

# Listening To Ecological Interference: Renewable Technologies And Their Soundscapes

## Linda O Keeffe

Lancaster University LICA  
United Kingdom  
l.okeeffe@lancaster.ac.uk

### Abstract

(This proposal is linked to an art proposal for the conference)

The sounds of modernity are increasingly moving into natural habitats. With an influx of new technologies designed to utilise and extract material from nature, the natural soundscape is becoming masked by the mechanical and technological. This article addresses an experience of listening and recording which took place in the summer of 2015, within two different natural landscapes: the southern region of Iceland and the north eastern region of Spain. The field trip exposed a significant keynote sound within each space; a sound produced by renewable technologies. The sounds produced by these technologies, wind farms and hydroelectric power stations, were significantly louder than had been expected. This led to an analysis of whether the soundscapes of environmentally friendly technologies can or should be critiqued, even if they have a demonstrable impact on the ecosystem.

### Keywords

Acoustic ecology, field recording, soundscapes, sound art.

### In search of a clean sonic terrains

In June of 2015 I was part of an audio field-recording group that visited the southern region of Iceland. One of the primary goals for most of the recordists was to document the natural soundscape, hopefully absent of man-made sounds. Iceland, with its vast uninhabitable landscape and small population, less than half a million people, is considered one of the few remaining landscapes to escape the soundscape of humanity. This can mean greater opportunities for recording a clean sound. Because of its harsh environment, long dark winters, live volcanoes and arctic temperatures most areas within Iceland are uninhabitable. This means that the landscape and by definition, the soundscape, remains untouched by human sound. A single sound produced by an animal can travel great distances without the masking effect of industrial or mechanical sounds. The ability to record in great

detail for example, a particular bird sound is made possible by this relative quiet. During the field trip the group recorded an immense variety of sounds from birds within forests and marshes, to the gurgling, hissing and bubbling of sulphur pools, the explosion of sound from geysers, and the sounds of floating icebergs. One of the most interesting animal sounds recorded on the trip was that of the Common Snipe; when it flaps its wings the sound is almost mechanical. I had never heard such an odd sound in nature and in my quest to document this sound I was confronted with the emerging technological soundscape infringing on the Icelandic landscape.

Within the recording it is possible to hear the faint sound of a car traversing the landscape, a sound that during the period of recording was increasingly difficult to ignore. A growing frustration developed within the group during the 10-day field trip as we tried to find natural habitats removed from a human presence. It became clear that escaping from the soundscape of humanity, without venturing off normal routes or working during the night, was almost impossible. Vast roads have been built in Iceland to traverse great distances to deliver goods and people all over the country. These roads flow between the mountains, volcanoes and glaciers bringing tourist coaches, trucks, cars and farm machinery to various spaces. When recording, if a car appeared on the horizon it was heard long past its disappearance from view. As Iceland has turned its economy towards tourism as a way to overcome the severe economic crash it experienced in the 2000s, more of the sites once seen as inaccessible, such as sulphur mountains, craggy volcanic rock areas and vast marshes, are now crowded with tourists, see Figure 1.



Figure 1. Tourists capturing a waterfall

This meant that some of the field recordings took place at night or during the early hours of the morning to escape these crowds. On one particular field trip the majority of the recordists chose to work only with hydrophones by a lake of floating icebergs, this was as a result of powerboats running throughout the day bringing thrill seeking tourists out on to the water, see figure 2.



Figure 2. Recording ice floats with hydraphones

### Technological interference: the sound of nature harnessed

In Iceland one of the greatest use of its natural landscape is hydroelectric power. With many vast rivers and waterfalls it is an immense natural resource. In comparison to oil or gas companies the ecological impact is minor. These power stations sit above and deep below the land, with massive engine rooms turning powerful fans, producing electricity. A visit was arranged which allowed the group record the soundscape of the station. Inside there were four levels each going down deeper into the earth. At each level the sound became louder and on the lowest floor, where the river was harnessed the sound of the water was intense, producing a physical pressure within the ear, see figure 3. After several hours of recording within this space the sounds began to affect several of the recordists, with some forced to leave the building.

Outside the station the sounds were faint, but beneath our feet the wave propagation produced by the turbines was travelling through the land and the river.



Figure 3. Inside the hydroelectric power plant



Figure 4. Recording the river outside the power plant

Before entering the station the sounds heard seemed subtle, gentle even, increasing the impression that this form of energy production must have little or no impact on the acoustic sphere. However, after travelling through the depths of the station, and experiencing the physical and audible impact of the sounds produced within, it was impossible to ignore the potential for these sounds to impact on subterranean or underwater ecosystems. Low frequency sounds have the potential to travel through objects and surfaces (Howard & Angus, 2009) and are known to cause physical reactions (Stocker 2002). After placing a hydrophone in the river outside the station it was possible to hear the constant low rumble of the turbines as they harnessed the river, see figure 4.

Researchers have suggested that oceanic and river environments are acoustically under threat. Helmreich (2011) and Stocker (2002) argue that oil drilling, factory fishing, and pleasure boating produce anthropogenic noise, which they counter, must affect marine life. Stocker has highlighted the biological importance of sounds produced by underwater creatures, suggesting that sounds produced by various underwater life forms are

necessary to their survival. Any sound, which masks or disrupts their ability to communicate, could damage an ecosystem. To date there has been little investment in ecological studies or programs to determine scientifically what the side effects may be. In part, one could argue that because the eco system and soundscape of the ocean is invisible and inaudible to humans, it has been easy to ignore the underwater soundscape.

For the recordists the soundscape of modernity was an intrusion into the natural habitats we wanted to document; these sounds masked our ability to record the unique sounds of Iceland. Yet hours were spent documenting the various frequencies of the power station, using a range of microphones. The varying mechanical and electrical sounds were beautiful in their own way. In fact one trip made was to record a large electrical power line using piezzo contact microphones. It is this contradiction that faces sound artists, field recordists and acoustic ecologists. Our fascination with sound in all its forms means that we also have a greater understanding of the fragility of certain soundscapes. It was during this trip that I began to question the logic of a sound artist documenting all potential sounds while critiquing the infringing soundscape of humanity.

In July, following the trip to Iceland I travelled to the Spanish Terra Alta region, the purpose of which was to record a contrasting soundscape to that of Iceland. Following from the Icelandic trip, the recording focus for Spain altered. Instead of trying to locate natural soundscapes removed from human sounds, I wanted to document where and how human sounds were interfering or interacting with the natural soundscape.

### **The Terra Alta soundscape July 2015**

The Terra Alta region of northern Spain is a vast mountainous area. During the summer the high temperatures parch the landscape, riverbeds dry up and fallen leaves and branches quickly turn brittle. The field recordings took place primarily around the village of La Fatarella, a municipality within the region of Ribera d'Ebre in Spain. The surrounding area consists of Finca's (A piece of rural land, which typically has a farmhouse or cottage present); the landscape, though rocky and dry allows farmers to produce crops of olives, almonds, grapes and cherries. During the day crickets dominate the soundscape, see figure 5, only slowly disappearing as the cool of the night sets in. At night swallows come out in their hundreds flying around the rooftops of the village producing high pitched cries. Throughout the day one hears the sounds of various vehicles, as they ascend the mountains, the boom of planes flying overhead and

occasionally the sound of a tractor on a piece of farm land. While recording the soundscape of this area there were few opportunities to document a sound absent of man-made sound. Instead, my approach involved listening first to the sounds, engaging with a form of embodied listening where one tries to interpret what role the sound plays in the environment.



Figure 5. Recording a cricket on a bush

### **Listening with intent**

When training as a deep listener with Pauline Oliveros (2005) in 2009, I discovered that there are different modes of listening: passive and active, or directional and focused. Similar to sight, one can focus in on sound; one can also tune sound out, either to deal with monotonous sounds or loud sounds (Ronayne, McDonald, & Smith, 1981). The overriding issue when recording environments for later listening/viewing is how memory and experience might interfere with our interpretation of the experience. Interpretivists contend that it is the experiential moment that is important, but a recording is only an indication of what sounds were in the space at a given time. In recording this space it was necessary to step back from the technology and instead pay attention to the entire sensory moment. The recording technology became an extension of my listening experience (Ihde, 2007), but it was necessary to not make it the only process by which I was documenting the space. This meant that the experience of listening and documenting became an embodied experience, whereby the sounds, sights and smells shaped my use of and experience with the space. I chose not to exclude any sound and instead interpret in what ways for example technological sounds transformed the natural soundscape.

In the last ten years a new sound has emerged within the surrounding region, the sounds of hundreds of wind turbines, see figure 6. These technologies used for harnessing wind power now shape both the visible and audible space of this region.





Figure 6. Wind turbines near La Fatarella

During the day, from a distance, these monolithic objects seem silent as they turn with the wind; at night their presence is made visible by a ring of red lights flashing on and off to warn pilots. Up close the sound of the turbine is a constant whush, whush, changing when the wind changes. As the blades turn they also momentarily darken the landscape covering and interrupting the ecology. They sit within a vast sensory space of smells, sights and sounds, most of which have evolved over time to fit together. The only other sound to match the mechanical nature of the turbines is the repetitive chucka, chucka, chucka of the crickets. However, unlike the turbines, the crickets respond to other sounds, going silent when for example, one walks close by. Yet the contradiction of the turbine is that it too has been constructed to respond to nature, only moving when there is a wind.



Figure 7. Recording the wind turbines. La Fatarella Spain 2015

Whitehouse (2015) would contend that within nature there is a call and response soundscape, where each sound fits within a bandwidth, and occupies "a distinct sonic niche" (Whitehouse 2015:57). This niche has evolved over tens of thousands of years and contain what Krause calls the biophony - the sounds of animals, plants and organism, and the geophony - environmental sounds such as wind, rain, waves etc. Yet the

whush, whush of the turbine is neither calling nor responding to the soundscape of this ecology, it is the anthrophony - a human made sound. It has no particular place within the natural spectrogram. It is tapping into the wind and turned by the wind but it is not in conversation with this space. However, this form of technology is ecologically friendly. It is an attempt to change the way in which humans extract power from the land; it does not burn, visibly pollute or damage the ecosystem. However, Recent studies have suggested that hundreds of birds and bats are killed every year by turbine blades, creating "population sinks" (Drewitt & Langston, 2006). Since 2008 there has been a massive increase in the presence of wind turbines in this part of Spain (Ariza-Montobbio & Farrell, 2012), but there has been no study on the impact these renewable energies have on the natural soundscape. Anecdotal stories have emerged from within the local population of a drop in bird sounds, where the turbines cluster. This may signal what Carson (2000) called the "silent spring", where man's poor management of the land will lead to a silencing of the natural soundscape.

Paradoxically, as a sound artist it was easy to be captivated by these objects. Similar to the hydroelectric power station, the sounds produced by the turbines were beautiful, from the sounds of the mechanics inside as they turned the turbines in response to wind directionality, to the whirring of the blades. They provided an interesting and odd contrast to the nature sounds of the area, see figure 7. It gave rise to various conceptual ideas for art works, installations, performances etc.

My concern for the soundscape of this space was in competition with a fascination of the sounds produced by the turbines. This was also true of the sounds produced within the hydroelectric power station in Iceland. Composers and sound artists have been fascinated with the sounds of technology since the introduction of mechanical and electric objects (Russolo, 1913). This has sat alongside growing concerns about how these sounds are bad for public health and damaging to the natural environment (Bijsterveld, 2004; NOISE.europa.eu, 2011; Thompson, 2004). Acoustic ecologists argue that mechanical and industrial sounds, within the natural world, are a form of noise and should be treated as a threat to the natural soundscape (Anon, 2007; Stocker, 2002). However, it is difficult to be critical of technologies when there is "a moral imperative to urgently establish a 100% renewable electrical system" (Ariza-Montobbio & Farrell, 2012).

A study conducted by the musician and ecologist Krauss (2012) explored how sustainable forestry (a goal where forests are expected to be managed to maintain biodiversity while

simultaneously meeting the needs of man) actually depleted animal populations. These interventions are considered ecologically sound; they include reforestation programmes of woodlands, where the wildlife forestry organisations argue that in replanting trees after cutting, they are maintaining the wildlife diversity. Krause's research found that while the visual elements of the natural landscape seemed materially unchanged the soundscape dramatically altered. Over a period of decades he recorded a drop in the sounds of birds and mammals within a particular forested area of San Francisco. Krauss discovered, through years of active listening and recording, that the animal soundscape was slowly disappearing because the ecosystem were constantly transformed through logging. His work has not been formally recognised as proof of an ecological impact, because subjective listening, is difficult to verify. Researchers have suggested that this period of history, known as the anthropocene<sup>1</sup>, is a period in which man's interventions into nature have the potential to not only alter the soundings of animal life, but to produce a profound shift in our relationship to the natural world (Steffen, Crutzen, & McNeill, 2007).

## Conclusion

A series of questions emerged as a result of the two field trips and from writing this paper. A key question was, how as a sound artist can I tackle issues such as noise in the natural world, whilst simultaneously finding the soundscape of technology fascinating? It is difficult to reject a sound or define a sound as negative or noisy. Working with sound means dealing in personal subjective aesthetics. It was however, hard to ignore how the soundscape of environmental technologies might interrupt and even interfere with a natural ecosystem, potentially masking, reducing or even removing certain sounds over time. As someone who has engaged with sound from a sociological perspective, I understand how important subjective listening experiences are to both individuals and local communities. The transformation of a space and the subsequent loss of a keynote sound can alter people's relationships to a space (O Keeffe, 2014, 2015), particularly older people. Yet research has found that over time new generations adapt to, and form connections with or adapt to emerging technological soundscapes (Bull, 2000; Ihde, 2007). The study of natural ecosystems is however, new to this researcher.

During the trip to Spain the sounds of the turbines began, over time, to feel less like an intrusion and more like a new part of the soundscape. These tall metallic structures seemed to dominate less, and through sheer numbers become a part of the landscape and soundscape. Yet they must in some way interfere with the natural soundscape, whether this is through the killing of birds and bats, or the cyclical rotation of sound and shadow that masks the surrounding space as the blades turn. One then wonders how can an ecosystem respond to such an object in its space. Humans adapt to, and interpret all sounds differently from an individual to a community level. However, within nature, should we expect the biophony to adapt to man-made sounds?

## Bibliography

- Anon. (2007). Marine mammals and noise: a sound approach to research and management, *a report to congress from the marine mammal commission*. USA.
- Ariza-Montobbio, P., & Farrell, K. N. (2012). Wind farm siting and protected areas in catalonia: planning alternatives or reproducing "one-dimensional thinking"? *Sustainability*, 4(12), 3180–3205. <http://doi.org/10.3390/su4123180>
- Bijsterveld, K. (2004). The diabolical symphony of the mechanical age: technology and symbolism of sound in european and north american noise abatement campaigns, 1900-40. In L. Back & M. Bull (Eds.), *The auditory culture reader* (1st Edition, pp. 165–190). Oxford, England: Berg Publishers.
- Bull, M. (2000). *Sounding out the city: personal stereotypes and the management of everyday life*. Oxford; New York: Berg.
- Carson, R. (2000). *Silent spring* (New Ed edition). Penguin Classics.
- Drewitt, A., & Langston, R. (2006). Assessing the impacts of wind farms on birds. *Ibis*, (148), 29–42.
- Helmreich, S. (2011). Underwater music: tuning composition to the sounds of science. In T. Pinch & K. Bijsterveld (Eds.), *The oxford handbook of sound studies*. USA: Oxford University Press.
- Howard, D. M., & Angus, J. (2009). *Acoustics and psychoacoustics*. USA: Focal Press.
- Ihde, D. (2007). *Listening and voice: phenomenologies of sound*. USA: SUNY Press.
- Krause, B. (2012). *The great animal orchestra: finding the origins of music in the world's wild places*. London: Profile Books.
- NOISE.europa.eu. (2011). *NOISE.europa.eu*. Retrieved July 21, 2011, from <http://noise.eionet.europa.eu/>

<sup>1</sup> A term defined by Paul J. Crutzen and Christian Schwägerl.

O Keffe, L. (2014, October 2). (Sound)walking through Smithfield square in Dublin [Soundstudiesblog]. Retrieved from <http://soundstudiesblog.com/2014/02/10/soundwalking-through-smithfield-square-in-dublin/>

O Keffe, L. (2015). Memories of sound: socioeconomic, community and cultural soundscapes of Smithfield, Dublin from the 1950s. In *Auditory Culture Reader* (2nd ed.). United Kingdom: Berg.

Oliveros, P. (2005). *Deep listening: a composer's sound practice*. USA: iUniverse, Inc.

Ronayne, T., McDonald, N. J., & Smith, H. V. (1981). *Noise, stress and work*. Co Dublin: The Foundation.

Russolo, L. (1913). Russolo: the art of noises. Retrieved from [http://120years.net/machines/futurist/art\\_of\\_noise.html](http://120years.net/machines/futurist/art_of_noise.html)

Steffen, W., Crutzen, P. J., & McNeill, J. R. (2007). The anthropocene: are humans now overwhelming the great forces of nature? *Ambio*, 36(8), 614–621. Retrieved from <http://www.jstor.org/stable/25547826>

Stocker, M. (2002). Ocean bio-acoustics and noise pollution: fish, mollusks and other sea animals' use of sound, and the impact of anthropogenic noise in the marine acoustic environment. *Soundscape*, 3(2).

Thompson, E. (2004). *The soundscape of modernity: architectural acoustics and the culture of listening in America, 1900-1933*. Cambridge, MA, USA: The MIT Press.

Whitehouse, A. (2015). Listening to birds in the anthropocene: the anxious semiotics of sound in a human-dominated world. *Environmental Humanities*, 6, 53–71. Retrieved from <https://doaj.org>

## Biography

O Keffe is a lecturer in sound studies at the Lancaster Institute for the Contemporary Arts, Lancaster University. She works as a sound artist and has created work for public installation, gallery exhibition, radio, dance and theatre. She is currently working on two sound projects, which explore gender issues in sound technology, and post colonialism in Ireland and Australia.