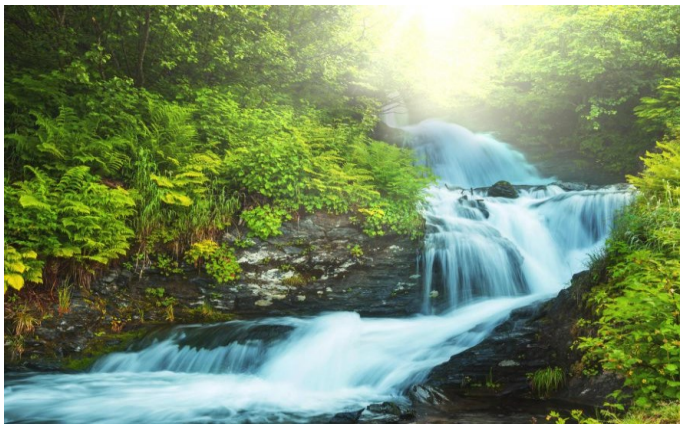


Figure 4. The running water in a stream or a water fall is another source of nature's sound, *(*Source: http://activerain.com/)

Figure 5: The wind that moves the tree branches and the leaves is another source of Natures sounds that give the rhythm of the wind blowing (Source: http://www.gettyimages.fi/)

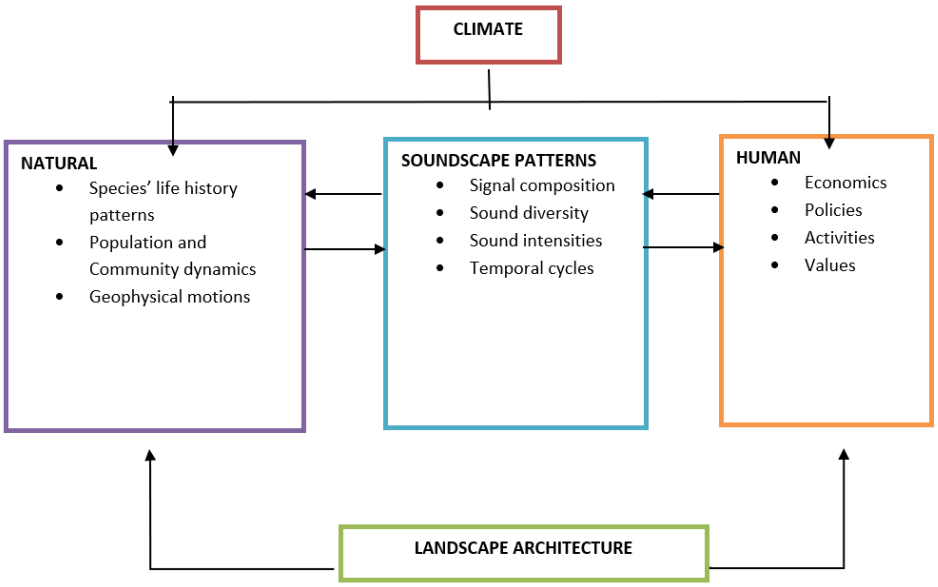


Figure 6. Conceptual framework for Soundscape ecology (Source: Site Soundscapes, Landscape architecture in the light of sound, Per Hedfors, Department of Landscape Planning Ultuna,Uppsala)

4.2 Sound as a part of Landscape Architecture

Landscape architecture is mainly related to the natural elements like water, vegetation, wind etc. In fact, it evolved using the elements of nature. Soundscape mainly natural soundscapes are sounds which is evolved from the natural landscapes i.e., the elements and organisms there in that landscape. In a rural area which had the natural landscape setting the rhythms of nature are heard which will connect one to nature. But in an urban context where natural settings are not always a part of it. Landscape architects generally use few landscape elements in showcasing and capturing the sounds of nature. For examples, by creating a fountain or any other water feature, one can feel the sounds of water that is splashing and creates an ambiance in that space. Though fountain, waterfall or any water feature is something artificially provisioned and created the element water, that used is basically from nature.

Figure 7. An artificially created waterfall that is designed along a road in Kansas City metropolitan area.

The cities which are on the banks of any river, as a part of their development programs and in the part of urban planning and design various river front parks and waterfront developments are done. This is one aspect of ecological development to free out some space that separate the quite areas and the busy urban noisy area. The sounds of water, wind, the birds etc., will act as the source to generate natural soundscapes in cities. In a way such projects will act like an anchoring point to make one get connected with the nature. Various community parks, lake side parks, riverfront barriers, ammusement parks on the shores of the sea etc are the concepts of waterfront developments which will connect to one main big natural element water and later to wind in such vast open areas.

Figure 8. A river front park on the banks of Arkansas River (Source: http://www.sayweee.com/article/view/8nvo1)

5. Urban Sounds

5.1 Urban Environment

Cities which are a hub for many happenings around the world, are like core points to attract various crowds of populations. Cities which are an anchoring point that allows its populations and migrants to settle and move to them as they have a wide verity of opportunities, education, employment, entertainment, transport, amenities etc. The cities are always happening with its active populations, traffic, markets, parks, plazas, skyscrapers, rail, road and air transport networks, office, educational, administrative buildings, residential colonies, slums, etc., But in the process of expanding the city size we are eating up the natural areas and, in a way, disturbing the nature.

5.2 Noise Pollution and Sources

The heavy traffic sounds along the roads, machinery sounds in the factories and industries are the main sources of heavy noise pollution created in cities and other urban environments. Noise disturbs the soothing and silent environments finally resulting in giving less peace to the humans and living organisms living in it. Baring large number of active populations, road traffic, construction activities and by expanding the cities are in a way expanding the noise environments also. The increase in production of vehicles and machinery, in a way disturb the peaceful environments with their increase in noise levels. The sources of noise are basically listed as Traffic, industry, household, public address systems, defence equipment, agricultural machines, and other miscellaneous sources. All these noise sources have a lot of impact on the systems of living beings and in humans. (https://en.wikipedia.org/wiki/Noise_pollution)

5.2.1 Disturbances on Humans

Noise is being a disturbing source for the city's residents. As we had already discussed that heavy noise pollution has its impact on the Human health which led to many physical, physiological as well as psychological effects. Most of all the effect of noise pollution leads nowhere and erases the peace in the environments which is the most needed thing to a human. **T**he main physical disorders that noise pollution let is its direct impact on hearing. Heavy sounds in factories were the workers must stand in front of the machines and work entire day will finally affect his hearing system. Negative physiological impacts that are shown on humans is that heavy noises will affect the cardiovascular system of humans leading to heart attacks, cardio attacks, impairment of night vision etc. Psychologically also noise pollution effects humans snatching the peaceful environment. Various psychological manifestations of noise pollutions are depression, Insomnia, straining of senses annoyance, emotional disturbances etc.

Figure 9. A picture depicting the way how various urban sounds disturb human beings (Source: https://en.wikipedia.org)

The effects of noise pollution on humans basically divide into Auditory and Non-auditory effects.

5.2.2 Disturbance on Fauna

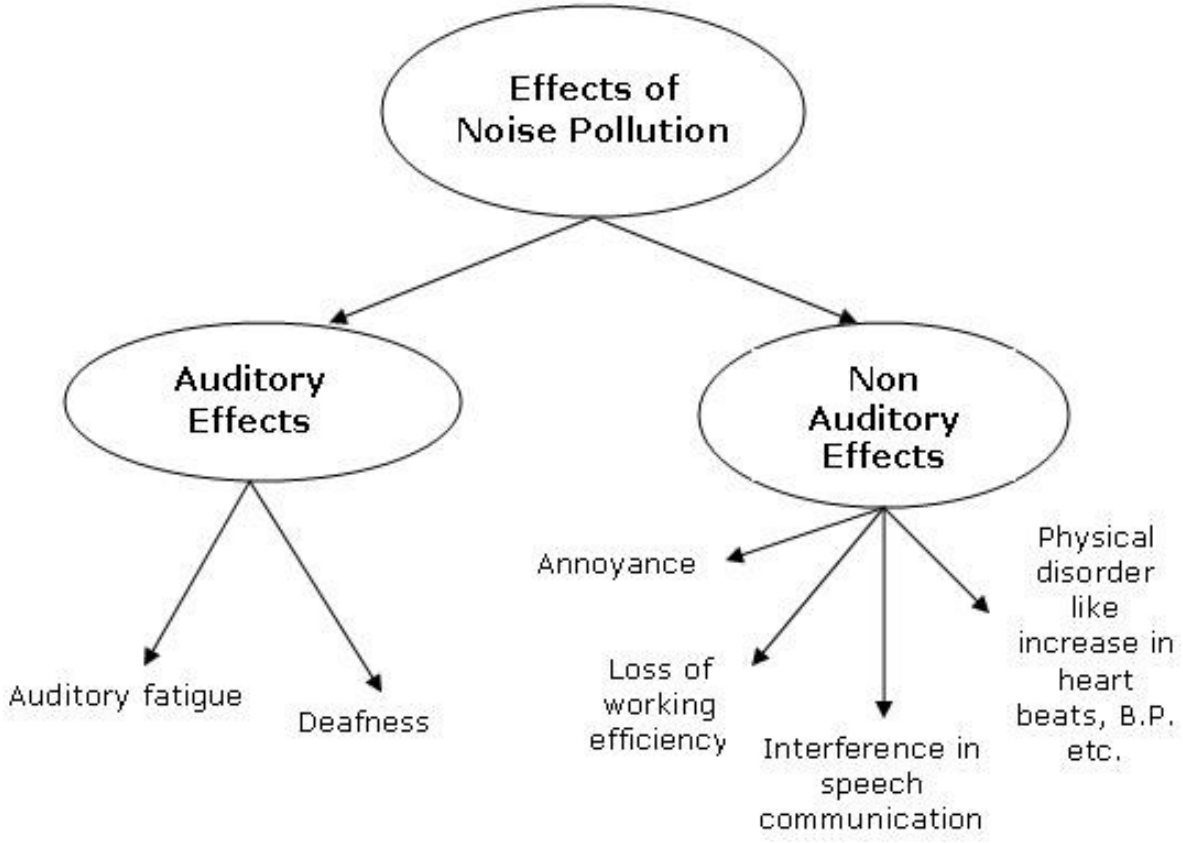


Figure 11. Effects of noise pollution on humans (Source: http://www.indiaonline.in/)

The Lower set of living organisms present in nature have a very sensitive noise baring capacity. As we know that the nature bares a delicate balance in the wildlife and their predator and prey detection and avoidance, communication of living organisms for reproduction, safety, navigations etc. These are the settings that the nature has set to itself to sustain its organisms and to maintain various ecological conditions. This thin line of delicate balance must be maintained by them. Lower living organisms like birds, insects, small animals etc. are the main types of wildlife that the noise pollution impact, by disturbing the habitat of noisy areas, which in case of endangered species may take a path to extinction. In some cases, when there is a lot of noise that might even make the species communicate much louder than the usual sound level, they communicate on by masking the other organisms and finally leading the whole ecosystem to speak and communicate more loudly. Mostly these are like signals of warning to its fellow living beings when any danger is surrounding them. This is another way of noise pollution that is created by the nature itself. This is called Lambard vocal response. For example, the Wales generally communicate to 75dbls, but when the sub-marine detectors are on their voice increase and that creates a Lambard vocal response at about 85dbls which is very high. This is one example which showcases the disturbances that is created by human activities in the actions of other living beings. In certain cases, the voices of small living beings like birds are muted by the noises that are generated by heavy vehicles and machines.

6. In the Context of Delhi

6.1 Delhi's natural conditions

Delhi ridge or the Ridge is present in the National capital territory of Delhi in India. The ridge is a northern extension of the ancient Aravalli Range, some 1500 million years old (compared to just 50 million for the Himalaya). The Delhi Ridge is said to be the green lungs for the city and protects Delhi from the hot winds of the deserts of Rajasthan to the west. It is also responsible for earning Delhi the tag of the world's second most bird-rich capital city, after Kenya's Nairobi.

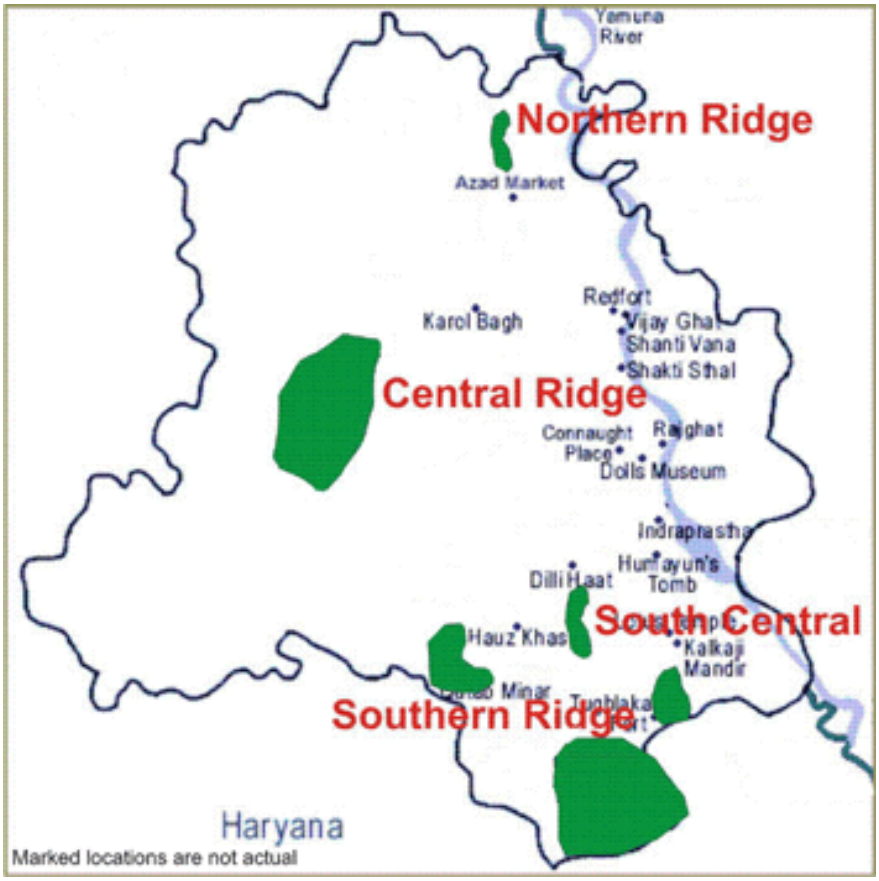


Figure 12 Map showing the locations of four parts of Delhi ridge that is present today. (Source : http://toxicslink.org/delhiridge/map)

The Ridge today, for administrative reasons, is divided into 4 separate zones,[7] namely:
1. The Old Delhi or **Northern Ridge** denotes the hilly area near Delhi University and is by far the smallest segment of the Ridge. Nearly 170 hectares were declared a Reserved Forest in 1915. Less than 87 hectares remain today, which is slated to develop as Biodiversity Park by the Delhi Development Authority.
2. The New Delhi or **Central Ridge** was made into a Reserved Forest in 1914 and stretches from just south of Sadar Bazaar to Dhaula Kuan. It extends over 864 hectares, but some bits have **been** nibbled away.
3. The Mehrauli or **South-Central Ridge** is centred on "Sanjay Vana", near JNU and Vasant Kunj, and encompasses 633 hectares. Large chunks have been encroached and built upon.
4. The Tughlaqabad or **Southern Ridge** sprawls across 6200 hectares and includes the Asola Bhatti Wildlife Sanctuary. This is the least urban of the 4 segments of the Ridge, but a lot of it is village-owned or privately owned farmland. (https://en.wikipedia.org/wiki/Delhi_Ridge)

6.2 Human interventions and Disturbances

As a Nation's capital Delhi is baring about one fourth of the national population, i.e around 25 million population crowd. In the process of extending the city to accommodate its migrants in it, Delhi's ridge was occupied and disturbed for various constructions and developments. As the ridge has a great treasure off Delhi red quartzite and other stones it was mined vigorously without assuming the depletion of the vast forest area that support a wide variety of ecosystems in it. This created a heavy loss in the vegetation, fauna and natural slopes that showcase the ridge conditions. In 1982 a study done by the School of Planning and Architecture, New Delhi, it was stated that about 40%of the ridge has been destroyed. The main activities are stated are large and uncontrolled encroachments and use of ridge for non-forest purposes which lead to the shrinking of ridge. This created a lot of depletion in the ridge's original frame and thus to the ecological situations it had. The land under Aravali Biodiversity Park was once a site for mining. Land, which once was covered with a dense forest, soon turned into pits and hillocks.

Figure 13. A part of mined site in Aravali biodiversity park, Gurgaon.

It was around in 2002 that the mining activities were given a check in awakening the Ridge's depleting scenario. In the process of recovering the ridge from the aftereffects of mining, and other non-forest uses the various voluntary organizations, citizens' groups, NGOs had arrived forward with many programs in rising awareness of the need of recovering and protecting a huge chunk of natural forested area, which welcomed and is still welcoming many species back to their home. Another aspect that disturbed the natural conditions of the Delhi's ridge is the introduction of few of the exotic species that totally changed the vegetation type of the ridge. In the process to making the ridge green a tree a tree species called *Prsophis juliflora* was planted which is an exotic species from France. This was planted by French people around 1880, it became so invasive that it didn't allow another species to grow under it. Despite it being a tree that is adaptive to any soil and moist conditions, ecologically it's not at all a friendly tree, as no bird nets sunder it and no animals feed on its leaves.

Yamuna River which is the major water source for Delhi is being mixed with almost 19 drains that carry sewerage from the city. This is the most miserable way contaminating the river. This in way is affecting the river ecosystem and causing to the loss of many river bases species. The flood plains are Yamuna River are misused for constructions and a space for natural habitat and hazard management have been concreted with buildings and roads leaving no scope for the 50 and 100-year flood plains to bare the flood. This is again disturbing the Urban habitat.

6.3 Muted sounds of Delhi

Figure 14. Constructions that are made on the flood plains of Yamuna River (Source: https://sandrp.wordpress.com/2013/11/29/river-yamuna-through-the-prism-of-political-manifestos)

In the process of development that is happening in Delhi is leaving o space for the birds and animals that thrive upon. Slowly the city is losing the nature's species that sing, hum, communicate in their own way. Acoustic communication is one of the most crucial aspects of bird behaviour having a bearing on the very survival of a species in each habitat. Birds are one of the most vocal classes of animal kingdom and depend on acoustic signals to attract mates, defend

territories, synchronize behaviours, and warn of dangers. However, their habitats can be noisy because of biotic and abiotic sounds, which interfere with signal detection and limit the range of communication. Although a wide variety of habitats have been investigated for their impact on animal signal design, until recently these did not include the urban habitat.

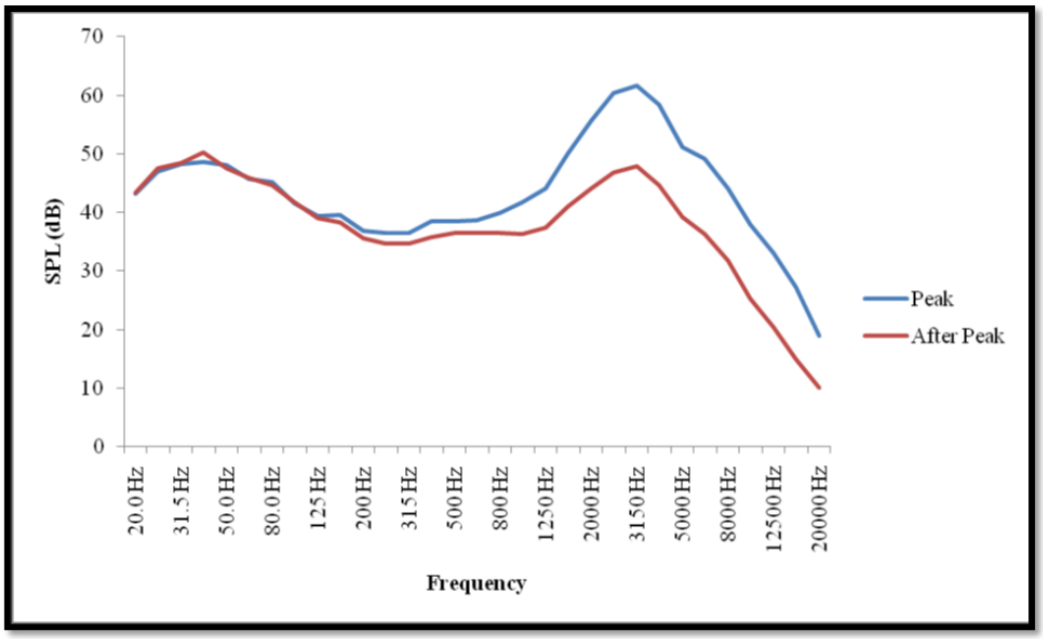


Figure 15. Power spectrum of Peak and after peak dB levels of dawn chorus at the ISTM (JNU Old campus) site. (Source: http://rspb.royalsocietypublishing.org/content/280/1773/20132290)

7. Case Studies (Selection Criteria):

To welcome the pleasant sounds into a city context it is very important to know the situations and activities that are happening in these urban spaces. To voice up the sounds of the nature, one should reduce the intensity of noise pollutions that is aching the urban environments. As a part of it one should know the method of Sound mapping which will help us to have a check on the activities leading to noise. There are projects around the world which are done as a ecology specific but not Soundscape oriented

The case studies for the Soundscape are selected based on three basic considerations:

- Noise mapping
- Natural sounds into urban contexts
- Artificially created soundscapes
- Natural sounds
- Musical sounds

7.1 Noise Mapping

Noise pollution which is a very serious problem these days in cities is killing the pleasant environments and muting the natural sounds. The sounds of vehicles, machinery, activities taking place at the events, market spaces, loading, unloading, conversations, gatherings etc. are the main sources of noise that is created in the cities. These sounds intensities should be measured according to the range of low, medium, and high levels of decibels and are categorized based on the activities which are becoming the main points of source to generate the noises. The method to be choose for these exercises is called Sound mapping. Mapping of sound in the areas, can help one to understand the activities to be eliminated, elements to be incorporated to enhance the natural sounds and the maintenance that can be done to sustain such areas.

For this purpose, as a part of noise mapping an exercise is done by the students of Department of architecture of C.E.P.T, Ahmadabad.

7.1.1 Case study 1

Location

This is mainly a sound mapping exercise done considering a very busy market area in Ahmadabad called Sindhi market which is near the Kalupur gate.

Activities

It is a very heavy activity baring area encouraging activities like shopping, hawking, loading, and unloading, having conjunction of traffic and vehicle movement, conversation, pouring etc. It is an ideal example for a typical market space which is a source to major noise generation area in cities. Such markets in Indian context are also the main source for attracting the crowd for shopping, business, hangout purposes etc. Noise which is the main disturbing problem in this main activity attracting market should be mapped out and categorized to take any steps to reduce it.

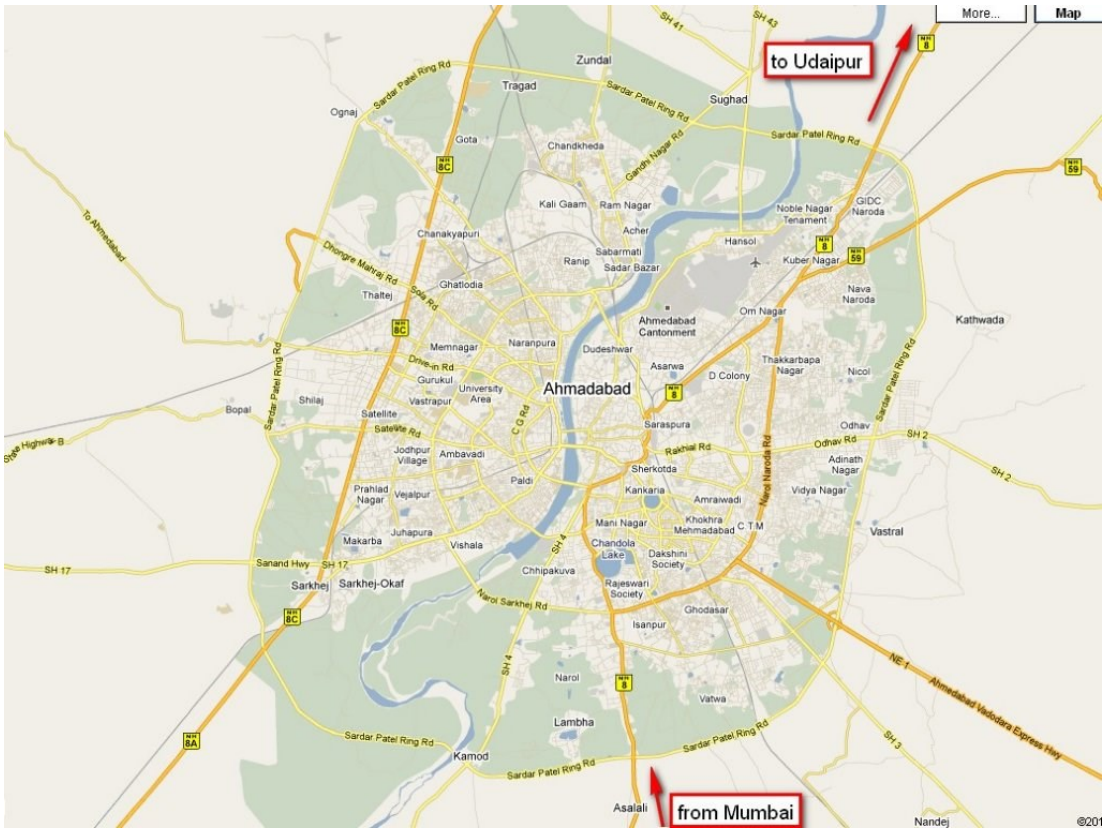


Figure 16. Map of Ahmadabad (Source: https://www.iter-india.org/map_ahmedabad.htm)

Figure 17. Location of Sindhi Market (Source: https://www.google.co.in/maps/place/Ahmedabad)

Figure 18. Activities happening in and around Sindhi market (Source : https://www.google.co.in*)*

Figure 19. Texture Map of Sindhi Market (Source: M.L.A, CEPT)

A Map of Sindhi market is taken and the activities that are happening in the market space are keenly observed that generate sounds. The activities are noted and the noise that is emitting out of these activities is recorded and is categorized as Low, Medium, and High. The measurements of sounds in a decibel form is finally formatted using a software called “Revan" This is done using a grid and is mapped accordingly. Various activities are mapped accordingly in a separated procedure, and a layering of the activities and the sounds emitting out of them are done.

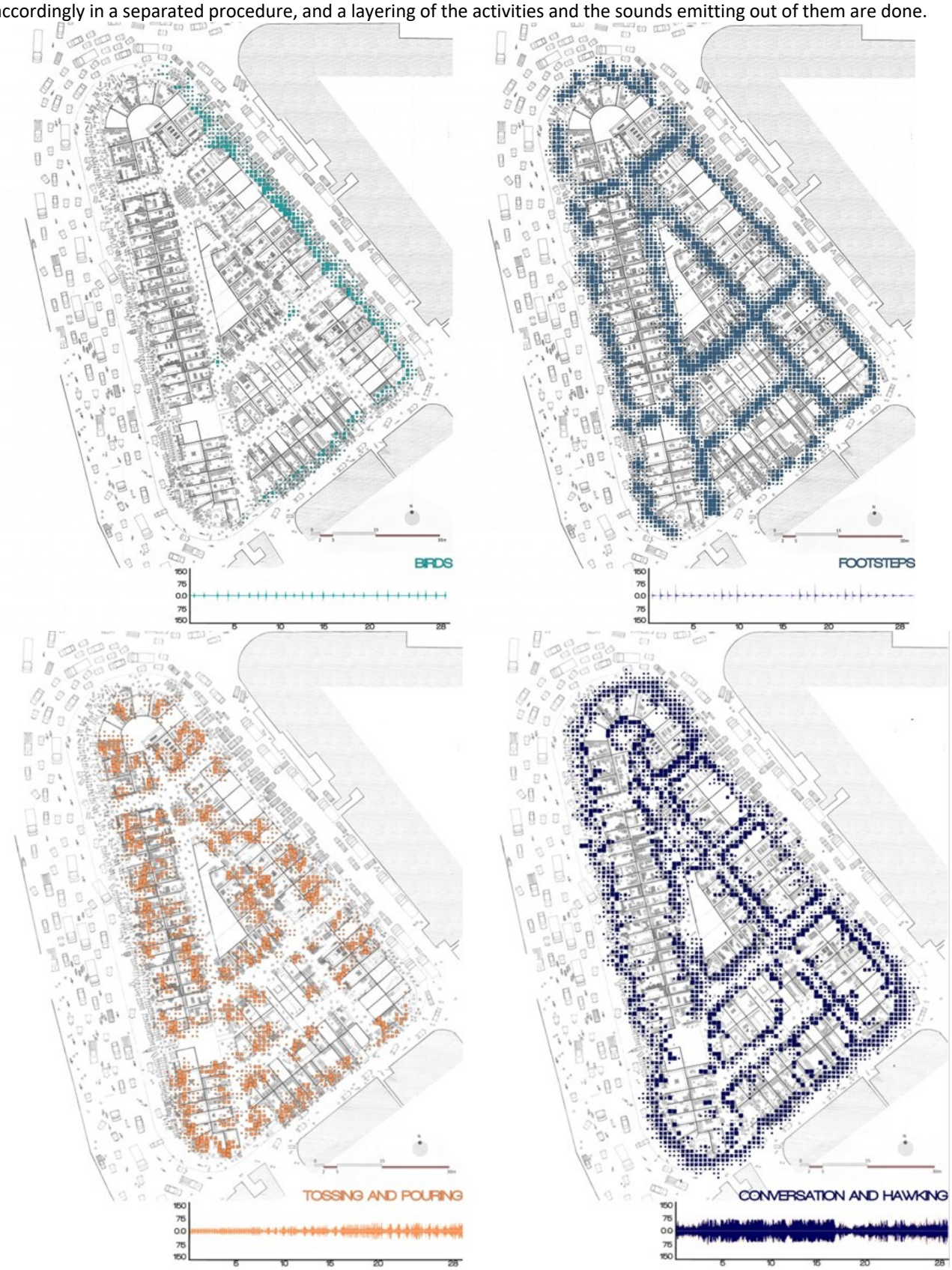


Figure 20. Sound mapping of Sounds emitted by Birds and by Footsteps (Source: M.L.A, CEPT)

The sounds that are emitted by the above activities are market and are layered to understand the intensity of sound is affecting the spaces and what are the major sources that are pricking the ears of the visitors, shopkeepers, customers, and other end users of Sindhi market.

Analysis:

The major noise that is affecting the area is the noise from the vehicles, which is due to the presence of the major road that is surrounding the market space. The next level of sounds that are affecting the space are the sounds emitting from the activities of conversation and hawking, tossing, and poring and then the noise created by footsteps of the people there in the market. These activities are muting the level of sounds created by birds that are there in the market. So, understanding this the activities that can be minimize should be clearly identified.

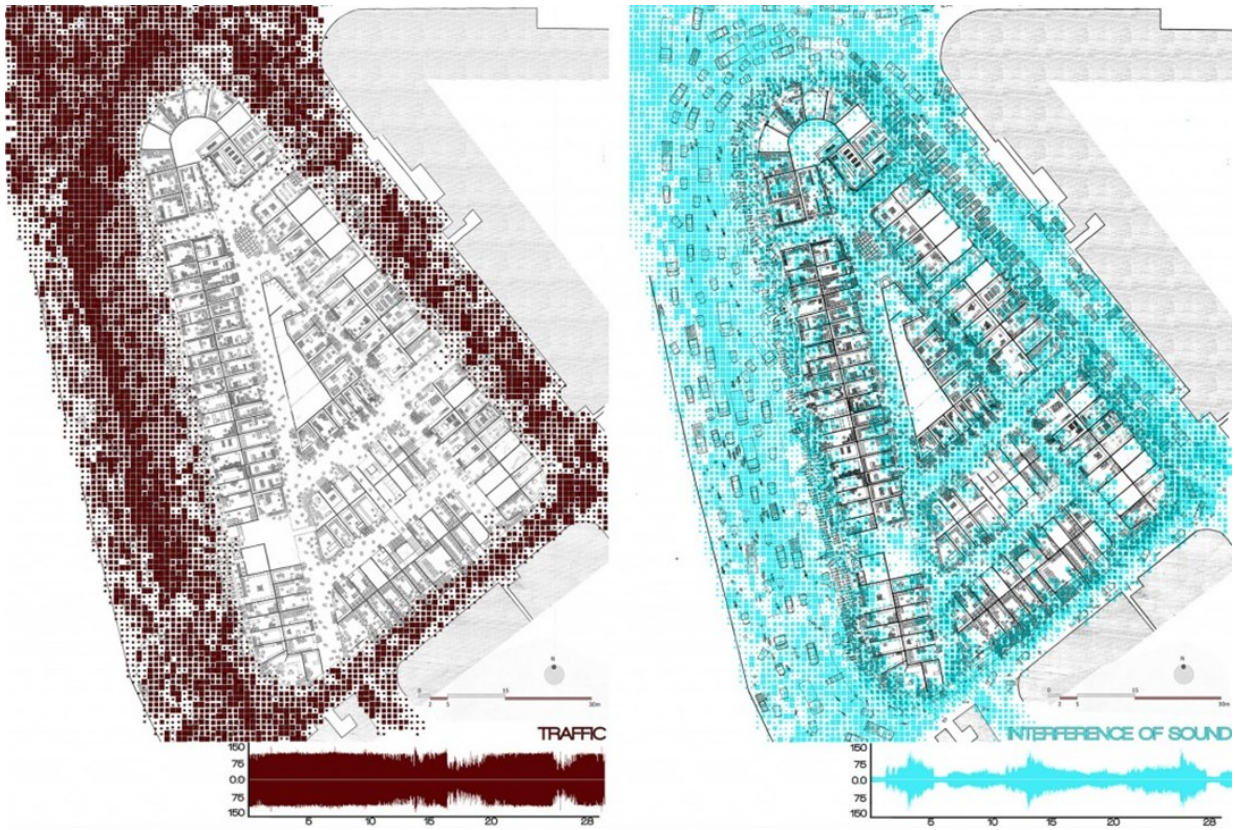


Figure 21. Sound mapping of sounds emitted by Traffic and the inference of sound that is there in the market (Source: M.L.A, CEPT)

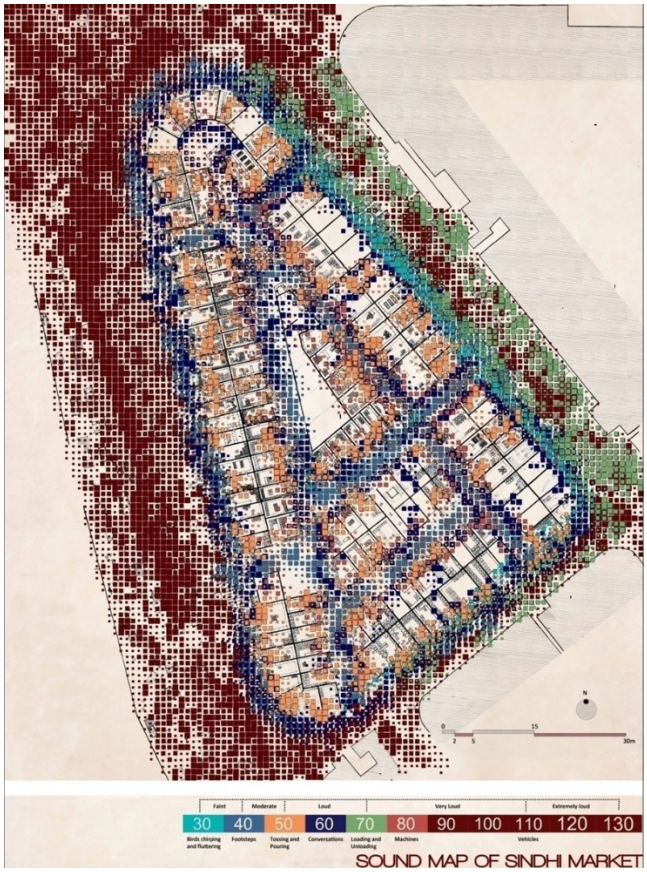


Figure 22. Sound mapping of layering of sounds by the activities (Source: M.L.A, CEPT)

7.2 Bringing Natural Sounds into Urban Contexts:

Attempting to get the natural sounds of water, birds and other fauna, winds, crushing of leaves etc is actually an ecological way of using landscape to create such an atmosphere to welcome those sounds into the urban areas. An ecological project from the city of Seoul.

7.2.1 Case study 2

Location

Seoul is the capital city and largest metropolis of South Korea. It is situation on the banks of river Han, where the city bisected into northern and southern parts by the river.

Figure 23. The river park development in the city Seoul (Source: https://www.google.co.in/maps)

Project

In the centre of the city Seoul there used once be an express highway which is more. The express highway was demolished, and it is replaced with a five mile, 800-yard-wide and 1,000-acre lateral park which became place for refreshment. Demolishing an existing highway way and then converting that as a lateral river park was the main idea of the Mayor of the city Seoul in the year 2002. It is developed as a main vision to bring back the lost heritage of the river and creating an ecological link considering other benefits like attracting economic growth, tourists, and investors in midst of a busy urban area. 22 new bridges were constructed across this river to allow the connectivity and help for the linkages of the either side of this lateral park. The water in the river is restored, albeit from the ground water. Initially like any other restoration projects, this project also faced a lot of problems from the drivers and end users of the highways. The sound of splashing water is achieved by creating small level differences instead of a slopping land. Now fish, bird and insects have made their way back into the urban river, and the area surrounding the park is about 3.6 deg C cooler than other parts of the city.

Figure 24. The Seoul's River Park (Source: http://inhabitat.com/seoul-recovers-a-lost-stream-transforms-it-into-an-urban-park/)

Figure 25. Activities happening at the edges of the river park at various points of time (Source: http://inhabitat.com/seoul-recovers-a-lost-stream-transforms-it-into-an-urban-park/)

As a part of this project the vehicular traffic that once passed by this way is diverted towards the other route which ensured the threat of disturbing the flora and fauna of this river park. This project is not directly worked with an aim to create a pleasant Soundscape in the city. But indirectly it welcomed the sounds of nature into its busy bussing city environment which attracted more people.

7.3 Case study 3

Location:

Another similar case study that is satisfying the ecological aspect of getting the natural sounds in to the city is in Oslo, the capital and the most popular city of Norway, which is sitting on the banks of river Akerselva. It starts at Maridalsvannet in Oslomarka, and follows the urban areas Nordre Aker, Sagene, Grünerløkka, Oslo centre and Grønland, whereby it finally ends at Paulsenkaien and Oset in Bjørvika.

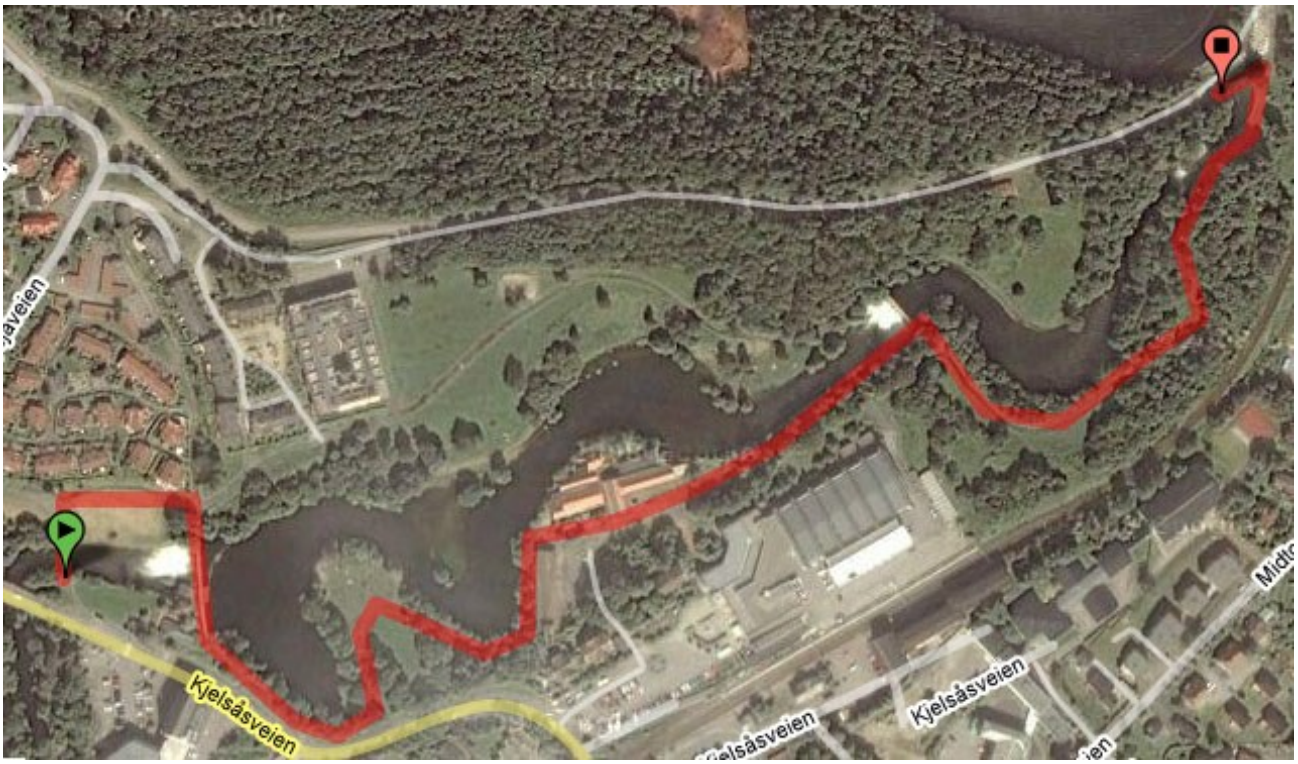


Figure 26. The River Akerselva flowing through the city Oslo.(Source : www.lifeinnorway.net)

Project

To create a positive city development at a same time attracting many tourists, investors and pubic, being the main motto of the Government of Norway for its cities. During the eighties, old, worn-down, and vacant buildings, deterioration, and poor environmental quality characterized the river basin area along the main river Akerselva. As a need to construct a healthily and an attractive city environment Akerselva Environmental Park was established. The main intention being is to improve the develop green spaces, parks, improve water quality and enhance cultural a tourism heritage of the city Oslo. The old building is now accommodated with new offices which had brought a part of the urban life towards the river edges by using the left-over built space. The existing setting of the topography that is guiding the river naturally makes the splashing sounds of river waters that is flowing through the city. The residences which are right beside the river get the most luxurious sounds of running water at their back yards. Since the interfering of vehicular traffic along the river is minor these sounds don't disturb the natural sounds of water, birds, winds, leaves etc. The walks that are there along and across the river Alkerselva are the spot for hanging out. The sounds of running water will make the space happening. (http://www.lifeinnorway.net/2011/12/a-winter-walk-along-akerselva)

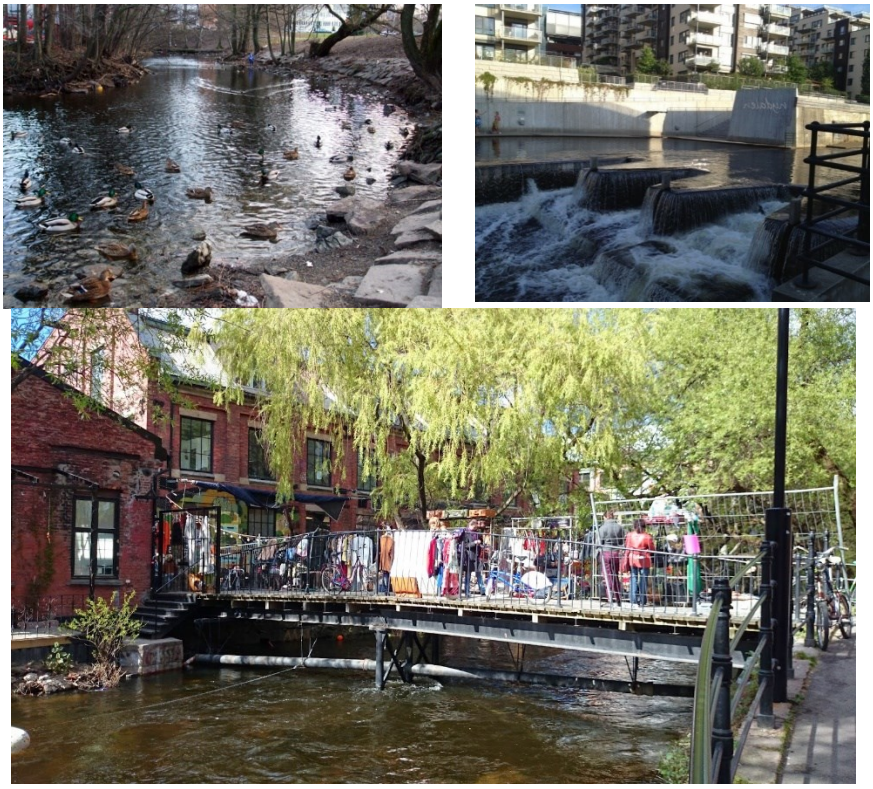


Figure 27. Images showing the river side activities across the bridge that become a part of crowd attraction in these areas (Source: www.lifeinnorway.net)

Figure 1 Accommodating public buildings along the river (Source: www.lifeinnorway.net)

7.4 Case study 4

Location:

The Aravallis are among the oldest mountain ranges having evolved about 1500 million years ago and extend from Gujarat through Rajasthan to Haryana–Delhi. The spurs of the Aravallis are popularly known as the Delhi Ridge in Delhi which is divided into the Northern, Central, South Central and Southern Ridge. The Aravalli Biodiversity Park is located on the South-Central Ridge and spreads over an area of 692 acres. The area is bounded clockwise by JNU (Nelson Mandela Marg), the Mehrauli - Mahipalpur road, NH-8 and the Palam road and the southern boundary of Vasant Vihar.

Context:

The landscape is undulating with gentle slopes and dotted with numerous morrum and clay mined pits of different sizes, depths and shapes. The site selected on the biodiversity park is an edge of the site which has a combination of various conditions. It has a heavy vehicular traffic on its southern end, a residential neighbourhood on its western end, and in the site, itself is free from vehicular traffic and is totally and ecological ridge condition that is happening in the site. the site is mined over years due to the presence of Delhi red quartzite. This activity of mining had eaten up the natural topographical conditions of the site and this had left the site with sliced depressions, and the vegetation of the site is highly disturbed that once whatever the dense vegetation it used to have also was disturbed. The invasive species *Prosophis juliflora* that sprawled over the ridge had overtaken the growth of other native species

of the ridge. This major destruction done by mining and invasion of other species had disturbed the ecology also. The fauna which is dependent on the vegetation have taken its route of distinction of few species.

Revival programs:

Various programs of reviving this part of the ridge are going on, by various NGOs and government. Ecological walks and participations are being encouraged by these bodies to create awareness in the people about the importance of the ridge and the nativity it once had. Planting of the ridge's native species to give back nature its own condition is being done, which will give a welcome call for the fauna which had left the ridge and heading its routs to extinction. The part of the ridge had a wide variety of birds, like Raptors, Peafowls, Non-passerine land birds, Perching waders, Doves, and animals like reptiles and mammals with a great diversity.

Analysis:

A part of the Aravali range is taken for the study which is accessible and have a mixed use. The combination of ridge, the heavy traffic road with metro above it, and a housing community. The sounds of various birds and mammals in the park and the housing community account for natural sounds. The sounds created by humans in the park who come jogging, trekking, planting, and exercising at various times of the day. the sounds of the vehicles and the metro that is dominating at one end of the park are with high intensity. As a part of observing the sounds of the site selected, various sounds and their levels are recorded. The sounds of vehicles that re there on the road and the sounds of metro, sounds of birds and other fauns in the park, sounds of people who are using the park and their levels are recorded. The levels are again categorized as High, Low and Medium. The mapping of these sound levels is framed in the form of individual maps as. The layering of these sounds' levels is done to understand the dominant sounds of this area. The most dominant sounds outside the park are the vehicular sounds on the main road that is edging the site. When one moves into the park one can feel the difference of the environment that is changed from outside of the road to its inside. As one moves inside, can feel the environment to be very calm, which makes on to admire the sounds of the birds, this can have happened only when the environment in the park is away from the heavy vehicular sounds. A balance in the ecosystem is another way of conserving and preserving the natural sounds. The sound intensity of the birds in the Aravali biodiversity park is found to be more when one goes to the interiors part of the park than at the entrance or at the places where the park is edged by the housing community and the heavy vehicles road and the metro line. The presence of various species of birds in the site are the main sources of the natural sounds in the park. The ecosystem is the main baring support that is maintaining these sounds. In a way this is a balance of ecosystem.

Figure 2. Sound levels of birds in the park.

Figure 3. Sound levels of people that are using the park

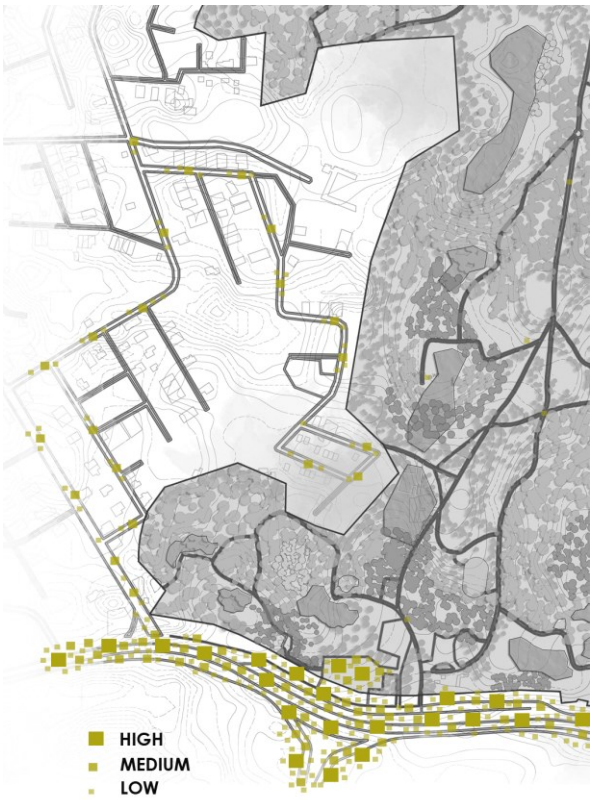


Figure 4. Sounds of various vehicles and metro that are coming from the main road and the community that is edging towards the west of the park.

Figure 5. Layering of various sounds that are there in and around the site.

7.5 Artificially Created Soundscapes

In environments were bringing or creating the sounds can't be achieved by ecological ways, there are ways to achieve by creating artificial landscape elements that can either tune up the musical sounds or natural sounds. Creating the water features in spaces where ecologically creating such spaces is a hard task to achieve, is one way that is an effective way to create the natural sounds of water. As a part of a personal observation two case examples are done.

7.5.1 Case study 5

Location:

Ambiance mall which is in Vasanth kunj, South-west Delhi, sets as a very good example for the projects that achieved getting the sounds of water by using landscape design.

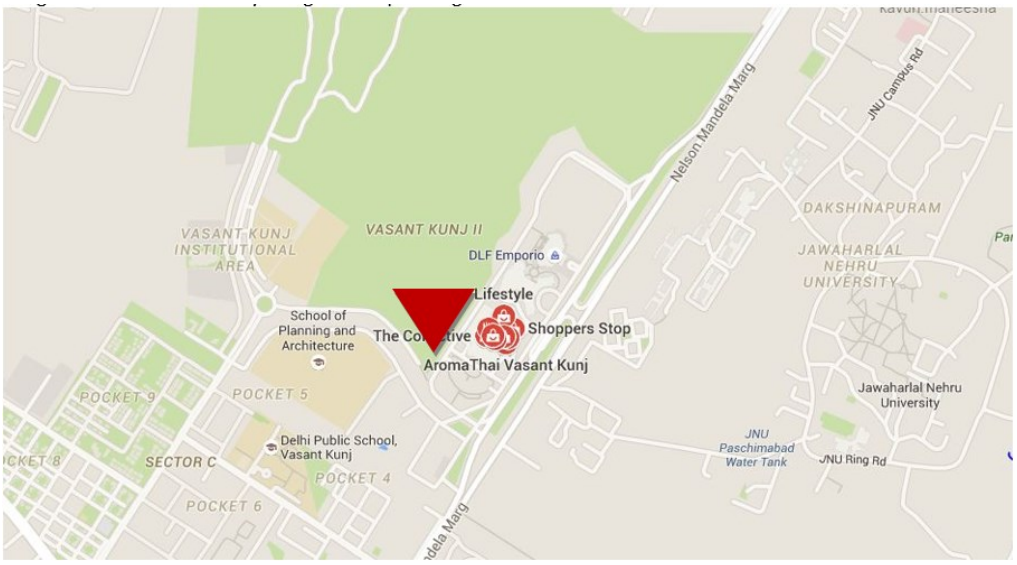


Figure 6. Location of Ambiance mall in Vasanth kunj (Source: https://www.google.com)

Project:

The water feature that is there right in front at the entrance of the Ambience mall is acting like a transition space between the road and the mall. This acting like a transition space will and mainly with its water fountains and the sound that is being created by it will act like a space which will arrest the noisy traffic sound. This will also become like a transition zone for the visitor to leave the tiredness of traffic and vehicular sounds and enter the shopping complex with a rejoice of hearing water.

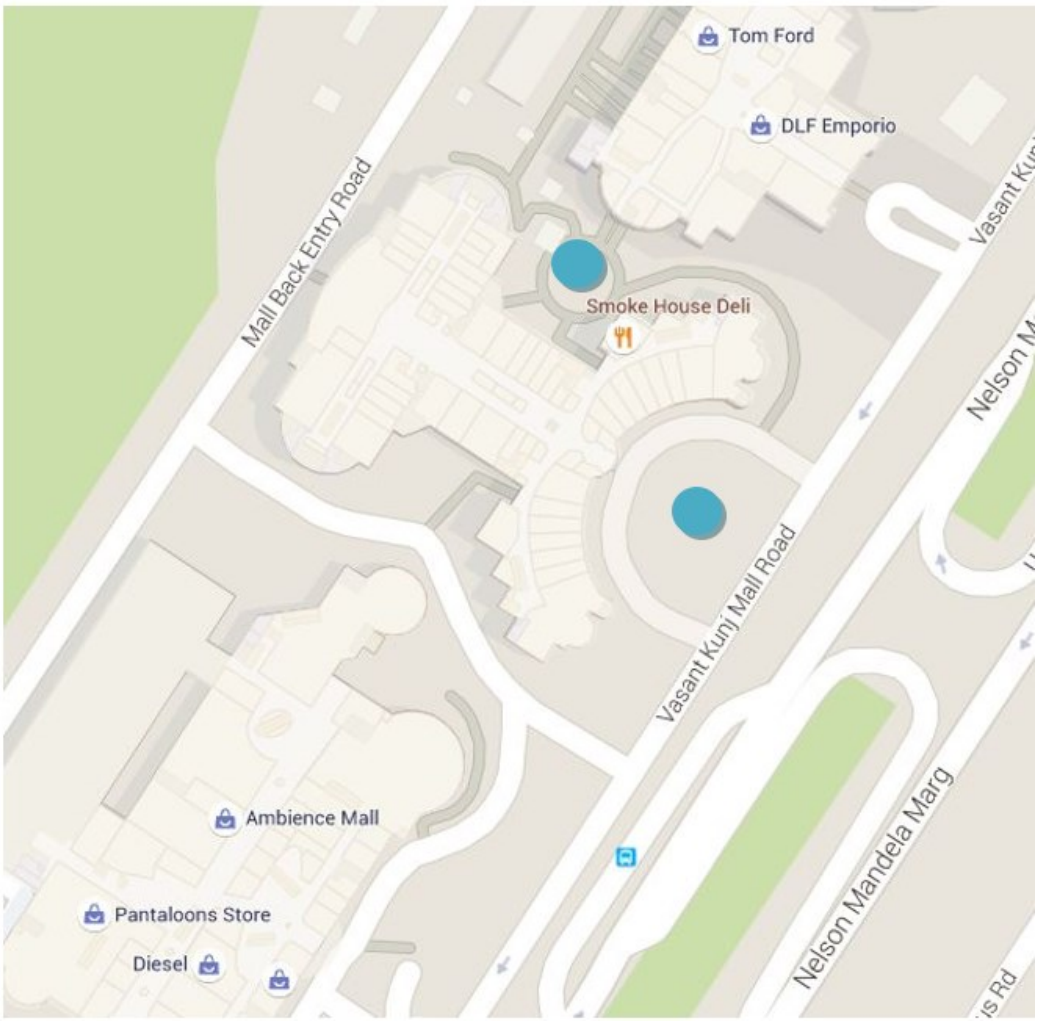


Figure 7. Presence of various water features in the mall complex

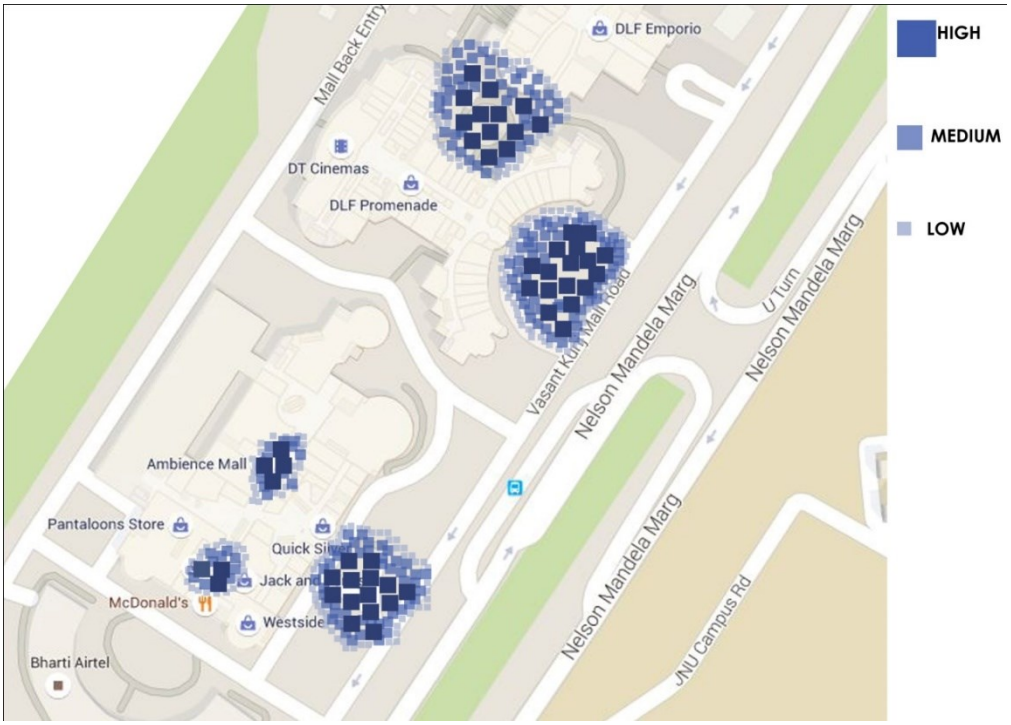


Figure 8. Density of water sounds that come from the water features.

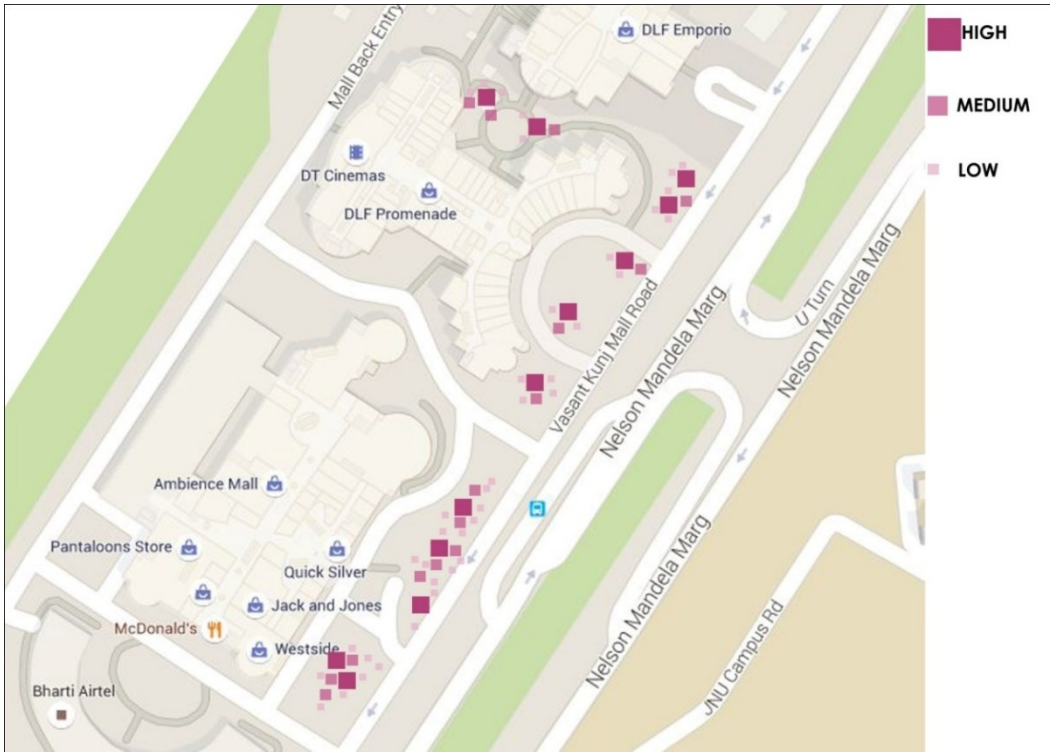


Figure 9. Density of bird sounds found around the mall

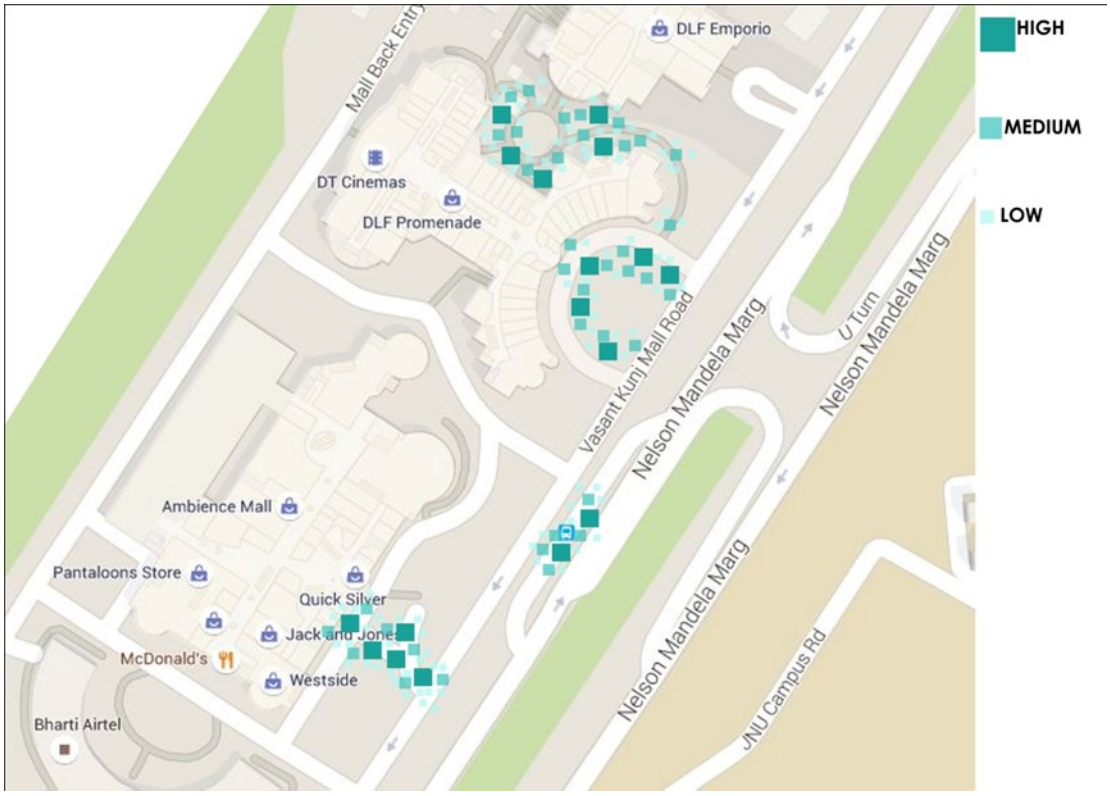


Figure 10. Density of sound distribution by people in main core points

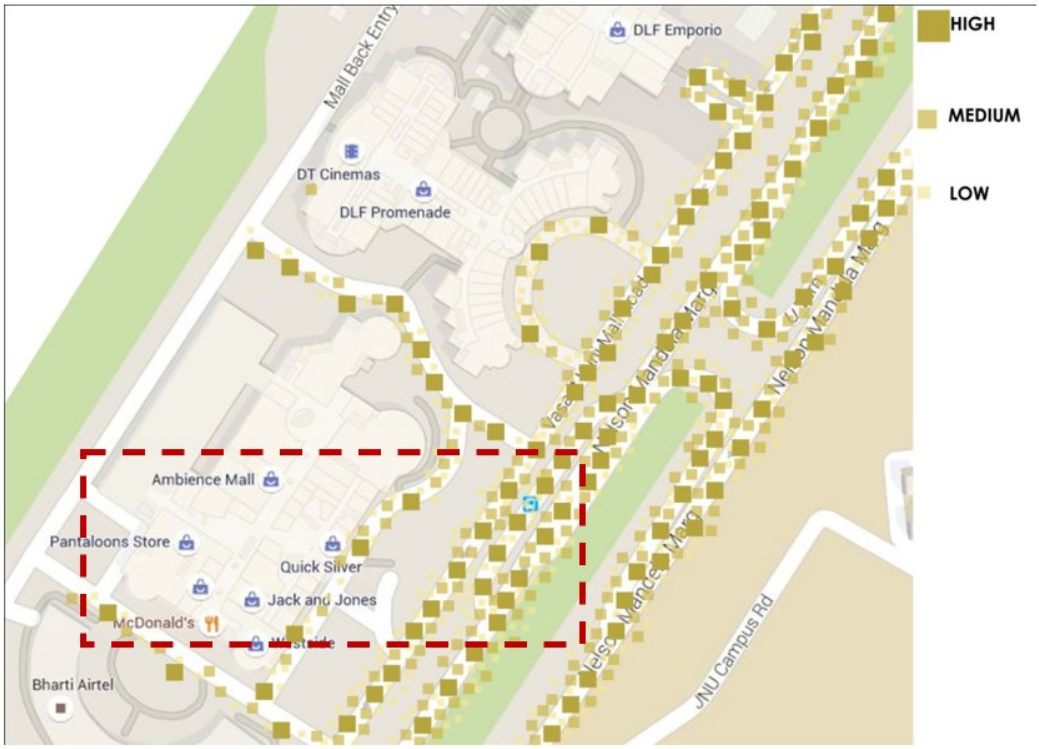


Figure 11. The vehicular sound density distribution along the roads and drive ways

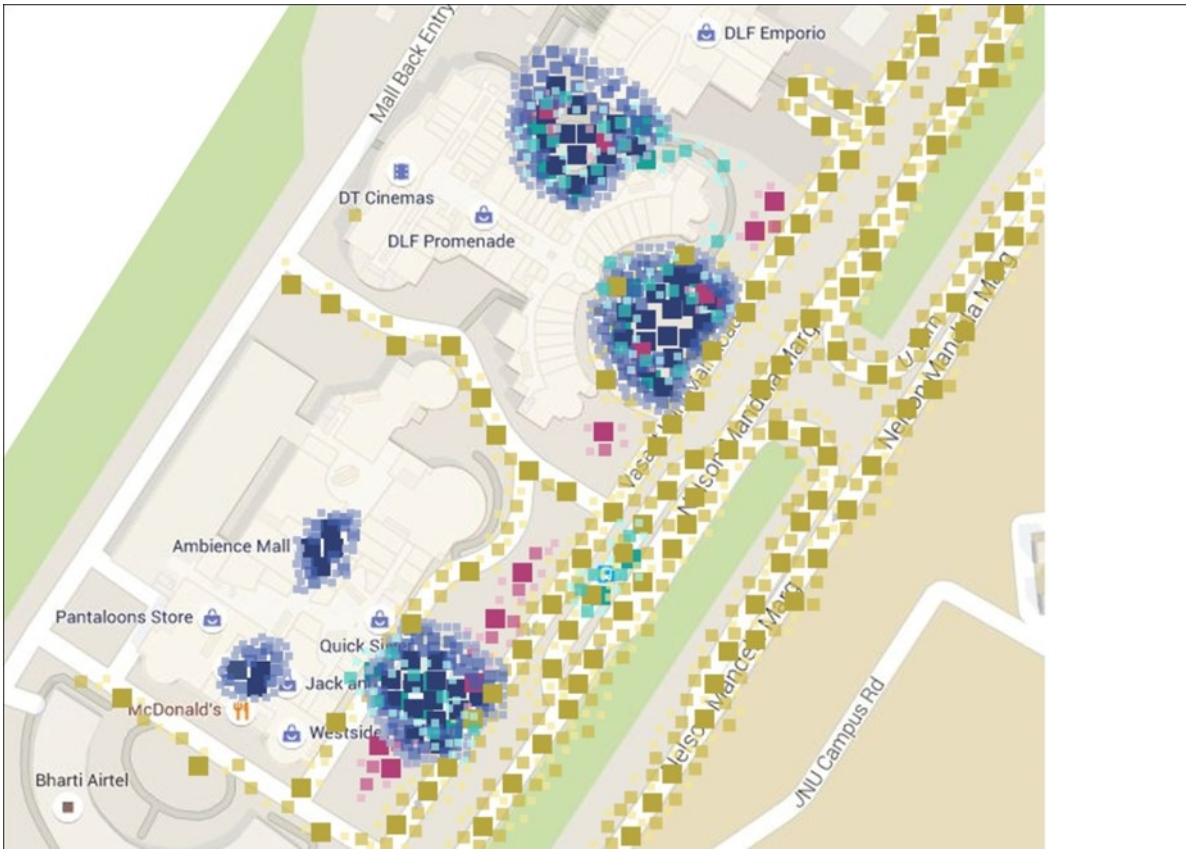


Figure 12. Layering of various sounds that are distributed to understand the dominated sound distribution in and around the mall.

Figure 41. The presence of a water feature in front of the mall that is acting like a transition zone between the road vehicular sounds and the sounds from mall. (Source: http://delhi-ncr.mallsmarket.com/malls/ambience-mall-vasant-kunj)

Figure 42. Function of water feature in the night time (Source: http://delhi-ncr.mallsmarket.com/malls/ambience-mall-vasant-kunj)

Figure 43. The water features

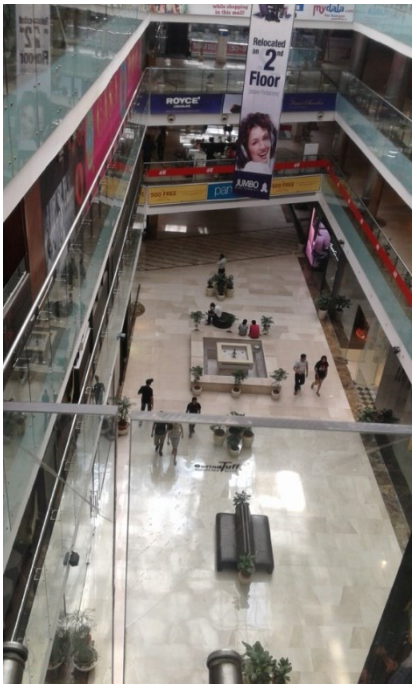


Figure 13. The image of the water feature that is seen from the 3rd floor of the mall.

Figure 45. The water fountain that are present inside the mall

Figure 46. The water fountain in front of the DLF mall that serves the same function as the other water feature.

7.6 Musical Sounds

In places where achieving the sounds of nature is difficult few alternatives can be done by using the elements of nature and incorporating the structural and architectural implementations and ideas to create tunes of music and stand as an iconic examples of case study.

7.6.1 Case study 6

Location:

Singing ringing tree in Burnley in England, which resembles a tree but is actually a wind powered sound sculpture set in the landscape of Pennine hill. It was a part of regeneration project created by the East Lancashire Environmental Arts Network (ELEAN) in 2006.

Project:

Designed by architects Mike Tonkin and Anna Liu of Tonkin Liu, the Singing Ringing Tree is a 3-metre-tall construction comprising pipes of galvanized steel which harness the energy of the wind to produce a slightly discordant and penetrating choral sound covering a range of several octaves. Some of the pipes are primarily structural and aesthetic elements, while others have been cut across their width enabling the sound. The harmonic and singing qualities of the tree were produced by tuning the pipes according to their length by adding holes to the underside of each. In 2007, the sculpture won (along with 13 other candidates) the National Award of the Royal Institute of British Architects (RIBA) for architectural excellence.

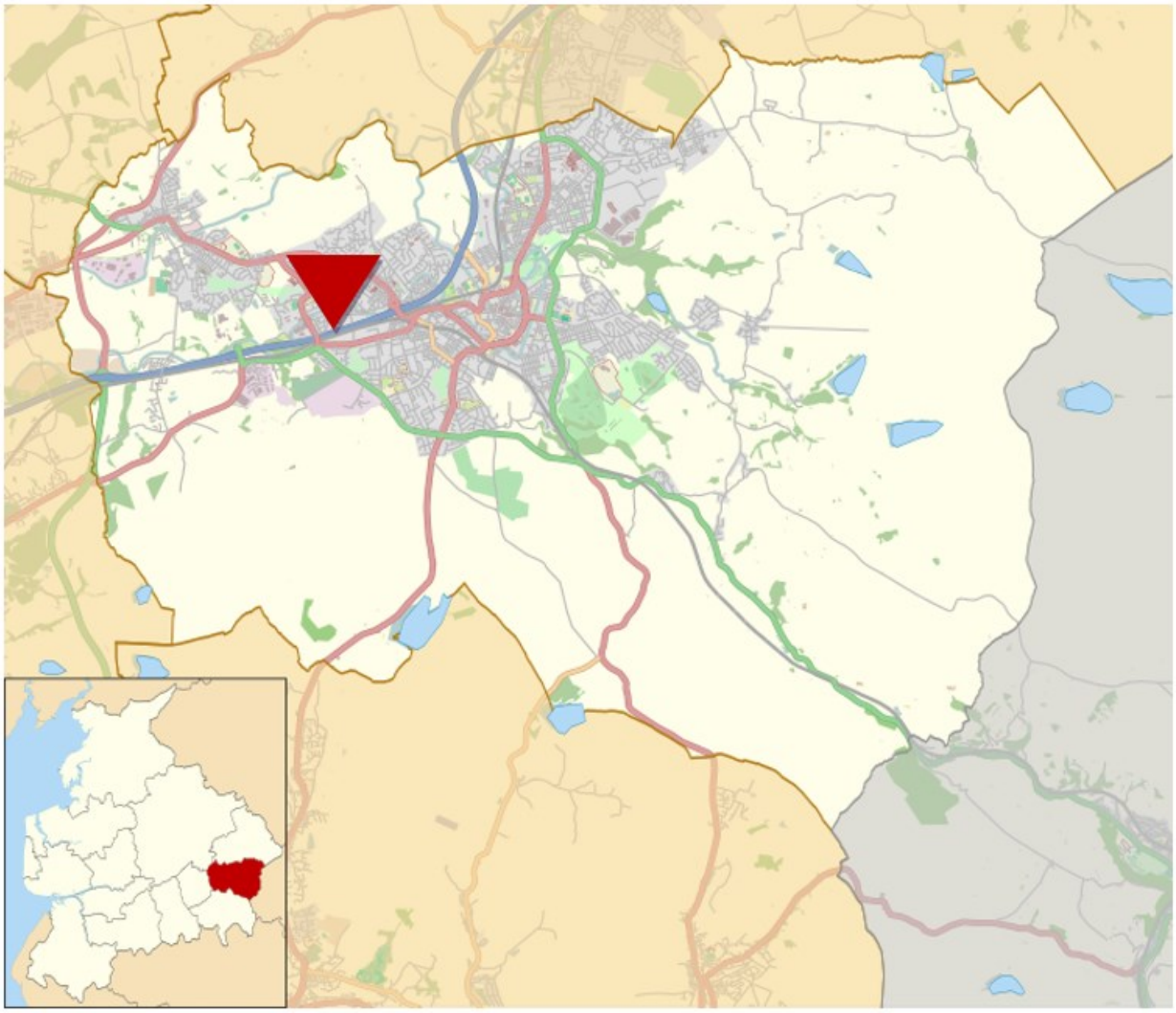


Figure 47. Location of Burley (Source: https://en.wikipedia.org/wiki/Queen_Street_Mill)

Figure 48. The Singing ringing tree (Source: http://www.midpenninearts.org.uk/panopticons-singing-ringing-tree)

The tree is constructed of stacked pipes of varying lengths, orientated to lean into the directions of the prevailing wind. As the wind passes through the different lengths of pipe, it plays different chords. Each time you sit under the tree, looking out through the wind, you will hear a different song.

Figure 14. 3d model of structural form of the Singing ringing tree (Source: http://www.midpenninearts.org.uk/panopticons-singing-ringing-tree)

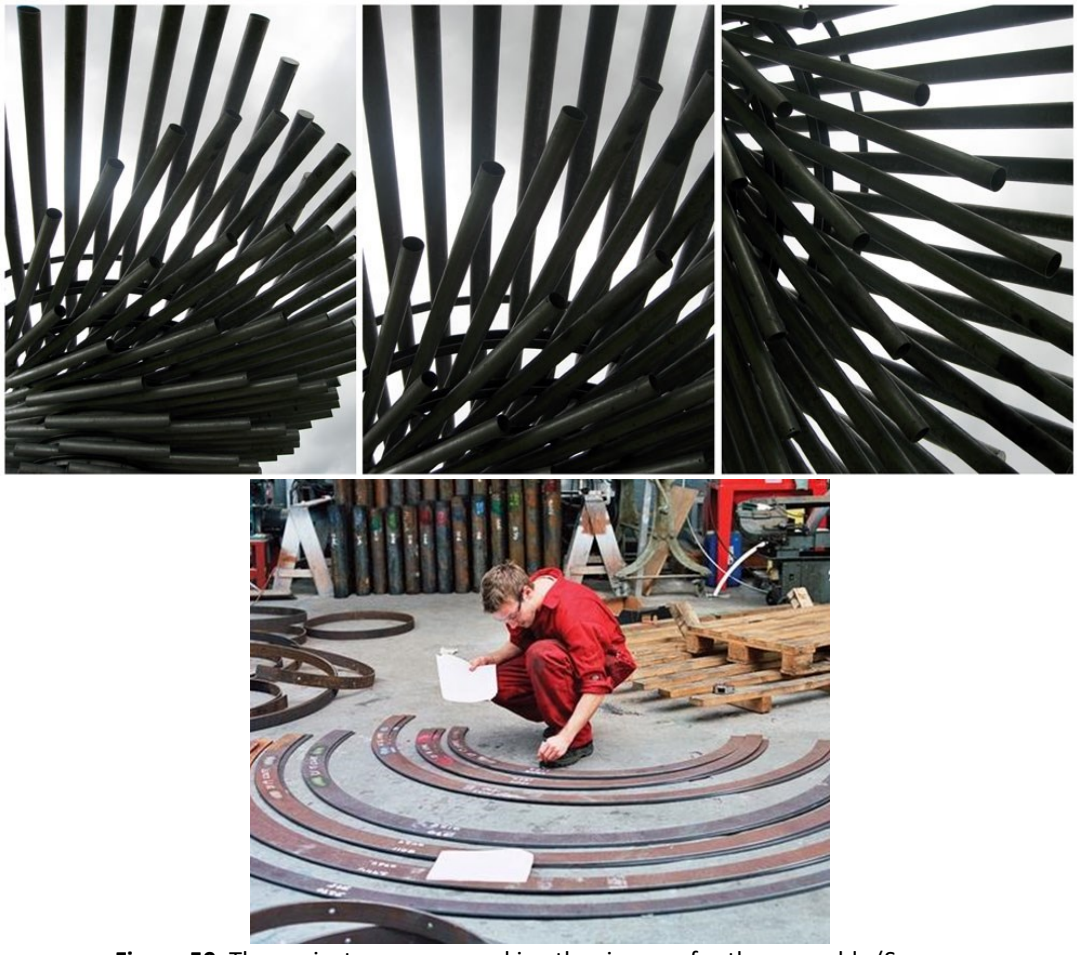


Figure 50. The project manager marking the rings up for the assembly (Source: http://www.midpenninearts.org.uk/panopticons-singing-ringing-tree)

7.7 Case study 7

Sea Organ - musical instrument played by the sea

Location: The sea organ is in the Zadar, a city on Croatia's Dalmatian coast, is known for te Roman and Venetian ruins.

Figure 51. Location of Sea organ in the town of ZADAR (Source: http://monplan.info/plan-de-zadar-2/)

Project:

The musical Sea Organ (morske orgulje) is located on the shores of Zadar, Croatia, and is the world's first musical pipe organs that is played by the sea. Simple and elegant steps, carved in white stone, were built on the quayside. Underneath, there are 35 musically tuned tubes with whistle openings on the sidewalk. The movement of the sea pushes air through, and – depending on the size and velocity of the wave – musical chords are played. The waves create random harmonic sounds. This masterpiece of acoustics and architecture was created by expert Dalmatian stone carvers and architect Nikola Basic in 2005, who recently received the European Prize for Urban Public Space for this project. Many tourists come to listen to this unique aero phone and enjoy unforgettable sunsets with a view of nearby islands. Famed director Alfred Hitchcock said that the most beautiful sunset in the world can be seen from precisely this spot on the Zadar quay Given that the uppermost horizontal edge of the corridor contains all along towards the seaside dense flanking apertures, this is the only passage for sound to emanate. It was estimated that by action of the waveguide a maximum of 10 pipes (2 chords) can be heard on a spot. With the operating frequency band chosen only the highest-pitched pipe sounds will radiate towards the sea. Most of the sound spectral contents will be heard not only at the scalinade but at margins of the nearby park and houses. We estimate that the SPL at the nearest house (55 m) will not surpass some 35 dBA in 90% of total time. If sound annoyance would be registered during the first period of operation the measures shall be taken to reduce the SPL. Three solutions to such a problem are envisaged: 1) by reducing the hydraulic pressure in the entry tubes, 2) by choking up a certain percentage of apertures, 3) by adequate damping the interior of the enclosure. The right measure or a combination thereof will be

decided upon after a suitable period of monitoring. (http://everwideningcircles.com/2015/11/14/sea-organ-croatia-public-space/)

Figure 52. Organ with its holes at its edges and the water splashing at the holes (Source: http://croatia.hr/en-GB/Destinations/Town/Zadar/Dalmatia-%E2%80%93-Zadar-Sea-Organ-and-Greeting)

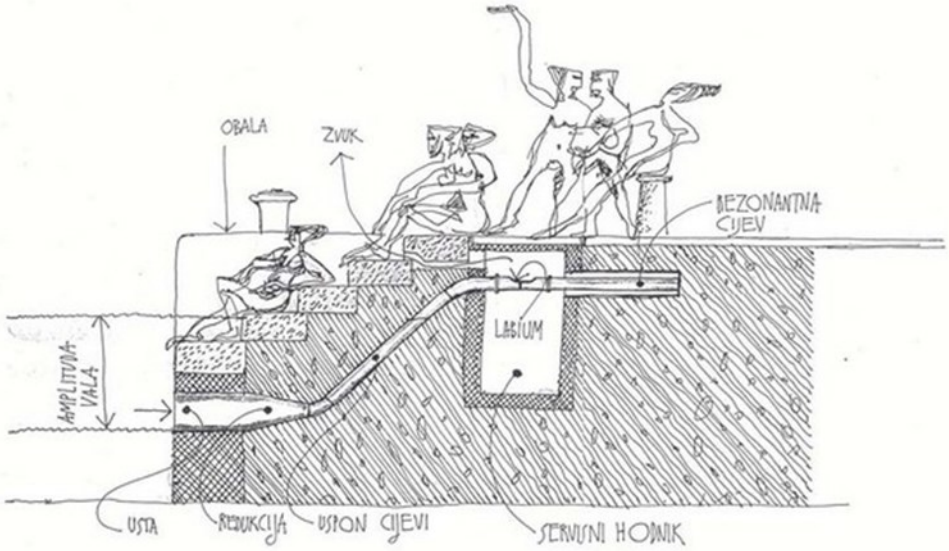


Figure 53. Architect's schematic sketch of the working of the sea argon and the activities that can happen at that space

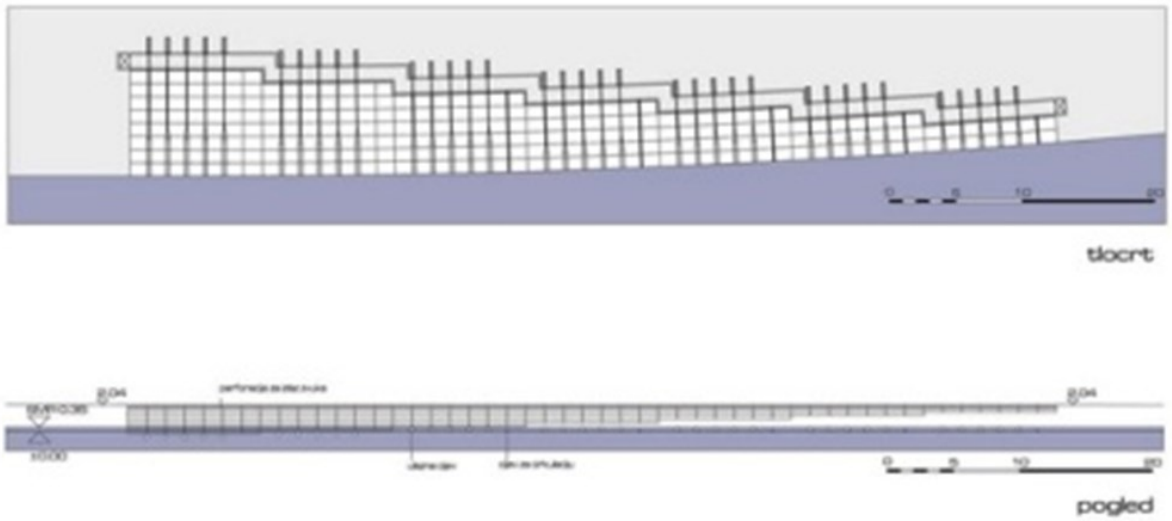
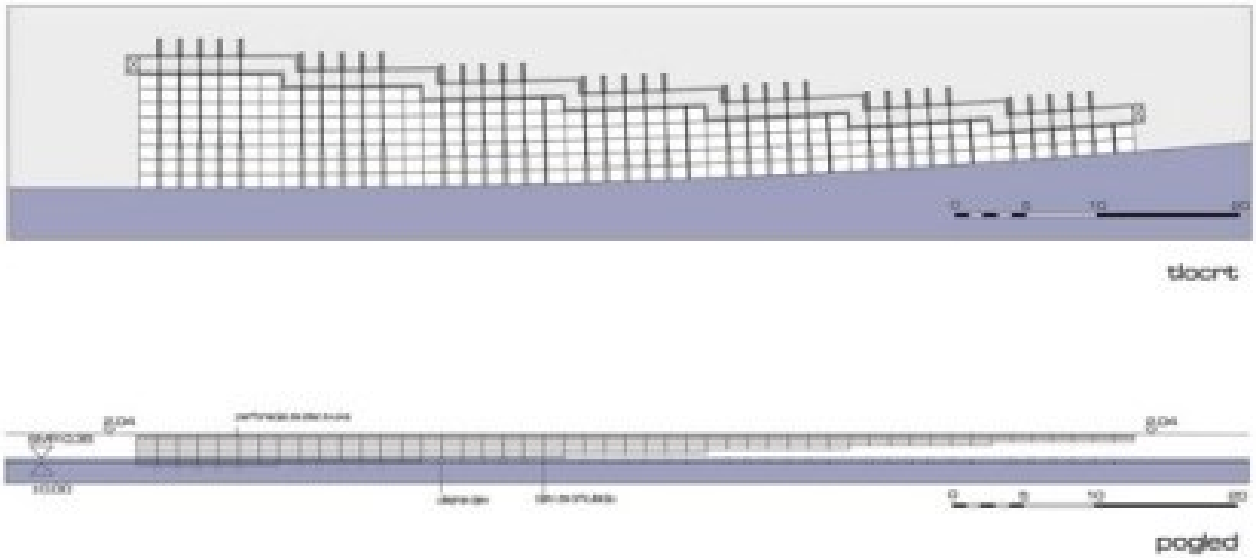


Figure 54. Plan of the Sea argon (Source: http://www.croatia.org/crown/articles/9359/1/nikola-baiae-author-of-the-zadar-sea-organ.html)



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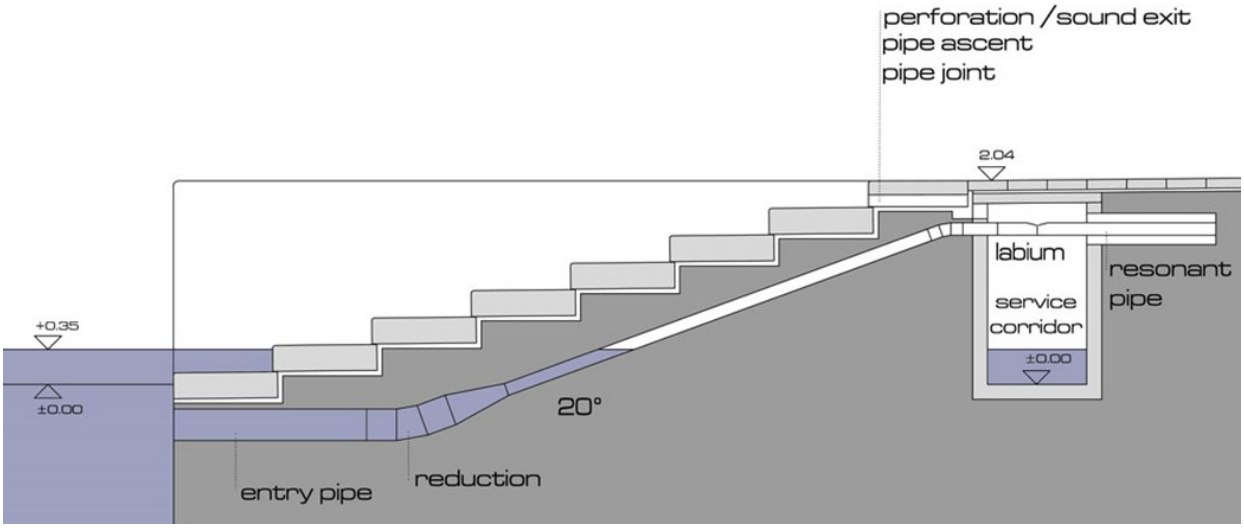

Figure 55. Basic section showing the passage of water through the holes and move the sound joint. (Source: http://www.croatia.org/crown/articles/9359/1/nikola-baiae-author-of-the-zadar-sea-organ.html)

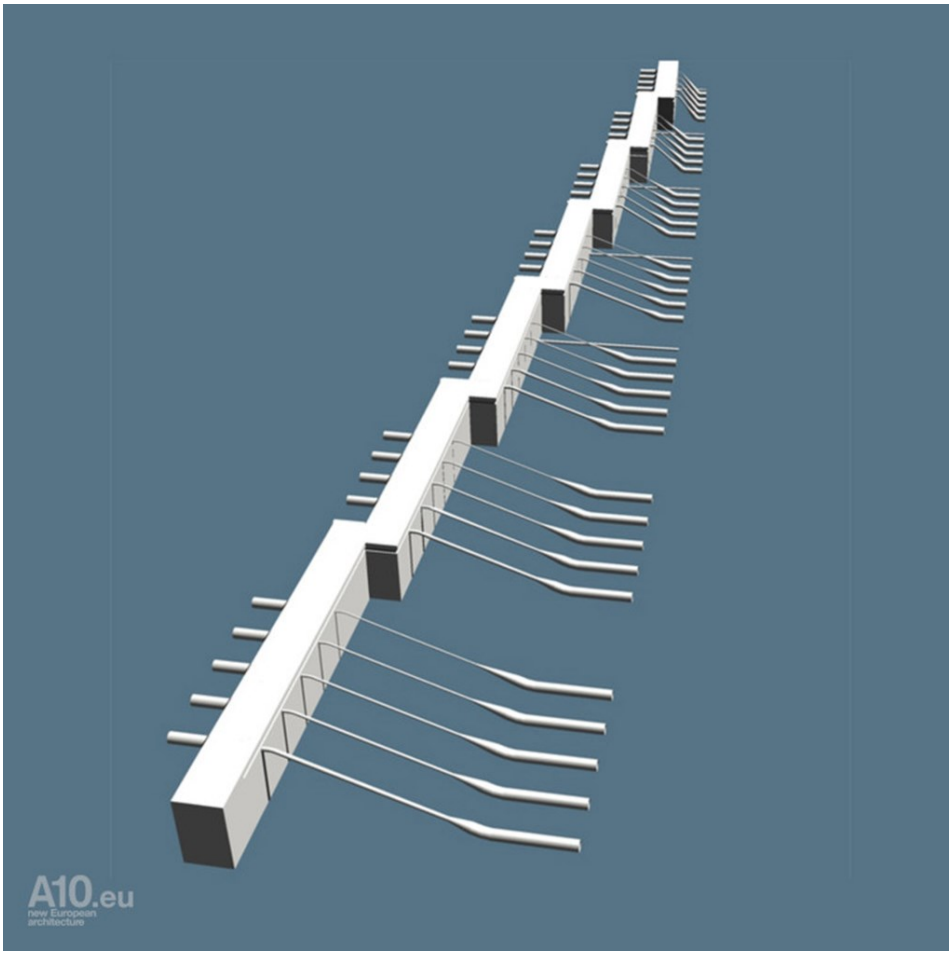

Figure 56. Sound joint incorporated inside the sea argon (Source: http://www.croatia.org/crown/articles/9359/1/nikola-baiae-author-of-the-zadar-sea-organ.html)

Figure 57. Activities that are happening along the length of the Sea argon (Source : http://www.croatia.org/crown/articles/9359/1/nikola-baiae-author-of-the-zadar-sea-organ.html)

8. Conclusion and Policies

- Sound should be identified as a measure of sensing the ecological sensitivity and the happening of the systems.
- Ecologically sensitive zones should be conserved and preserved the local fauna to come, habitat and survive in that area.
- As a part of the eco-friendly development of these natural landscapes, species of selection should be native specific than exotic.
- Various urban developments which are a part of city's expansion should be kept in check so that the aftereffects on the ecological conditions can be reduced.
- Natural water bodies are to be developed wisely and ecology friendly, with encouraging sensible activities and helping one to experience the beauty of sounds of water, yet without dominating or disturbing these areas with the sounds of vehicles and other machinery.
- Activities creating loud noises near to the ecologically sensitive areas should be controlled or kept in check to not to disturb the communications of the fauna that is residing in those areas.
- Welcoming nature into the urban context is equal to welcoming the sounds of nature into the cities.
- Encouraging the plantation programs and policies will bring the sounds of birds, winds and leaves into the urban areas and resulting in a great experience of sounds of nature.
- Techniques and policy checks which can reduce the noise levels in busy city environments which cater to the noises of vehicles, factories, loud music etc, will surely let the muted voices of the nature to raise.
- Incorporating landscape design ideas in urban areas like giving a water feature, a chabutra, various trees, etc can be done to create a point of interest in these busy areas.
- Architectural or artistic installations that can use natural elements like wind, water etc and create musical sounds can be another way of creating soundscapes in the cities.

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