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Reverberations and Post-War Trauma: the Sustained Aftermath of Aerial Strikes on Lebanon in 2006

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ABSTRACT

This paper explores sound at the intersection between urban environments and conflict, specifically extracted from a particular case of aerial bombardment that occurred during the 2006 war on Lebanon. To formulate an argument on the long-lasting and traumatic sonic repercussions during military operations; sound studies and architectural environments would coalesce to unearth the unseen, yet extremely sensed assaults during this war. Here, I look at Reverberations as the product of both sound and the built surrounding, where it operates as a method to read the subtle, extended yet affective impacts of contemporary military conflict. I therefore argue that the initial impact's sound is rather bypassed, and the auditory focus shifted on its tail as a sonic phenomenon that is amplified and channelled by the urban morphology. This research relies on multiple analytical, theoretical, and practical resources spanning from spectrograms to sonic mapping. Those means serve to illustrate the behaviour of sound during conflict in a compressed urban environment. Paired with its cognitive and visceral responses, this method offers greater accounts on the victims that weren't directly targeted by aerial assaults.

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Introduction: sustained impacts

At 2:35 p.m. on 13 August 2006, a series of blasts shook Dahyeh, the southern suburb of Beirut, Lebanon, as well as its neighbouring areas. On the same day, the 1701 United Nations' ceasefire resolution had been approved by both parties in conflict to put an end to the 2006 Israel-Lebanon war. Just before this agreement was implemented, and within a margin of two minutes, these very blasts, which totalled twenty missiles (Human Rights Watch 2007, 79), had flattened the Imam Al Hassan residential complex in the south of Dahyeh. The scale of the attack was justified by the Israeli Air Force as a firm response to Hezbollah's missile strikes on Israeli northern settlements, and to the suspected presence of militant officials in the basement of the targeted complex. Earlier that day, upon learning of the ceasefire, most of Beirut's and its suburbs' residents had rushed to their homes. For civilians that weren't physically harmed by the bombardments, the first indicator of a sustained impact was the extreme auditory repercussions caused by the consecutive missile strikes lasting for two minutes. The sonic shock from the complex's

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bombardment had travelled beyond the outskirts of the suburb to reach the capital; the diffused vibration of airwaves produced by the shelling's intensity was prolonged for a few long seconds after the event. This territorial migration and reflection of vibrations, known as the reverberation of sound, is a physical and ideological illustration of the conjunction between the slow and spectacular violence that shaped the 2006 war (Kazan 2018). American historian Emily Ann Thompson defines reverberation as "the lingering over time of residual sound in a space "(Thompson 2004 page?). It is a physical phenomenon, an inseparable component of a sonic event and a base for any sonic texture. Through this lens, a territory occupied by violence (Connolly 1994), escapes the regimes of legality when the occupier is as volatile as a dynamic sonic act.

South Beirut is considered Hezbollah's security quadrant – its bureaucratic and political stronghold – and was subject to widespread bombing and devastation throughout the duration of the thirty-four-day war, as most military manoeuvres from the Israeli side were aiming to debilitate the Lebanese party's missile and militant capabilities. Thirteen years later, the 2006 war still resonates in the confines of the southern suburb. Although its full extent remains elusive for psychiatry and its diagnostic standards, post-war trauma among civilians that witnessed hostilities was unfolded through the curious denial of the trauma's palpable, albeit latent condition. Denying and blurring trauma in this case is ideologically and politically explicit through Hezbollah's all-encompassing discourse on victory (Moghnieh 2015).

Sound's role in triggering intrusive memories among traumatised subjects is established on both practical theoretical grounds (Kardiner 1941; Van Der Kolk, McFarlane, and Weisaeth 2007; Daughtry 2015; Streb et al. 2017). Although building on this, my intervention does not aim at reinforcing or revisiting this notion. Rather, by using and restructuring these pre-existing findings through the lens of reverberations, I identify how the crucial entanglements between the sonics of aerial bombardment, urban geography and military ideology would delineate the structure of trauma. This interdisciplinary reading moves from the scholarship on the weaponisation of sound and acoustic violence (Goodman 2009; Parker 2019; Volcler 2013), to a sensorial, epistemic, and material understanding of reverberations as a chief component through which trauma is gauged during warfare. Although the links between post-war trauma and external shocks among veterans have already been shown, little has been done on civilians, of whom the most disenfranchised are often forced to remain within critical proximity to strikes.

This reasoning aims to contribute to multiple areas of sonic research and trauma theory: It aims at showing how the ramifications of military technologies – particularly the targeting operations – build an aftermath of hearing, perception and affect rather than strictly looking into these facets during warfare (Daughtry 2015; Birdsall 2012). Additionally, by illuminating the interactions between the extreme sonics of warfare and urban configurations, this research exposes the inseparability of these accounts during hostilities and violence. And lastly, this essay attempts to flesh out an ontology of reverb that transcends its sonic framework, bleeding into the aetiology of trauma and civilians' condition in the aftermath. This method will clarify the associations between explosive sound and psychological trauma, a formula that remains implicit (Daughtry 2015, 98). Through a theorisation on the event as an external shock through which trauma takes shape (Fassin and Rechtman 2011, 31), reverb as a method will serve to expound on the extended actualisation of the original event as a basis for understanding post-trauma

and its intertwinement with sound. As an event that engendered a singular sonorous paradigm, the assault on Imam Al Hassan complex contained multiple evidentiary dimensions that could be unearthed through different practices, such as sound maps, spectrographic analysis, and urban acoustics. To demonstrate how the sonic impacts of aerial strikes had invasively echoed in the auditors of Al Imam Al Hassan operation, I divided this research into three temporalities: The event itself, its reconstruction, and its prolonged aftermaths. From the bombardment to its aftermath through Dahyeh's reconstruction, the soundscape of each of these three temporalities resonated with the one preceding it. I argue that reverberation is a violence of low frequencies that migrates beyond the outbounds and instantaneity of a sonic event while contaminating the proximate environment.

Anomalous reverb

Seconds before the decay

Reverberation of sound is a witness to an architectural space; it portrays a sonic reaction that is generated when a signal gets reflected by the surrounding environment, engendering a large number of late reflections until it decays as it gets absorbed by the material around it (Figure 1). Indeed, those observations were made tangible through the pioneering work of Sigmund Exner, who theorised and engineered reverb calculations. Following these discoveries, architects adopting modernist agendas had dealt with reverbs as an impurity that ought to be eradicated (Thompson 2004). Since what mattered is a space with a signal-like clarity, sound – among other elements – was slowly separated from its spatial signature. It ended up defining reverberation as noise; dysfunction; or an anomaly of sound. Emily Thompson exposes here a paramount link between modern architecture and sound by referring to soundscape (Thompson 2004). Coined by Michael Southworth,

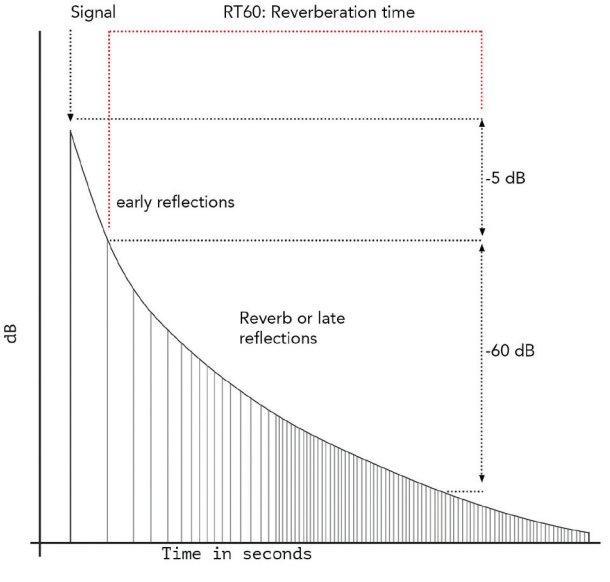


Figure 1. Reverb scheme. Courtesy of Author.

but later theorised on by R. Murray Schafer, soundscapes are the clusters of sound that dominate a given environment (Schaffer 1997, 7). Soundscape is thus an immersive sonic environment resulting from the infinite overlaps between acoustic sources and their effects. An operation, not only limited to reverberations but greatly influenced by it. Among the numerous uses of Soundscapes, Emily Thompson's reference to Alain Corbin rather than Schafer, aligns with multiple planes and connotations of an extreme sonic environment. For Thompson, soundscape is "simultaneously a physical environment and a way of perceiving that environment; it is both a world and a culture constructed to make sense of that world". (Thompson 2004, 1). According to her, it is not only dominated by sounds "but also the material objects that create, and sometimes destroy, those sounds" (Ibid: 1). Additionally, this immersive acoustic environment is attuned to and morphed by technology, whether military, industrial or the combination of both. In the genealogy on urban noise, Karin Bijsterveld underscores that this sonic immersion and listening cultures were meshed with rapid industrialisation. She elucidates how noise abatement societies were failing to predict noise levels and, therefore their mitigation, due to sonic anomalies, essentially prompted by urban reverberations (Bjisterveld 2017). In its military grounds, we decipher a merging factor between reverbs, space, and listening cultures. As framed by J. Martin Daughtry [reverberations of] sound exist in – and are defined by – surrounding structures, but they also infiltrate bodies through modulated vibrations. They trigger synapses to fire and get rendered into thoughts and emotions (Daughtry 2015, 189). Moreover, in the context of aerial bombardment, reverberations most importantly burgeon out of a shockwave's interaction with urban acoustics.[1] A reverberant environment of armed conflicts, where aerial strikes are predominantly operated, is a soundscape ridden by low frequencies. As these low frequencies travel the furthest, they are capable of reverberating within the confines of sheltered civilians. In tune with these sonic peculiarities, the case outlined in this paper, was an event where aerial strikes were maximised. Thereby generating an auditory paradigm, a condition where reverbs became prominent and prolonged.

The scope and breadth of the attack on the Imam Al Hassan complex was unprecedented, unveiling the intensity of the military strategy and brief behind this war, which targeted Hezbollah's leaders and other high-ranking officials. The party's leading figures, however, were largely protected by impenetrable layers of slabs under the southern suburb (Lambeth 2011, 22). Still, it was crucial for the IDF to destabilise Hezbollah's symbolic domination and infrastructure – political and otherwise – in the southern suburb. The Imam Al Hassan complex was a "star witness" to these military doctrines, with a total of eight buildings levelled to the ground. These buildings, which featured 240 residential units, were mostly deserted by their respective residents prior to the bombardment. The total number of casualties that resulted from the attack equalled thirty-six civilians and a mere four militants – a bewilderingly low figure, given the massive scale of the assault. The strategic asymmetry of this attack and its logic of psychological intimidation can be assessed by analysing the type of weapon that was deployed; the multiple facets of its impact; and the aftermath of such military tactics. This event's distinctiveness lies in the attack's magnitude, as well as in the weight and type of the bombs that were used. A Human Rights Watch report (Human rights Watch 2007, 77) determined that the eight, ten-story buildings were razed by twenty airstrikes, while a Hezbollah-affiliated news agency hinted at a "ground-penetrating weapon".[2] The essential drive behind the

use of such technology lies in the nature Hezbollah's underground bunkers that were buried under a thick layer – ninety to 150 feet – (Rand 2011: 191) of hard limestone structure. In order to counter this architecture, the IDF invested in a hundred GBU-28 missiles to reinforce their mission of eradicating Hezbollah's leaders along with their missile power. In the aftermath of the assault (Figure 2), one can identify and localise the extent of the damage, which reached subterranean levels, within the area of the complex. The buildings were razed all the way to the second basement. This was further confirmed earlier this year through an audio message recorded by a witness – who wishes to remain anonymous – from the field:

> "The first missile was the one that penetrated fortifications; after that, they sent a vacuum bomb, the kind that destroys a place without burning it . . . "

The witness describes the details of the GBU-28, a bunker buster with a thermobaric weapon. The use of a weapon capable of causing indiscriminate and monumental demolition, was a pivotal part of the implementation of a military doctrine formulated by the IDF Chief of General Staff Gadi Eizenkot, known as the Dahya doctrine. This doctrine supports the use of asymmetric warfare and disproportionate power, acting as a form of punishment to both the party and civilian infrastructure. As outlined by analyst Gabi Siboni from the Israeli Institute for National Security Studies, these inordinately violent military actions aim at breeding a paralysing aftermath, whereby reconstruction is rendered both difficult and costly (Siboni 2008). Incidentally, Hezbollah's extensive underground network catalysed the inception and implementation of Israel's new military strategies, which chiefly encompassed the use of the GBU-28 as the sole means to destroy the party's bunkers.

A few minutes after detecting the bunkers, twenty GBU-28 missiles were launched over the complex. Over a period that ranges between 50 and 70 milliseconds, the moment that each of these missiles exploded on the Imam Al Hassan complex (Figure 3) can be identified. According to Kinney and Graham, the sound of an explosion of one tonne of TNT in an experimental set-up was recorded as 235.3 dB (Kinney and Graham 2014). This measurement contains all the frequencies that cover the human audible range (20 Hz to 20 kHz), with the loudest frequencies ranging from 300 Hz to 5 kHz (Figure 4). When simulated on a noise map that draws a scaled prediction of this original impact emission,

Figure 2. Basement scheme. image credit to Khiyam.com.

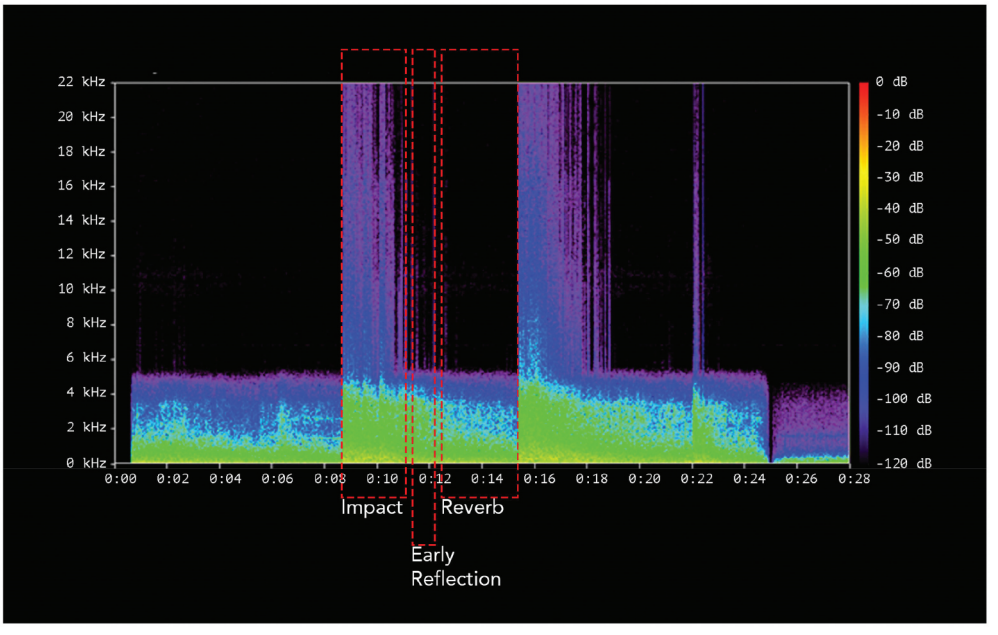


Figure 3. Bombardment spectrogram. Courtesy of Author.

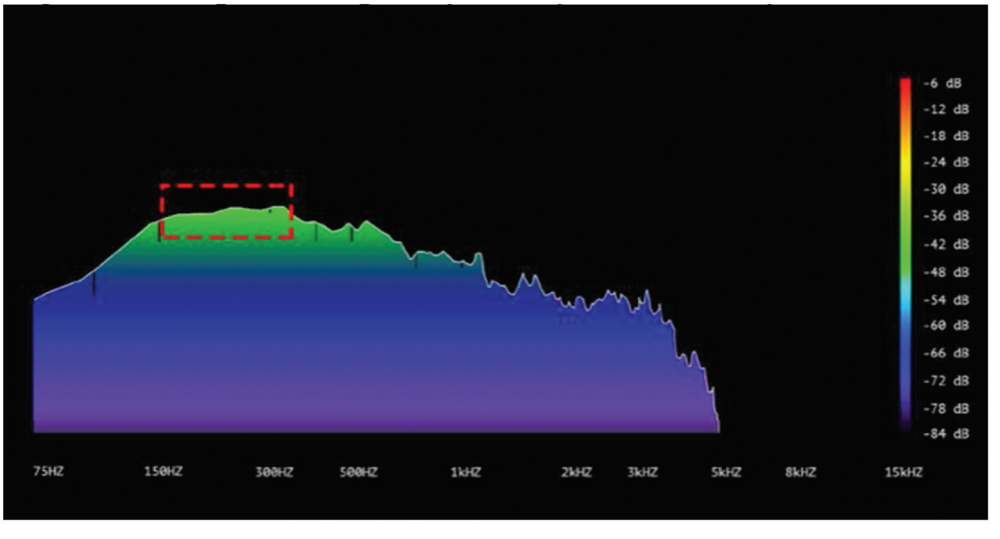


Figure 4. Impact frequency analysis. Courtesy of Author.

we can estimate the sonic range that was covered by this impact. Heard at 120 dB within a range of 5 km radius (map 1), this impact reverberated within the infinite number of points covered by this radius. For each point within this radius, an early reflection appears when this signal drops by 5 dB, followed by the biggest mass of late reflection when the signal drops by 60 dB from the original signal (Figure 3). For approximately five seconds, the bombardment's lowest frequencies reverberated with frequencies ranging from

150 Hz to 300 Hz, which is considered to be the loudest range (Figure 4). When amplified and spatialised, these frequencies are directly translated by their receivers' ears as a threat. As electro-acoustician and clinical neuropsychiatrist Seth Ayyaz Bhunnoo grounds it, the process of hearing can be divided into cochlear hearing and visceral hearing. While the former channels frequencies from the auditory pathways into the cortical structure to ultimately become transposed into meaning, the latter crosses different pathways that trigger an instantaneous physical experience (Bhunnoo 2017). The initial bombardment frequencies were most prominent between 300 Hz and 5000 Hz. These frequencies reverberated in such a way that the lowest among them were the most prolonged. What constituted the blueprint of the visceral hearing experience were thus the lower frequencies that got more extended over time. These low frequencies carry in them information on the early disturbances of affect. This information conveys within it an anomaly in the mechanism of a sonic experience. Such scientific and acoustic enquiries are theorised in the field of sound studies. Particularly where sound, loudness and affect are juxtaposed, a mode of hearing is imposed by the outcomes of military technology. This conjures multiple concepts that help unpack the peculiarities and effects of sudden traumatic auditory experience. James Parker conveys, "Cognitively, the sudden loudness of explosive sound heralds death and destruction. It speaks of one's own vulnerability as well as that of family, friends, colleagues and loved ones". (Parker 2019). Sound, like any other external stimuli, when charged with connotations of violence and aggression becomes one of the most salient catalysts for psychic trauma. Soundwaves in this context transports an event of violence from its space of occurrence into the listener's ears. It would be certain, as Juliette Volcler claims, that within military technological rationale, "the ear is a vulnerable target: you can't close it, you can't choose what it hears, and the sounds that reach it can profoundly alter your psychological or physical state". (Volcler 2013, 1) Daughtry labels this sonic reality as *Thanatosonics*, or the extreme wartime acoustic phenomenon. He resorts to Steve Goodman's Sonic Warfare, where Daughtry hinges on Goodman's affect-centred theorisation on sound. Goodman's account of the sonic extrapolates the processes through which vibrations tackle the physical, affective, and libidinal dynamics of bodies right before these vibrations are decoded by our cognitive faculties (Goodman 2009, 10). Throughout the multitude of emergent discourses within the affective turn (Clough 2007), affect in this context is conceptualized through its intersections with sound and later Trauma. While looking at its sonic repercussion, Michael Gallaghers states that "Affect involves any kind of body impinging on another body in some way that augments or diminishes the affected body's capacities to act" (Gallaghers 2016: 43). In the context of an event or a dimension of an event, Brian Massumi, expands on affect as being inseparable from the perception of shock (Massumi 2015: 53). Affect is examined here as bodily experience of shock that occurs following an abrupt sonic experience. One which modulates "sensory, emotional and symbolic multidirectional flow", as Andreas Philippopoulos-Mihalopoulos implies, it transcends beyond the physical and ontological containment within one's body and radiates over other bodies. (Philippopoulos-Mihalopoulos, 2015). When intersected with violent sonic overtones in a soundscape of aerial bombardment, listening invokes a mode of affective responses. This condition of reflexive listening (Tuuri and Eerola 2012) is concerned with startle reflexes. It is a state where the auditors' perception surpasses a conscious examination of the sounds themselves but instead surrender to bodily impulses. Like

instances of earthquakes, shocks are abruptly sensed following continuous bombardments. Parallel tremors between bodies and objects fuse the subjects with a crumbling material reality. Outlined by Steven Connor, symptoms following a sudden shock, trigger shakes:

> "Shaking belongs to a different universe or physical order from the universe of colliding solids announced by Newton. It belongs to a physical universe based on the principle of sympathetic resonance, in which substances and events reach into each other's hearts."(Connor 2015, 210)

Moreover, Gallaghers postulates that sonic affects unfold closely with the context in which they are exerted (Gallaghers 2016: 46). Limiting them to universal observations undermines multiple factors that are necessary to illustrate the aversive sonic effects and their traumatic implications during warfare. Affect and later trauma are fleshed out at the conjunction of spatial, acoustic, and psychoacoustic perception, where reverberation is a paramount contributor. Furthermore, as I will maintain in the next section, the correlations between sound and trauma are concerned with the location of the listener. Both physically and ontologically. These extreme acoustic phenomena affect subjects that own what Daughtry calls "the luxury of distance" (Daughtry 2014, 39). Subjects that are far enough from dying and getting physically injured, but close enough to absorb the traumatic effects of blastwaves and shockwaves.

Reverb as ubiquity: a Spatio-Sonic interpretation of Trauma

Jonathan Stern notes that "Depending on the positioning of hearers, a space may sound totally different. If you hear the same sound in two different spaces, you may not even recognize it as the same sound. Hearing requires positionality". (Stern 2012, 4). Reverberations' interaction with architectural configurations during conflict are observed and dissected here from their practical, and namely sensorial consequences during instances of Trauma. In other words, sound's role in the peritraumatic (which occurs during the traumatic event) is tangled with its spatial conditions. The *peritraumatic* experience of sheltered civilians is above all an irregularity in positionality during the experience of threat. These warfare auditors' incapacity to locate sound and discern distances, scales and proximity to violence is at the basis of an overwhelming experience of threat. In reference to Daughtry's concept of sonic omnidirectionality (Daughtry 2015, 45), sound possesses, among others, two fundamental and psychoacoustic material conditions: it is ubiquitous; and it leaks (Stanyek and Pietkut 2014; Daughtry 2015; Abu Hamdan 2018). The former, as defined by Augoyard and Torgue, is fused with – and lubricated by – the urban environment (Augoyard and Torgue 2014, 16), which has altered an important component in the nature of hearing: echolocation. Framed by Casey O'Callagan and Mathew Nudds, locating sound, as an evolutionary quality, is the most perceptive structure of auditory functions (O'Callaghan and Nudds 2009). Echolocation, and more so, sound localisation is contingent upon O'Callagan's assignment of sound as the "disturbance event"; this observation is contested by Augoyard and Torgue, since the urban environment has "compressed acoustic space and confused directionality, making it often difficult or impossible to locate sources". In parallel, when a sonic source is activated, sound moves in unpredictable directions that are different

from those intended. This "symptom" framed by Daughtry as a leakage of sound, equips sound with the potential of invasiveness where the material boundaries between the source, the listener, and their shelter collapse (Daughtry 2015, 171). Both leakage and ubiquity are intrinsic complementary accounts of reverberation.

In the seconds that followed the bombardment, before decaying and dissipating to the point of inaudibility, the impact signal got extended by being reflected through the surrounding urban environment until it reached the interiors of structures, reverberating inside of them. During this process, the sound that was leaking in an environment that debilitated the sense of directionality challenged the survival instinct of hearing threats, distorting the vital function of sound localisation. Listening to the reverberant environments of armed conflicts is delineated by Daughtry through what he terms *the resonant acoustic territories*. Most outstandingly here, explosive sound bleeds across three different scales of bodies, architectures, and topographies (Daughtry 2015, 201). They are unified following an abrupt overlap of reverberant low frequencies. This intensification of sound levels, under continuous aerial bombardment, characterises listening by loudness. Theorised by Michael Heller as the *listener collapse*, it "occurs when loud sound dissolves the ability to distinguish between interior and exterior worlds, especially regarding sound and self. Sound does not only touch, it saturates and fills mental and physical consciousness, eliminating the possibility of detached listening". (Heller 2015: 44). In addition to its capacity to vibrate and resonate body organs, sound's ubiquitous nature dismantles the secure edges between safe internal spaces and the deadly adjacent surrounding.

Within the field of trauma studies, the invasion of an internal safe space through ubiquitous and inescapable sonic volumes coincides with the etymology of trauma. Central to Catherine Malabou's theorisation on this subject matter, she maintains that the word trauma means "wound" and is also derived from the verb "to pierce". She deduces that Trauma defines the wound that emerges out of an "effraction" both physically and psychically. Which in that case, Trauma is thus understood as a "a shock that forces open or pierces a protective barrier" (Malabou 2012: 6). Also, within the sonorous environment of warfare, civilian auditors are stripped from their capacity to escape reverberations. This aligns with the psychiatric definition of a traumatic event as an "experience of an inescapable stressful event that overwhelms one's existing coping mechanisms" (Van Der Kolk and Fisler 1995, 506). In effect, reverberation contributes to the cementation of this shocking encounter primarily when it amplifies the perception of threat. Listening to threat as such coincides with multiple sonic registers: the startle invoked by a sudden loudness, the incapacity to locate the source, and the extension of omnipresent lower frequencies with their vibrations. Threat is considered here a main component that contributes to the materialisation of Trauma. Judith Herman reasons on threat as a phenomenon through which the sympathetic nervous system is stimulated, whereby the subject is forced into a state of alert (Herman 1997, 24). Witnesses of violence, at a critical proximity to hostilities, are anticipating death when a mass scale of consecutive aerial strikes is taking place. It is a state of heightened attention and focus on a devastation that is yet to reach them. This act of attention is

described in detail by Abraham Kardiner, as he defines the different psychological shapes of a traumatic injury. Attention and the adaptation to a continuously evolving environment induces a particular reading by Kardiner:

> "It narrows or focuses the field of consciousness and is accompanied by some muscular immobilization which can be considered a preparation for new activity consequent upon the new perceptions involved. The immobilization phenomena are most conspicuous in the case of auditory stimuli, less so with visual, tactile, olfactory, and gustatory stimuli." (Kardiner 1941, 74)

Scientific and acoustic scholarship established reverberations' role in distorting attention (Ruggles and Shinn-Cunningham 2011; Culling et al. 2003; Kidd et al. 2005; Darwin and Hukin 2000), supporting Kardiner's general observation on auditory stimuli and its feedbacks in the perception of a listening subject.[3] An infinite number of sonic reflections are in fact in this case multidirectional auditory stimulus, perceived by distressed witnesses as a pervasive threat. Through them, coping mechanisms are exhausted.

From another angle, Reverberations sketch a diagram of a traumatic experience. It is a sonic, yet illustrative method and process that unpacks the structure of Trauma. Reverberations as a delay of the initial signal is a depiction of the very process of trauma. In Cathy Caruth's account " . . . Trauma is not experienced as a mere repression or defence, but as a temporal delay that carries the individual beyond the shock of the first moment" (Caruth 1995). Looking at trauma during the 2006 war through the acoustic lens of Imam Al Hassan's bombardment, is primarily an examination of its aftereffects. It is a spectacular event around which the war was concluded. At least for the residents living in the southern suburb.

Abou Ahmad Bazzi, the owner of a shop that was located next to the Imam Al Hassan complex, reflects on the moment the explosion took place:

> "It was a terrifying moment; everything changed with it. The impact of the bombardment was so strong it deafened the ear. I have never heard anything like my whole life. Later, we learned that they had fired smart missiles. They sucked the air out the complex, then the buildings started to collapse like biscuits."[4]

Abou Ahmad is one witness among many to recall the horrifying event that has since been seared in the memories of Beirutis. On the day the bombardment took place, after the 1701 UN resolution had been approved, many residents made their way back to low-tension proximity areas to get ready to return to their properties and homes. Like Abou Ahmad, they didn't know that after this day, "everything [would] change". This disproportionate and low-precision attack reinforced a central aspect of the Dahya Doctrine: extended aftermath, and the kind of damage would plunge deeply in the neural circuits of the witnesses

Indoctrinated reconstructions

The solemn promise

After the ceasefire, multiple governmental and non-governmental organisation rushed to survey and quantify the razed and the damaged structures. Over 200 multi-story apartment buildings were substantially destroyed, resulting in large-scale displacement (Fawaz and Ghandour 2007).

Hezbollah had pledged to manage and rebuild the destroyed southern suburb through its predominantly Iran-funded Waad project, or The Solemn Promise. Lebanese Urban theorist Mona Fawaz argues that this was a necessary urban intervention that consolidated the party's territory and managed the space of their neighbourhood according to thorough political preconceptions (Ibid: 293). The operations targeting the reconstruction of the 243 destroyed or partially damaged buildings had been promoted by the party's secretary general to be executed in the shortest period possible. Certain elements of the "promise" prescribed the architectural design guidelines, insisting that the inception of the soon-to-be-built suburb would coincide directly with the "collective memory" of its residents, as outlined by one of the main architects of the project, Rahif Fayyad. In addition, this reconstruction portrayed the ongoing planning proposals that transposed the military conflict into a real-estate one, through property divisions and zoning into territorial confrontations between the different political parties that were battling during the Lebanese Civil War (1975–1990) (Bou-Akar 2012). Waad's (The Solemn Promise) ideological spectacle, however, overrode the aforementioned observation by militarising the reconstruction via two major aspects: a reconstruction that is repercussive of the type of military operations; and an architecture that anticipates an upcoming war (Kazan 2019). The Solemn Promise was unfolding as an urban planner's wet dream, so to speak, for it had ample potentials for new urban experimentations and spatial rectifications: it had a relatively high budget; a tabula rasa-like territory; a centralised power; and, above all, a subordinated population. Instead, apart from the urban planning investigations that explored the territorial and geographic paradigms that this project had led to (Al-Harithy 2010), both its militarisation and weaponisation were under-discussed. In line with Fawaz's observations, this project had cemented the party's institutionalised and militarised powers, whereby the reconstruction that took place within these measures and timeline were presented as an "act of resistance" and a "victory over the enemy" (Fawaz 2014, 931). As claimed by the party's executive board, she adds, that the reconstruction was a "strategy", implemented as a reaction to the military tactic of the IDF (Ibid: 931). Hezbollah had authorised a post-war urbanisation that visibly bounded its zones of power, which included a group that would solely benefit from its infrastructure and services (Ghandour and Fawaz 2007). In IDF's estimates, this territory, with all its apparatuses and popular base, is computed as a military target.[5] With multiple exchanges of threats unfolding between 2006 and now, the two sides are as prepared as ever for the next war. The *Great War*[6] as both sides term it, is in constant delay with several abrupt and limited clashes on the Lebanese-Occupied Palestinian borders.

Repercussive manoeuvres: exposed underground and lower reverbs

Contingent upon its ideological grounds, militarised construction had reproduced auditory traces that collide with the material conditions of the post-impact reverb. The use of the GBU-28 on the residential complex had imposed particular reconstruction methods, such as the instalment of coring and pilling setups to recreate the damaged foundations. Heavy demolition operations were utilised to eradicate structures that survived but couldn't be rehabilitated within the tight deadline of the project. One method to reassess these sounds that weren't recorded, is through Auralization techniques that are mainly

used by acousticians.[7] In line with imagery evidence (Figure 5), multiple pile driver vehicles were mobilised to drive steel poles into the soil. These structures would later serve to pour concrete into the complex's foundations. By simulating the pile drivers' impact sound in a crater-like exposed underground and its resulting reverbs, material conditions that overlap with the initial bombardment begin to surface (Figure 6). A peak of lower frequencies between 150 and 300 Hz appears on reverbs (Figure 7). Those frequencies are regenerated in a much more reduced intensity level in comparison with the bombardment reverb, though they carry similar sonic data to the post-impact reverb that the residents of the suburb had experienced during the attack on the Imam Al Hassan complex. In those given circumstance of the complex's surrounding, lower frequencies echoed and persisted the most, particularly following construction impacts. Residents of the proximate buildings who had returned to their properties the day of the ceasefire could easily recognise the sounds that had once signalled for them an imminent threat (map 2). These assumptions were supported by several psychiatric longitudinal studies made at least nine months after the war (Farhood et al. 2006, 2014; Karam et al. 2006, 2008; Fares et al. 2017; El Hajj 2021). One of them was conducted on public school students after the 2006 war (Karam et al. 2006); the study began in 2006 and was concluded in 2010. It corroborated that the occurrence of post-traumatic stress disorder (PTSD) was significant among students from high bombardment areas, as well as low-risk adjacent areas. In fact, nine months after the war had ended, tests using the third edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM 3) as a criterion showed that a staggering 35% of the subjects studied who lived in the targeted area presented symptoms of PTSD. On the other hand, 23.9% of the students living in areas that weren't subjected to any bombardments presented PTSD symptoms (Shaar 2013, 2) – a still rather high figure. These outcomes recall an IDF affiliate body, established in 2005, and responsible for conducting and managing psychological operations during the 2006 war. The MALAT (Mercaz L'Mitzaei Toda'a: The Centre for Consciousness/Perception Operations) is known to have invested in multiple psychologically targeted strategies during this war. From counterpropaganda to direct communication with Lebanese citizens, those modalities were utilised to crumble the popular base of Hezbollah (Schleifer 2009, 223). In congruence with Rand's report on this war, shaking Hezbollah's self-confidence was an essential aim that had guided the IDF's military strategies and the methods of combat (Lambeth 2011). Merged with the asymmetric tactic of the Dahya

Figure 5. Site image of pile driver. image credit to al-akhbar.com.

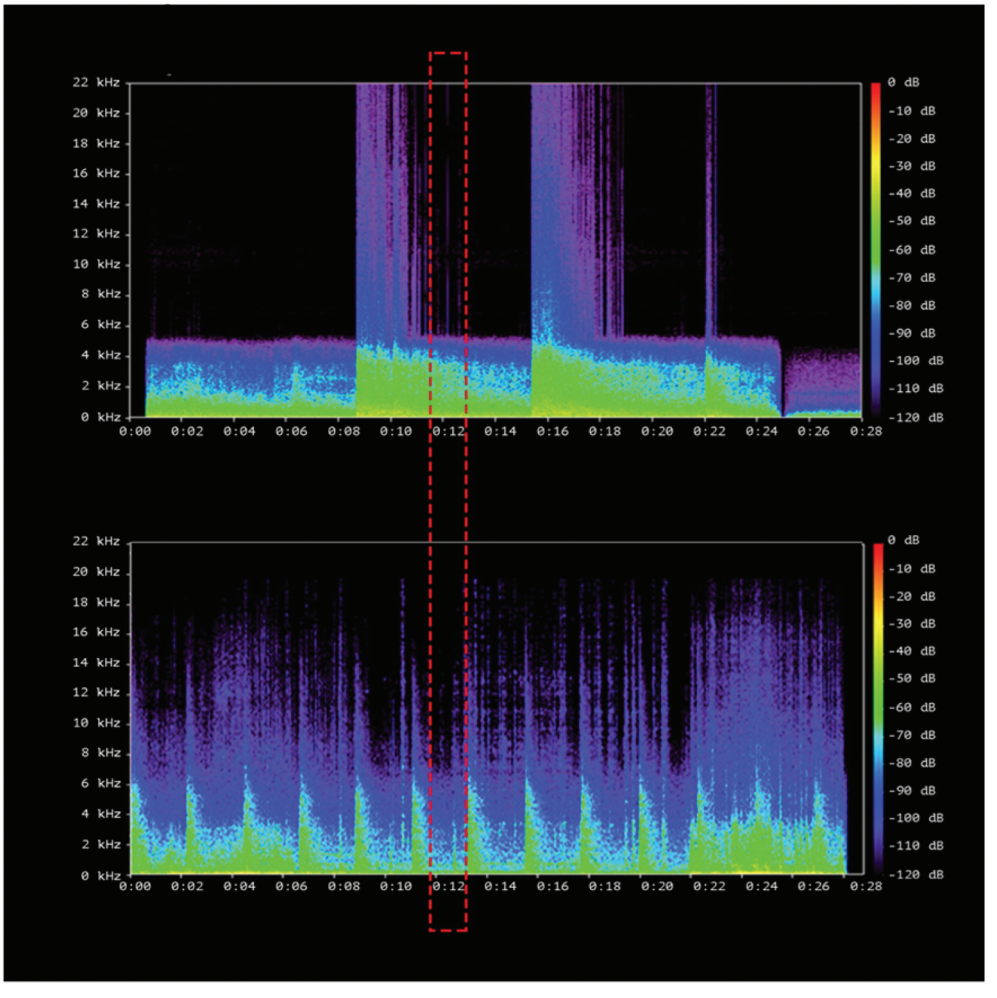


Figure 6. Spectrographic comparison between the bombardment and the pile driver. Courtesy of Author.

Doctrine, the psychological operations (PSYOP) had not succeeded in disintegrating Hezbollah's popular and administrative base. But in fact, its extended impacts generated a fertile soil for exploitation by the party as a method to enroot its sovereignty over territories that were once beyond its reach. These overlaps between post-war traumas and the political nature of Lebanon at the time – which spans till present day – was interpreted by Lebanese researcher Lamia Moghnieh. She argues that civilians' post-war condition and its diagnostics or counter-diagnostics were blurred on one hand and deployed on the other for and by ideological and political objectives. Moghnieh's arguments had relied on sharp discrepancies in the results of several psychiatric studies, out of which many were conducted by humanitarian organisations, and whose pathologization shifted from conventional therapeutics into the diagnosis of every-day life pathologies (Moghnieh 2016,13). She maintains that the psycho-social domain was a subject of scrutiny during the war, and essentially perceived as a target. From both sides of the

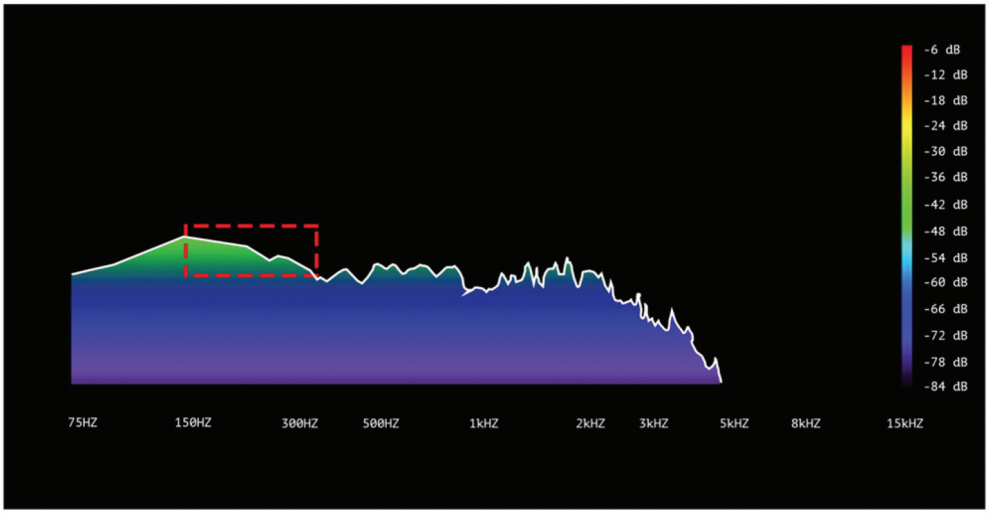


Figure 7. Frequency analysis of the pile driver's reverb. Courtesy of Author.

conflict, traumatisation was seen as a military advantage in the battlefield. Thus, resisting trauma became a criterion for triumph (Ibid: 111). A facet that was celebrated publicly three years later by Hezbollah's secretary general, where he cited psychological studies that showed low rates of trauma among his group. He referred to it as evidence of the Shiite popular base's continuous narrative on resilience and resistance (Moghnieh 2015). And more directly so, ideology became a synthesis of these tensions between the active attempts to resist trauma on one hand and succumbing to its emergent symptoms on the other hand (Moghnieh 2016:112).

Although construction manoeuvres had substantially replicated and repeated what the bombardment had sonically produced, however as mentioned earlier, trauma responses had altered under the omnipotence of ideological constructs. These threads are deeply rooted in the Lebanese cultural discourse since the end of the civil war in 1990. Aligned with this reconstruction venture, trauma and memory were also underlined following the civil war, namely through the lens of its post-war reconstruction project, *Solidere* (Larkin 2010; Khalaf and Saad Khalaf 2012). Adding to Moghnieh's observations that are specific to the community that was damaged the most by the 2006 war, the general discourse on trauma in Lebanon is concerned with witnessing and memory, and more so an access to events of violence. Lebanese writer and artist Walid Sadek's reasoning on the witness is meticulous on that subject matter in interview with writer Ghalya Saadawi where he states that:

> "One of the many insidious machinations of civil [. . .] war is the near interdiction of witnessing. In Lebanon, this is partly ascertainable through the dearth of testimonies by ex-civil war combatants."[8]

Although the 2006 war's scope of violence and its aftermath falls under a different category, issues with witnessing had also taken different turns. Testimonies on trauma from Hezbollah's militants were extremely scarce, and if available, they were treated with tremendous secrecy. Adding to the particularity in the diagnosis of an indoctrinated

population, Sadek's complicated the notion of trauma in 2006 by invoking the category of "untargeted survivors". He maintains that the 2006 war, oversaturated with media coverage, was giving the surrounding population reassurance that bombs were not targeting them, but strictly areas under the control of Hezbollah. He adds that this audience, spared from hostilities, would hear the continuous bombardment throughout the war. This amalgam between "the televised death of the other and the knowledge garnered from hearing bombs rock the city" was nothing but a reflection on the survival of this audience of war (Saadawi 2019). Sadek's attention to survival is crucial in a discourse on trauma. It is during the reverberant time of an explosion that the earwitness become cognisant of her or his own survival. These seconds of emotional overload before silence inform listeners on their own survival from the attacks. Cathy Caruth stresses that survival and trauma are tightly interlinked. While she reflects on the complexity of the event of trauma, she makes clear that the survival from what is traumatic is a crisis (Caruth 1995, 9). This thesis was expanded through what is termed as *Survivors Syndrome* (Lifton 1973; Bettelheim 1980). An attribute to traumatic symptoms, survivor's syndrome is an act of witnessing traumas and listening to traumas. Indeed, as Dori Laub mentions:

> "By extension, the listener to trauma comes to be a participant and a co-owner of the traumatic event: through his very listening, he come to partially experience trauma in himself" (Felman and Laub 2013, 57)

Trauma can be interpreted sonically through Laub's statement, not just through the listening practice that Laub's refers to, but as the structure of trauma. Extension here outlines the traumatic event's potential to seep spatially, temporally, and ontologically. Beside listening to the event of trauma, subjects are listening to its extensions through reconstruction, whose frequencies had occupied the very sites of trauma during the aftermath. A sustained drone, continuing the strikes' reverberations, the sonic repercussions from construction sites are soundscapes under which pathologies are exchanged and tamed at the same time. Sound's influence on traumatised subjects is outstanding evidence, a trace of this event's brutality that the ideological endeavours of the "victorious" party had sought to supress.

This statement ties us to the definition of the event itself, whether it was disproportionate or not. The Event in its ontological definition carries extensions. In line with Deleuze's extensive theorisation on the Event, Alain Badiou analyses the Axioms through which Deleuze defines the event. He maintains that the Event cannot be separated from the act of becoming; it is a continuity and an intensification. It is a sequence of multiplicities that concurs the "limitless of becoming and the singularity of the Event" (Roffe 2014). Events according to Deleuze are always actualised within other emerging events that constitute an inseparable part of the Event itself (Deleuze 2012, 54). In the Deleuze sets the paradigms that build the Event:

> "That is clearly the first component or condition of both Whitehead's and Leibniz's definition of the event: extension. Extension exists when one element is stretched over the following ones, such that it is a whole and the following elements are its parts." (Ibid: 77)

Though he generally extracts this facet from Whitehead, Deleuze elaborates on the extension as a main component of the Event. He argues that a singular action constantly bleeds into the future, "vibrat[ing] with an infinity of harmonics", to quote Deleuze. Hence,

a sonic source with its resulting tails represents a perfect example that can diagrammatise the Event. High frequencies wavelengths stretching and de-phasing to shift slowly into lower frequencies are an Event. Reverberations in that paradigm are an essential sub-multiple of the whole Event. When the missile strike was fired, the loudness of the initial signal channelled and reflected through the dense concrete environment that had imposed an Event whose components were expressed enough to stretch it to a specific duration and navigate different temporalities. Reconstruction would not only be an extension of a "pure Event", but an actualisation of the Event.

Wa'ad was celebrated among the party's "nurturing environment" as a breakthrough in terms of its record time restoration, transparency and, arguably an upgrade from its past. However, its militarised and ephemeral fate, infuses its spatial subtexts with violence and imminent threat. A sonic discourse, in that case, materialises the re-experience of threat both in terms of trauma triggers, and through actual acoustic registers denoting an upcoming destruction. The re-exposure to traumatic auditory stimuli, though theoretically pervasive, had not been empirically addressed by any of psychiatric or social intervention in Lebanon.

The ambient aftermaths

More than a pollutant

The celebration of the finally rebuilt dwellings in late 2012 was promoted as a victory and a new form of resistance; among the biggest achievements was the Imam Al Hassan complex. The southern suburb and the rest of Beirut overall had gone back to a pre-war state; to a semi-functional, contested, yet adaptable socio-political life. With all the geo-political and internal threats unfolding in the horizon, the city's roads had never lost their vibrancy, in the sonic sense of the word. As a less harming pollutant than the ensuing environmental crisis that would later shape the city's biosphere, ambient noise was weakly addressed and virtually absent from environmental studies. Few older decrees and regulations were enforced for brief periods of time by the Ministry of the Environment and the Ministry of Interior and Municipalities. These decrees tackled the sources of noise in residential areas, and managed industrial noise in some instances (Sabbagh 2019). Pre-2006-war academic and government-funded studies assessed noise in greater Beirut and had identified the primary emitters (Korfali and Massoud 2003). Noise levels were greatly influenced by car engine noise, crowd density, and most importantly, the ongoing construction noise. Essentially releasing signals, they eventually reverberated within the congested concrete urban occupation that the post-civil war economies had enforced. Noise emerging from these conditions is a versatile phenomenon, in the sense that other "noises" override each other according to our hearing conditions (Ruiz, Ascensión, and South 2019). In this context, amplified background sounds are absorbed by the listeners. From R. Murray Schafer's standpoint, details of an acoustic environment could directly reflect the social conditions that engendered this soundscape as well as the evolution of those conditions (Schafer 1994). Contextually, the sonic textures of the proximate environment of the Imam Al Hassan complex, which included parts of the capital Beirut, are now directly welded to the auditory decay that followed the impact. Subjects got exposed to the sonic replica

of an impact through an extension of lower frequencies, both during conflict and its reconstruction. They have now encoded new meanings for the soundscape as it became cohesive with warfare sounds and its residues.

Field recordings, noise-metering, and spectrographic analyses were conducted along different areas in Beirut, specifically in areas surrounding the Imam Al Hassan complex. Multiple results were overlaid and excluded all potential peaks of different recordings (car honks, screams, events etc.). This subtractive method aimed at extracting what might be closely assimilated to the prototypical ambient noise, or the soundscape's drone (Figure 8). Frequency analysis graphs show that the most prominent frequencies peaked at around 100 to 200 Hz, with a sustained audible level of the lower frequencies from 20 to 100 Hz (Figure 9). Beside those frequencies conforming with the two previous events, lower signals from the audible spectrum are visibly shown on the analyser. The residual lower frequencies are both an outcome of the main sonic emitters as well as the acoustic subsequent of reverbs. Those readings coincide with Augoyard and Torgues when urban sonic phenomena were examined, notably the drone effect. They define it as a sustained sonic occurrence that derives from low frequencies, which usually emanates from modern urbanity, such as automobiles, crowds murmuring, and mechanical installations on buildings, among others. Within built and populated environments, those sounds get automatically associated with layers of affect, such as danger, sadness, or melancholy (Augoyard and Torgue 2014, 42). The writers add that the nature of drones is identified according to the type of urban configuration that facilitates their diffuse. The congested urban morphology of Beirut – which itself is a direct translation of its socio-economic constructs – is shaped by its narrow streets, where the surrounding

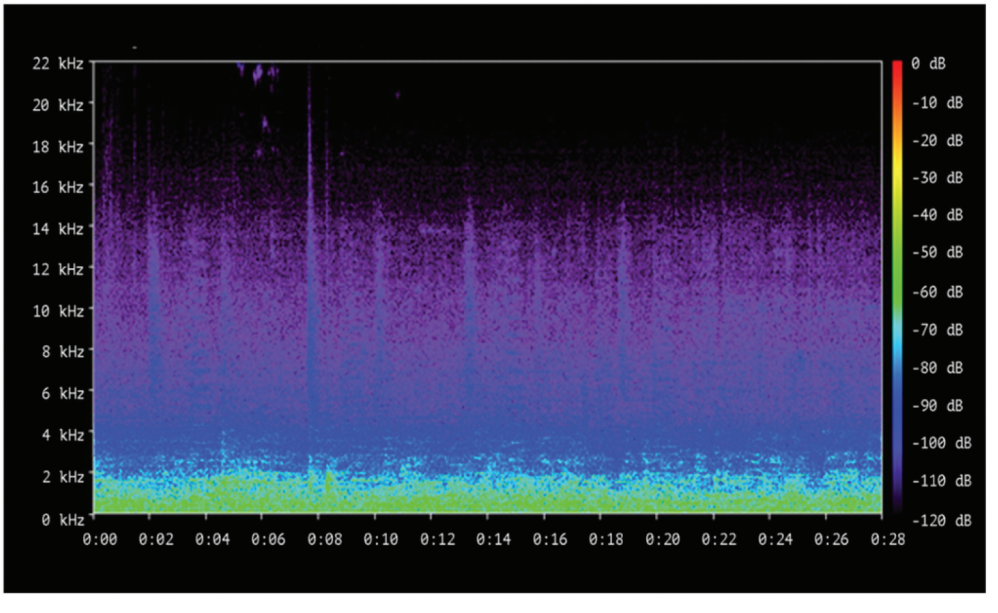


Figure 8. Environmental Noise spectrogram from recordings in Beirut and the Suburb. Courtesy of Author.

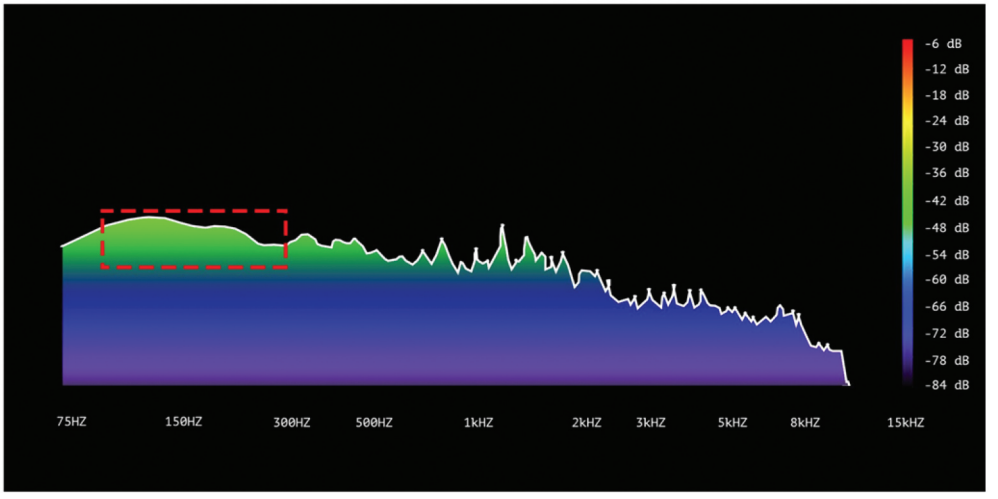


Figure 9. Frequency analysis of environmental noise. Courtesy of Author.

buildings act as large concrete reflectors. However, any sonic signal occurring in the daytime, when large crowds roam the streets, is absorbed by those crowds' bodies. In non-conflict times, the city's drone – as a sustained frequency – portrayed a sonic replica of a reverb that occurred during both reconstruction and bombardment. In line with Brandon LaBelle's account on public streets' acoustic impacts, he discerns a primary component of acoustic territories that are drenched in car engine noise. Vibration, as the inaudible extension of low frequencies, is "an influential, sensual flux performing as a vital contour to the psychodynamics of the emotional self" (LaBelle 2010, 134). LaBelle's theorisation is not grounded in the auditory experience of post-conflict societies; however, he writes that vibration is traced as a phenomenon that is reminiscent of memories (Ibid: 161). In the aftermath of the July war and as its reconstruction was complete, the southern suburb of Beirut became a geography whose sonorous character insinuated ambivalent connotations. Vibrations – emanating from car engines but also from a constellation of private generators, symptomatic of an unfolding energy sector crisis – are, in this particular context, suggestive of both a dysfunctional urbanisation and an armed conflict that never ended. As hostilities became swift and dispersed over different temporalities, the discourse on trauma had shifted from the traditional concepts of seeing and living with violence. This was prominent after the assassination of the Lebanese prime minister in 2005, and more accentuated in Dahye after the Syrian war in 2011. The capital and its suburb had witnessed an almost regular interval of explosive violence due to assassinations and Isis-led suicide bombings. The sonics of explosives are not any more concerned with zones of tension and wartime audibility (Daughtry 2015). They are, during the cessation of hostilities, the aural experience of everyday life (LaBelle 2010). The sonic debris of war, when intermingled with the assemblage of atmospheric noise peculiarities of the suburb, can modulate the spatial and material conditions of this area. War or at least a trace of it can occur during the interferences and overlaps between background noise and abrupt sonic eruptions, such as aircraft

noise, parades, and fireworks. It is an alteration in the acoustic and spatial perception irrespective if strikes or car-bombs had ensued or not. Lebanese artist and writer Mohamad Hafeda conveys this feature, where anxieties and fears can be repercussive of sounds of commercial airplanes in Lebanon (Hafeda 2018, 170).

Prolonged aftermaths

Though he addresses extended environmental impacts, Rob Nixon tackles the aftermath on civilian condition when gaging the effects of depleted uranium during the Gulf War (1990–1991). As a residue of contemporary military strategies, the specific weapon technologies that were deployed in "precision warfare" or "surgical strikes" are congruent with the writer's views on the Longue durée (Nixon 2011, 200). During contemporary warfare, Nixon asserts, some war-inflicted catastrophes take years or generations in order for their lethality to get fully unpacked. A concept emerging from what Nixon coins as slow violence situates the military events whose substantiation goes beyond the direct act of occurrence, but unfolds slowly, within a specific – sometimes unexpected – delay that deprives it from the classic definitions of violence. Most importantly, it is an event that "challenges visibility" (Ibid: 22). The assault on the Imam Al Hassan complex, as an exemplary yet spectacular event in the 2006 war, animates the concept of slow violence and Longue durée from all its theoretical and practical concerns. As this event's radiations reverberated beyond the radius of the missiles' craters, two facets had illustrated its lack of visibility, feedbacks, and sustain: a Sovereignty of a fait accompli and a stratified trauma. Apart from how Foucault theorised pastoral power and its intersection with the formation of knowledge through "conscience and the ability to direct it" (Dreyfus and Rabinow 2013, 214), his views on trauma, according to Jenny Edkins, ought to be integrated within situated social practices, and notably, in a biopolitical discourse (Edkins 2013, 44). Within this conception, traumatised subjects are transposed into governable subjects. Foregrounding post-bombardment reverb and its different reiterations is a method that envisions the aftermath and its affective sequels, but also the way through which governmentality was enrooted and sustained. Jasbir Puar's thoughts on the strategies of maiming and disability, inherent to IDF's combat techniques, unearth the areas where biopolitics and military capacities methodically converge within bodies victims. Though she partially attends to the traumatic sequels of warfare, she connects it to disability as being a cognitive injury (Puar 2017, 152). She frames this technology of fear as a biopolitical practice whose main intention is to drain any potential of resistance (Ibid 152). As magnified in the sections above, the military doctrine that fuelled this war was hinging on asymmetry to produce extended repercussions. Intertwined with psychological operations through different apparatuses, the results didn't collide directly with what the IDF had expected where Hezbollah's popular base would crumble. Instead, facing a subterranean force, this war's prolonged reverberations had drifted further into deeper neural circuits that had completely altered the victims' cognition of sound and space – a violence the reflections of which modulated the affect, generating a vulnerable population on which power was fluidly exerted. The preoccupation of the subjugated individual

with their mental hardship as a symptom of various levels of trauma, had in fact, diminished any ability to fathom the forces of control and exploitation that they were subjected to. As being mindful of the legal implications of warfare, military campaigns invest in scrupulous technologies to blur the temporal boundaries of the conflict itself. Hence the civilian object's spatiality and temporality are deemed morphable as the upshots of the military campaign aim for greater efficiency. Engendering a sort of power that exploits the plasticity of architecture as well as the volatility of the civilians' psyche.

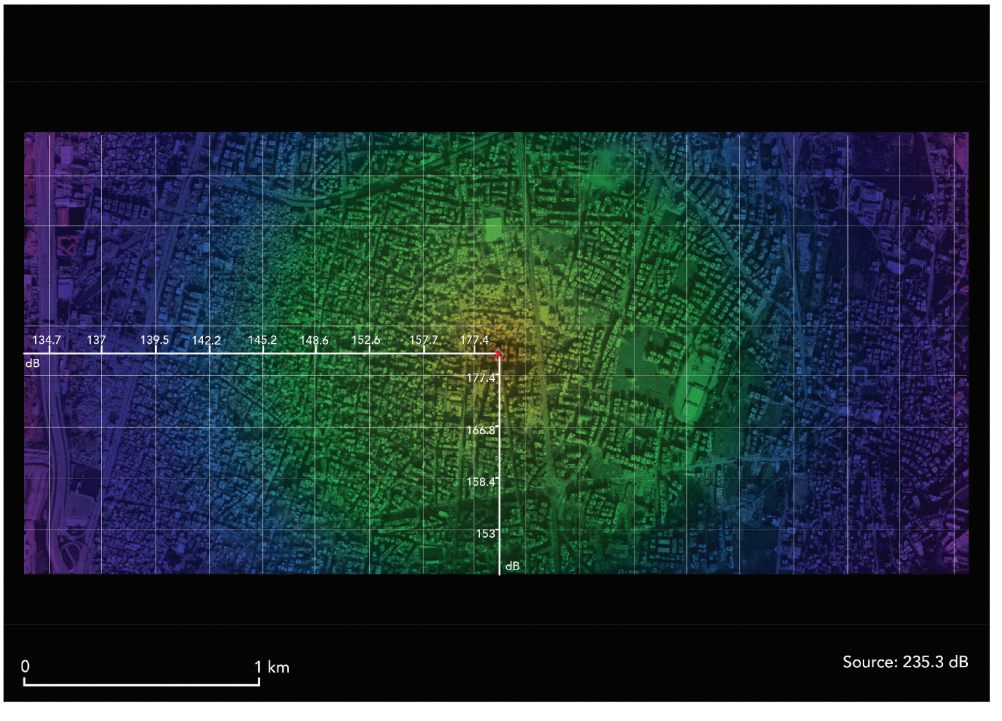
Conclusion

A territory unfolding as a disaster, the Lebanese socio-political reality is witnessing an exponential drop considering the three aforementioned and interchained conditions: warfare, real estate and the environment. With reflections on its internal political milieu, it is charged by a sharp collapse in its economic, social, and ecological status that became conspicuous in late 2019. While gradually descending into its deepest pits, these three facets had vigorously collided in a split second. Above a sonorous ambient continuum, an infrasonic burst had wobbled the ground at 6:07 pm. Thirty-three seconds later,[9] as subjects were sensing this glitch, a stabbing sonic force coupled with its vibrational surplus would heave materials and bodies. The warehouse 12 at Beirut port came under fire on the 4th of August 2020 and was followed by a massive explosion of approximately 520 tons of ammonium nitrate (Aouad et.al 2021). None had anticipated that up until this late afternoon, the highly charged, volatile particles were in their most intimate frictions. Leaving behind a total 218 dead, the largest man-made non-nuclear explosions in the 21st century (Helou et al. 2021) was heard and sensed within a radius of 240 km (Bressan). Theories on a timeline of slow violence, complemented by a series of dispersed spectacular outbreaks were rendered an all-pervading practice during this split second. As the whole process from the fire to the blast to its ravaging shockwave was being broadcasted, the world had witnessed how years of political violence, state corruption, growing militarisation and toxicity would interfuse in one great elastic wave. An analysis of the singular sonic effects of this event is clearly beyond the scope of this paper both practically and conceptually. However, it coincided with an auditory paradigm particular to warfare. This was evident in an enveloping post-traumatic aftermath. This detonation, for many that were not even physically injured, was not just a re-exposure to war-trauma, but a new trauma with all its fresh symptoms. A new war of sorts. Still, these two traumas intersect mechanically, biologically, and cognitively. Generations born during the civil war in the 1970's or others born in the 1990's or the ones born in the 2000's, would share pathologies and namely varied, sometimes acute auditory sensitivities. Since a trauma or a post-trauma never reached its healing with time, it was re-activated by cyclical events of violence, out of which many were monumental. The timeline of violence in Lebanon as such is a sustained reverberation. It is periodically stimulated by dramatic sound-events just as the preceding shockwave is in its final moments of decay. The sonic power to endlessly reverberate, theoretically if the spatial and acoustic set-ups are adequate,

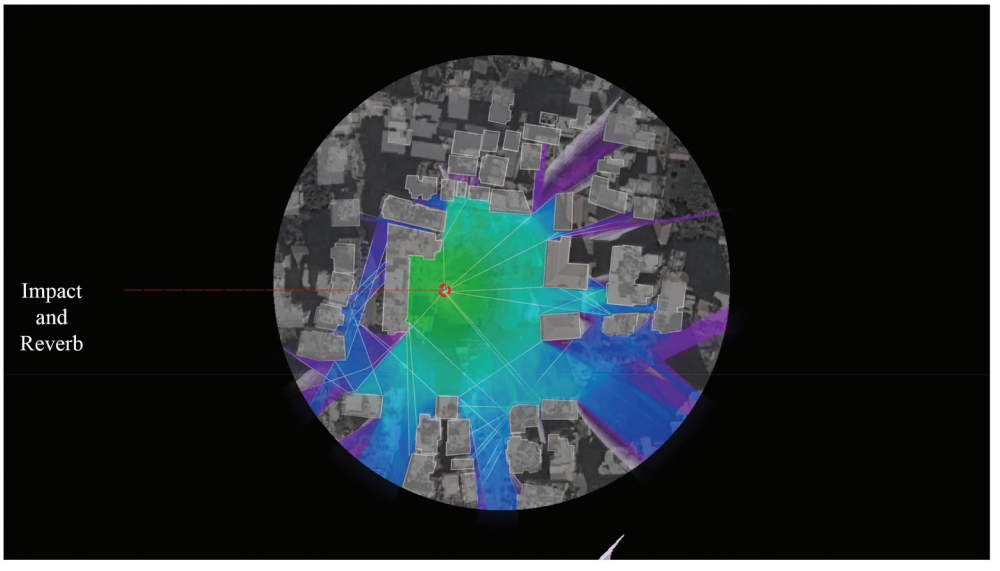
would impede the auditors "focus on the activating impact". Trauma in that sense is a reverberation that obscures the ability to discern the traumatic event itself (Caruth 1995). Dori Laub writes:

> The traumatic event, although real, took place outside the parameters of "normal" reality, such as causality, sequence, place and time. The trauma is thus an event that has no beginning, no ending, no before, no during and no after. This absence of categories that define it lends it a quality of "otherness," a salience a timelessness and a ubiquity that puts it outside the range of associatively linked experiences, outside the range of comprehension, of recounting and of mastery (Felman and Laub 2013, 69).

In this text, I make use of reverberation as a method, an effect and a language that offers both practitioners in sound and trauma studies an adequate theoretical and practical instrument to outline the "dark" networks between sound and psychological trauma. Whereby I intend to demonstrate through reverberation that making links visible between the auditory, the epistemological, and the psycho-social is first and foremost a matter of sonic effects (Augoyard and Torgue 2014). But more so, reverberation is drawn upon here to unearth the difficulties in trauma diagnosis, also vis-à-vis its contextual and spatial peculiarities. This effect is therefore deployed for further comprehensive methods that could demystify the complexity of a traumatic event and aftermaths. Ultimately, Reverberations as a condition that intertwines trauma and sound during urban warfare would morph the role of hearing and its modes during armed conflicts. Under this pretext, hostilities are not a confrontation between two combatants anymore, whereby the civilian witness' ears also become targets. Deeming them, in some cases, what the laws of armed conflict term as collateral damage (Schuppli 2014, Felman and Laub 201, 69).



Map 1. Noise intensity prediction map. Courtesy of the Author.



Map 2. Reverb simulation. Courtesy of the Author.

Notes

1. In short, shockwave is a phenomenon that occurs when a pressure moves at supersonic speed against the surrounding air – it is the foundational physical principle that takes shape during a blast or explosion. Following this process, a sequel, sometimes known as sonic booms, takes place generating large amounts of sound energy (May 2002). This enormous compression of air, known as sound, travels at high speed through air particles from the source of the blast into the surrounding environment. Due to its nature, loudness and its frequency, its propagation is known to be nonlinear (Krehl 2011), it means that sound waves with large amplitudes get more distorted in amplitude as they travel away from the source. Timothy. Hecker states that this process sounds with capacities to travel at long distances "were subject to a multitude of non-linear complexities that repeatedly thwarted understanding." (Hecker 2014: 188) Additionally, this long-range transmission is concerned with specific sound frequencies, as the audible spectrum spans from low to high frequencies, these frequencies are formed of wavelengths. In summary, the higher the frequency is, the shorter the size of its wavelength (Schuppli 2014, 64). Hence the lowest frequencies, with greater wavelengths have the potential to travel at longer distances.
2. An article published in the New York Times confirmed that the dispatch of a series of guided bomb unit (GBU-28) missiles to Israel from the US was accelerated during the second half of the war on Lebanon (Cloud and Cooper: 2006). A detailed Rand Corporation report (Rand 2011, 191) on the missiles and the military tactics that were deployed during this war confirmed that GBU-28 was administered by the Israeli Air Force's F-151. GBU-28 belongs to a family of weapons known as laser-guided bunker-busting bombs, which have the capacity to penetrate layers of hardened concrete covering bunkers or underground shelters. It contains the Bomb Live Unit BLU-122, which has bunker-busting capabilities due to its thermobaric nature.
3. Kardiner's foundational reasoning on combat trauma is rooted in a genealogy on *Traumatic Neurosis* at the nexus between psychoanalytic and anthropological studies where sound was a contributor to these early finding on trauma. It is entrenched in a history of psychoanalytic theory where the main contribution to trauma theory was closely examined after world one and two, and later the Vietnam war with the emergence of post-traumatic stress disorder

(Fassin and Rechtman 2011). In its early discourses, trauma was seen as an interaction between loudness, military, and psychiatric grounds. Namely, they were unpacked through the emergence of shell shock after the first world war, at the time medical, phenomenon (Hecker 2014, 171) The works of physiologists D.R. Hooker and military psychiatrist Charles S. Myers in the 1920's, had attempted to unravel the scientific tension between physiological and psychological symptoms in combatant that had experienced the extreme audible implications of shelling. Though this history relating loud explosive sound to trauma was later morphed within contemporary neuropsychiatry and neurology, i.e. Traumatic brain Injury, it remains crucial that a research into auditory stimuli was foundational for early psychiatric studies on trauma.

4. For more details on the case see Khiyam.com. Accessed July | مجمع الإمام الحسن: "عشرة مبان سكنية دمرتها إسرائيل في دقيقة ونصف." الخيام http://www.khiyam.com/news/article.php?articleID=1418.
5. See timesofisrael.com/idf-adds-two-more-alleged-hezbollah-missile-sites-to-netanyahus-unclaim/.
6. See Hezbollah's deputy secretary general Naim Qassem's book, *"The Mahdi, the Savior"*, published a year after the war.
7. Auralization is a method that inserts a sound within a predictive software that generate reverbs according to a 3d construction of a given space. In the case I had resorted to Blender – Evertim plugin that generate ray tracing for reverbs and simulate the sound in a 3d model. Those sound were later adjusted on ableton live.
8. "On the Labour of Missing: A Conversation between Walid Sadek and Jacko Restikian." In Plot for a Biennial: Sharjah Biennial 10, exhibition catalogue edited by Ghalya Saadawi. Sharjah: Sharjah Art Foundation, 2011.
9. In Qiblawi, Tamara; Mankarious, Sarah-Grace; Thompson, Nick (6 August 2020). "From sea to mountain: How a massive explosion left a trail of destruction across Beirut and beyond". *CNN*. Archived from the original on 7 August 2020. Retrieved 8 August 2020. The first explosion at 6:07 p.m. is followed by a second massive blast 33 seconds later.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributor

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