

# CRAFTING ALONG MATERIAL WEAR

*Interweaving crafts and materials  
towards wear in architecture & beyond*









# ABSTRACT

**Keywords:** Wear, Ageing, Material Culture/Ritual, Crafting, Tacit, Repair, Reuse, Heterogeneity, Hybridity, Network

The institutionalization of the architectural practice has caused a linear life cycle that relies on the efficiency of mass standardized products, not only exacerbating ecological effects but also breeding mediocrity in architecture. An epistemic break from the creative and tangible process of craftsmanship, which has been marginalized as practice of the past. The aforementioned restrictive qualities of the practice have spurred the emergence of new counter ideologies in repair and reuse, which embrace the heterogeneity inherent in wear. The context of Madrid provides an opportunity to explore the idea of crafting wear, beginning with empowering an network of traditional crafters and extending to overlooked actors in material aging, enriching discourse and exchange of material knowledge towards a more mature attitude in hybrid design. The transformative impact of embracing wear in the urban fabric can cultivate a communal sensitivity towards architectural expression of material aging. In adopting a hybrid expression of wear, from the craftsman to the public, interweaving various knowledge domains carving a niche in the practice of architecture, that develops into a thriving network of skilled crafters in material wear.

# CONTENT

<i>Abstract</i>	3
<i>Introduction</i>	6
<i>Problem Statement</i>	8
<i>Chapter 1: Crafting Material (Who/How)</i>	10
<i>Chapter 2: Extracting Material (Where)</i>	16
<i>Chapter 3: Ageing Material (What/Why)</i>	22
<i>Conclusion</i>	28
<i>Bibliography</i>	30





# INTRODUCTION

The Machine age and the automation of labor brought about a significant shift in the process of work emphasizing speed, efficiency and fixed products. This was further exacerbated by enlightenment in the 19th century, which favored artistic expression, originality and an inward-focused approach to creativity. This was evident within the Modern Movement, which sought new architectural forms disconnected from the past, driven by technological innovations (McCullough 1996). The diminishing value of work in craftsmanship towards a capitalist industrial society, ultimately led to its decline, marginalization and stasis. The socio-economic and technological trends of the industrial age continue to persist into the digital age. A focus on productive activity, innovation and fixed products, that generates things lacking in quality. Similarly advancements in the construction industry have enabled more efficient methods of building, with institutionalized codes, standardized components, prefabrication and the automation of labor (Carpo 2023). Mass accessibility to industry standard products further perpetuate the over consumption and idealization of pristine architecture that “carry no memory” (Boniver 2010). Although this reality has enhanced the overall standards of architecture, it has consequently inspired a wave of homogeneous architecture that often lacks qualities embracing local history, culture and rituals (Figure 1).

Furthermore, the utilization of highly processed construction materials have detrimental repercussions on the environment. The mass adoption of cement, iron and steel in the built environment contribute a large percentage of carbon emissions, as displayed by their embedded carbon. In addition, the continued investment towards sustainable urban renewal projects, continues to perpetuate the reliance on techno-fixes that degrade the existing building stock in the city. In the year 2020, the construction and demolition sector is responsible for generating the largest portion of waste in Europe at 37.5% (Eurostat 2023). The resulting consequences of the current construction system, has in turn given rise to counter strategies. Many pilot initiatives like the Interreg Facilitating the circulation of reclaimed building elements (FCRBE) Project that aims to increase material reclamation in North West Europe to 50% by 2032 (Topalov 2021). The program has conducted a number of research papers and pilot projects that outline methods towards material reuse at various scales. These roadmaps have been applied to a number of pilot projects in the UK, Belgium and France that display considerable potential to disrupt the common life cycle of materials in construction. Similar sentiments perpetuated by “The Great Repair”, towards a reparative approach in architecture, that empowers an existing network of craftspeople and skilled experts in conserving the existing (Hiller 2023). Rotor’s Belgian pavilion at the 2010 Venice Architecture Biennale “Usus/usures” also underlines the shifting attitude towards the embrace of aging and wear in architecture. Even landscape theory, like Fourth Nature design, emphasizes the importance of embracing natural ecological conditions of aging instead of striving for a “pure” nostalgic past (Bakshi 2020). This transitioning value system towards wear in architecture, presents an opportunity in the reemergence of crafting as a productive knowledge domain.



When	11 Century	12 -18 Century	14-17 Century	18 -20 Century	20 -21 Century	21-22 Century
What	Monastery spiritual haven, walled sanctuary	Guild workshop	Artistry renaissance/enlightenment	Industrialization mechanization of making	Digital Innovation computerization of work	Homo Faber & Repair makers movement the great repair
Who	Abbots Craftsmen-saints Monastic community	Master Journeyman Apprentice	Artisans Artist Apprentice Patron	Bourgeoisie Proletariats Modern Movement	Digital Designers Programmers 3D Fabricators	Digital Craftsman Makers Repairers Architects Fabricator
Values	Religion Christian Doctrine's Fear of Material Obsession, counter destructive tendencies	Quality Technique/Skill Community Fraternity Rituals	Originality Expression Individualistic Subjectivity	Optimization Standardization Efficiency Products Capitalism	Innovation Optimization Efficiency Products Massification	Quality Community Optimization Automation Creativity
Decline	urbanization sacred and profane spaces, absence of monastic equilibrium	Institutionalization Socio-political agendas Proto-capitalist ideas	Religious Motives Political agendas Industrialization	Telecommunications Computer Secondary --- Tertiary	Homo Faber The Great Repair ...???	
Movements	Romanesque churches, castles, stained glass, heavy pier, arches, vaulted roofs, religion	Gothic churches, flying buttresses, pointed arches, vaulted ceilings, tapestries	Renaissance symmetry, geometry, proportion, hemispherical domes, stone flooring  Baroque exaggerated ornamentation, portico, detailed interior	Art Nouveau Modernism Art Deco Bauhaus	Deconstructivism fragmentation, asymmetry, experimental materials  Parametricism algorithmic, generative, computational	

Figure 1 - key historical moments deteriorating the principles of craftsmanship and the emergence of counter ideologies reviving crafts (author's diagram).

# PROBLEM STATEMENT

The institutionalization of the architectural practice has consequently caused a linear life cycle from production, construction, to demolition and waste. The overreliance on mass standardized and optimized components, not only exacerbate ecological effects but also breed mediocrity in architecture. An epistemic break from the expressive and physical process of crafting, which has been marginalized into a practice of the past. The growing pains towards the aforementioned restrictive qualities of the practice have bred new counter ideologies in repair and reuse that embrace the heterogeneity of wear.

In this transition, Madrid serves as an ideal laboratory in the revival and mutation of architectural craftsmanship in the city. The rich guild history during the 15th to 16th century serve as backbone towards the evolution of crafts in the city. In contemporary times organizations such as Mad'in Europe and Red de Maestros highlight an existing network of traditional building masters within Madrid that continue to practice and evolve certain material techniques. Crafting also extends to material extraction in the Granite Quarries of Madrid, in which material culture and rituals are deeply entrenched in historic mining towns. Furthermore, the over emphasis in material recycling of Madrid's current waste system ignores the intrinsic issue of over-consumption. The European Union's emphasis towards the transition in "resource efficiency" once again invites the productive and sustainable potential of crafting (Baker-Brown 2021). In these socio-political and ecological trends, why is crafts still relevant and what opportunities can emerge? With that being said, the question arises:

*How can the historic material culture and rituals in Madrid be interwoven within the emerging crafting of wear to discover alternative forms of architectural expression?*

Madrid's transition towards reuse and repair presents an opportunity to initiate an alternative paradigm that embraces the aging of materials, while harmonizing with existing material culture and rituals, and extending beyond. The tacit knowledge in a network of traditional crafters in Madrid, serves as the foundation in the hybrid design of wear characterized as heterogeneous (Figure 2). This extends to overlooked contributors in care and maintenance, enriching discourse by exchanging their material expertise for a more comprehensive architectural expression of aging. In studying material extraction, the granite quarry towns of Madrid, elucidate material knowledge transcends the confines of industry and filter into everyday rituals that foster material culture. Moreover, the fourth nature landscape of abandoned quarries and other material scars underscores how aging can lead to desired evolution and further enrichment of material culture. Similarly, the transformative influence of embracing wear in the urban fabric, can foster a collective ethos and culture towards material aging. In adopting an architectural expression of aging from the craftsman to the layman, empowers various knowledge domains towards a niche, an urban commons of skilled crafters in material wear.

The paper begins with crafting material, through contextualizing the significant role of craftsmanship in Madrid from the 15th century to the evolution of traditional craftsman today. Additionally, deconstructing the productive epistemological domain of crafting that enables the cultivation of tacit knowledge towards materials sensitivity. The next chapter focuses on material extraction, by exploring the Granite Quarry mining towns in the Guadarrama Mountain regions and its influence on material culture and ritual. Moreover,



discussing the temporal aspect of declining mining industries and the implications of fourth nature landscapes in abandoned quarries. Finally leading to examining aging materials, that first contextualizes the topic through the waste system of Madrid. Continuing towards the potential transition towards reuse and repair that embraces the variability of aging materials. Lastly, synthesis the various actors and concepts towards an urban commons of crafters embracing material wear.

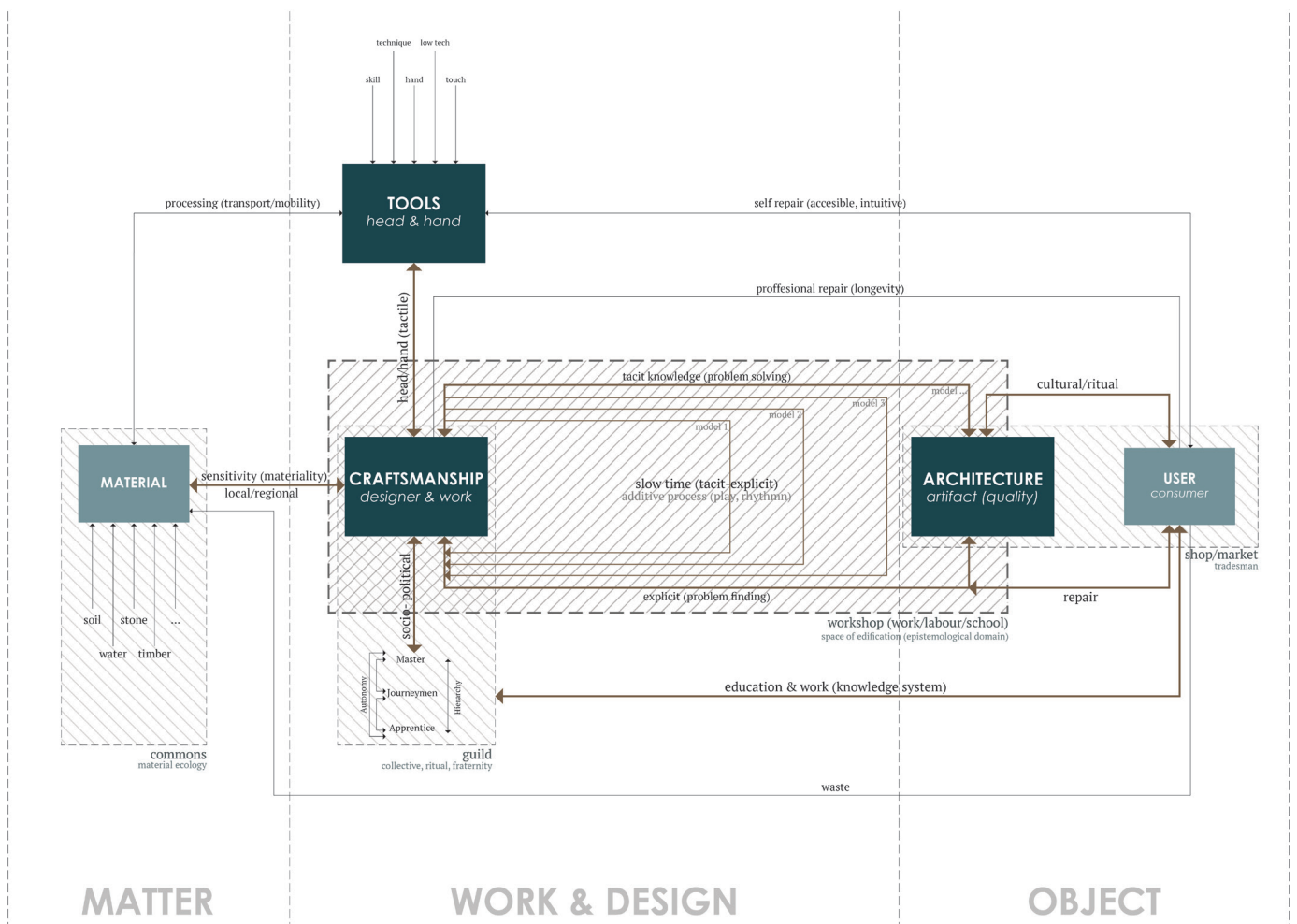


Figure 2 - initial actor-network diagram of historical craftsmanship, revealing the productive rhythmic play in tacit knowledge, cultivating material sensitivity and quality (author's diagram)

- key actors
- secondary actors
- main productive spaces
- other productive spaces
- key networks
- secondary networks







# **CRAFTING MATERIAL**

*chapter 1*



# CH.1 CRAFTING MATERIAL (WHO/HOW)

Contrary to the traditional perspective of Madrid being a parasitical consumer city, during the 1561 there existed a thriving local guild trade with the establishment of the court's "Capitoline Triad". The trades catered to courtiers, clerics, bureaucrats and tradespeople residing in the city, where wealth circulated within the city and stimulated local production. In 1757, the city had one of the largest populations of workers in Spain, in which 44% of the city's laborers were organized in guilds. The workforce distribution consisted of 42% crafts, 35% construction and furniture, and 23% food and energy. There were certain patterns in distribution of workshops, with silversmiths found in the Platería quarter near Plaza Mayor, Silk crafts in the southern district of Lavapiés and tanners located southwards near city walls in proximity to slaughterhouses in the Manzanares river (Figure 3) (Nieto 2016). Although in contemporary times, the City has expanded far beyond the historic city walls, the influence of the craft industry persists within the urban fabric today. This is observable not only in the continuity of generational handicraft shops but also in the nomenclature of street names. Street signs in the form of a nine gridded ceramic tile, suggests a rich artisanal past, such as: "La Ribera de Curtidores" (The Tanners Riverside) within the Rastro open air flea market, or "Botoneras" the most powerful women guild in Madrid in the 17th century that served as button makers for the royal family (Ortigas 2020). The signages highlight the importance of guilds in relation to the state, for their service of knowledge and production of material. Guilds formed a thriving network intertwined within the local context that permeated into everyday social life.

**Figure 3-** mapping of historic crafting clusters in Madrid during the 18th century (overlaid on 1831 map)

- Silversmith** - were found in the Platería quarter (near the Plaza Mayor, or main square)
- Botoneras** - women guild that served as button makers for royal family
- Silk Crafts** - crafts in Lavapiés (a southern district of the city).
- La Ribera de Curtidores** - where tanners use to sell their product



The historic significance of crafting in Madrid, suggests a productive epistemological domain in craftsmanship. As described by Richard Sennett, the meticulous pursuit of quality by a craftsman during the process of work enables a continuous cycle of problem finding and problem solving. During craft, the craftsman enters a rhythm of the tacit, explicit and back to tacit, where he continuously builds on top of the knowledge gained previously (Sennett 2016). This process seeks quality over product, that is purposeful rather than the routine in habit. This humble methodology of craftsmanship, seeks a different way of working through slow and repetitive play. This unique productive process began without industry, in which “everything was craft” (McCullough 1996). This slowly evolved into monasteries during medieval times, providing a spiritual haven for craftsmen. This monastic equilibrium was degraded during the transition to urban life in the 12th and 13th centuries, where guild masters likened to abbots maintained the previous order. This autonomous pursuit of quality was balanced with authority and standards, maintained by masters asserting principles of religion, rituals and community. The workshop served as an essential space for the transmission of knowledge and production of creativity. The delicate balance of social power upheld in a guild workshop, became increasingly corrupted by its entanglement with urban life. Craftsmanship became increasingly institutionalized and revealed proto-industrialized intentions, degrading the essence of quality in the creative process (Sennett 2008).

The Machine age and the automation of labor brought about a significant shift in the process of work emphasizing speed, efficiency and fixed products. This was further exacerbated by the 19th century, which favored artistic expression, originality and an inward-focused approach to creativity. These bourgeois ideas of making art and its commercialization began an epistemic break valuing innovation— a break away from the established practice and traditions (McCullough 1996). In this manner Craftsmanship contrasts greatly as an additive skill, that builds upon what is known. From a sociological dimension, the craftsman’s process values the collective activity of disseminating knowledge, rather than individualistic innovators. The diminishing value of work in craftsmanship towards a capitalist industrial society, ultimately led to its decline and stasis. The consequence of this shifting value system continued into the digital age, in which both innovation and efficiency are placed first and foremost. This attitude is reflected in the advancements of the construction industry with more efficient methods of building, institutionalized codes, standardized components, prefabrication and the automation of labor (Carpo 2023). Moreover, the specialization of tools has also further fragmented the actors in the built environment, creating a schism between material sensibility, labor and design. Although digital tools have enhanced the overall standards of architecture, it has simultaneously given agency towards unmotivated architecture. The flexibility and variability of craftsmanship that once anchored the architectural practice, has been labeled as superfluous and inefficient.

**Tailors** - dispersed throughout the city, but densified in central urban locations for direct contact with potential clients.

**Small Shoe Repair** - LaManzana, contained a profusion of repair stalls

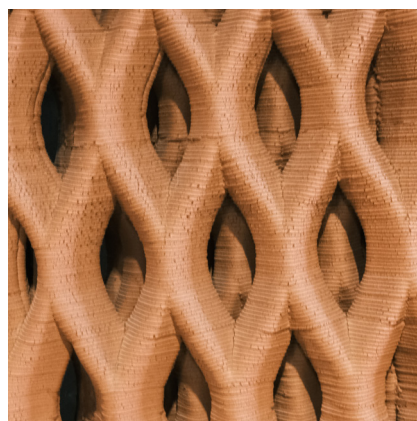
**Tanners** - left the city center in the early 16th century, to occupy the southward area close to the city walls and near the slaughterhouse

Other trades relating to leather tanning were also located close to the tanneries on the Manzanares River

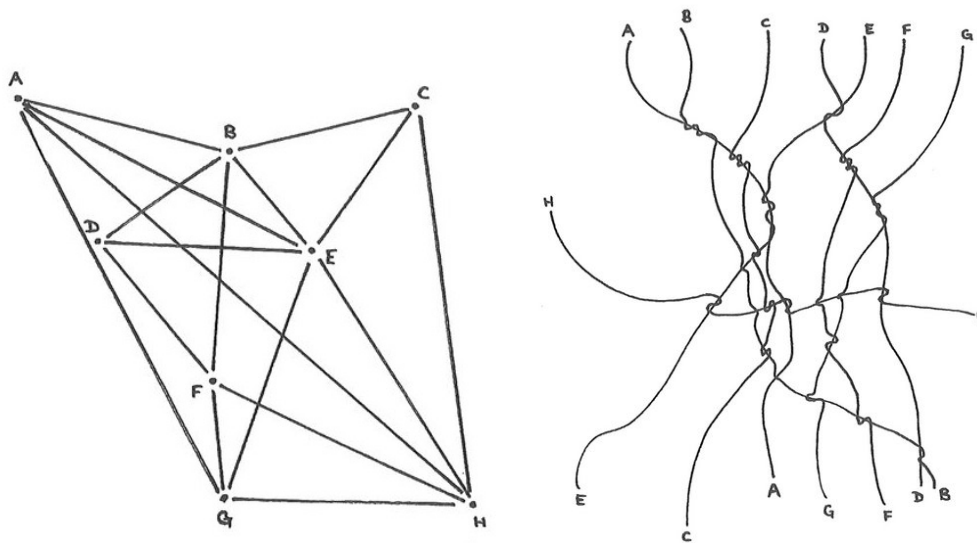


## CRAFTING MATERIAL

The aforementioned repercussions are evident within contemporary Madrid, in which only traces of historical building craftsmanship exist today. In conducting this research a number of craftsmen highlighted from “Red Española de Maestros de la Construcción Tradicional” were interviewed that provided insight into the current state of building craftsmanship in Madrid. Firstly, Marisa de Lucas’ ceramic atelier that specializes in recipes for the Spanish-Muslim technique of carbonization ceramics, in which chemical reaction between metal oxides and carbon, generates deep colors of metallic shine. Lucas’ recounts her personal journey in uncovering this technique, “It’s not easy. [it’s not] Patience... It’s passion... for many years, alone in the atelier”. The obsession to her craft is reminiscent of ancient craftsmen, who were consumed by the pursuit of perfection, rather than external incentives, as exemplified by her meticulous research, documented recipes and apprenticeships. Although her practice may evoke nostalgia compared to other interviewees, a consistent theme emerges in the significance attributed to materials. In her process to “develop the.. colors [she] dreams” as to “find the color as we are in the nature”, she emphasizes ““even [in] the colors..the most important ingredient are the mineral”. This sentiment is shared with Manuel Díaz Martín, a co-owner of Hidrocal Revocos, a company specializing in traditional lime finishes. Martin was originally an apprentice to Master renderer D. Carmelo Cárdenas López, in which he translated his artisanal process into contemporary standards, efficiency and costs. This modernization was achieved in collaboration with the Instituto Eduardo Torroja that enabled the development of a new coating system that met standards required on vertical walls with high salt and humidity levels. Compared to Lucas’ personal practice, Martin noticed the importance of transitioning his company rooted in traditional techniques into current technical building standards. Although the approach differs, similarly material sensibility remains constant, reflected in Martin’s statement of how “lime today, is the only material that breathes...although the eye cannot see it...is like a living being”. The tacit knowledge intrinsic in the crafting of materials, is reflected in his emphasis of touching the powdered lime as to “know that it is pure lime” through its impression on the fingerprint. Interestingly, even more innovative digital crafts in 3D printing like Yara Tayoun’s applied printing program in the Institute for Advanced Architecture of Catalonia reflect the same sensitivity towards materials. As she describes “of course there’s so much to learn from craftsmanship. I don’t think we’re discovering anything really...using local materials to



**Figure 4** - the material qualities and craft of Lucas, Martin & Tayoun respectively  
(author's photographs)



**Figure 5 - Network vs. Meshwork:** not of interconnected points but of interwoven lines, not a network but a meshwork . Flows and counter-flows, winding through without beginning or end (Ingold, 2009)

construct...You know, like you come back to earth (clay)”. These case studies offer insights into the diverse spectrum of contemporary craftsmanship in Madrid, ranging from Lucas’ atelier likened to the archetypal craftsman, to Martin’s lime business, representing a middle ground of evolved practice, and finally, Tayoun’s hybrid technologies envisioning a future of digital crafts (Figure 4). Despite the varied approaches, each practice is bound by the unique tacit process of craftsmanship outlined by Sennett that calls for empathy between maker and material. This dynamic is likened to Latour’s “Actor-Network Theory”, that positions both human and non-human actors at equal agency (Latour 2007). Highlighting a persisting importance placed upon the material, even before the act of the craftsman.

This transition towards an ecology of materials brings upon a shift away from the hylomorphic model that defines form as something imposed upon by an agent with a premeditated end (Ingold 2012). This ideology can be attributed to the architectural writings of Leon Battista Alberti that began the codification of architecture. The textility of making gave way to geometrical form, in which things could be “conceived in the abstract in advance of its realization” in a homogenized material medium (Ingold, 2009). In consequence, the textility of building gave way to the architectonics of pure form in spite of their common beginnings of craft, diverging the designer (architect) from the builder and craftsman. In reaction to the erosion of the tactile and sensuous knowledge that once guided architects/craftsmen, Ingold underscores the importance to evolve and return as wanderers and wayfarers that followed the varied and heterogeneous materials. Rather than retroactively interpreting finished objects from their initial intentions, the approach is to trace, weave and interweave their varied material flows into the fabric of the built environment (Figure 5) (Ingold, 2009). Using a carpenter’s sculpting of wood as a metaphor, wherein each stroke is distinctive, embracing the variable nature of the grain’s surface and following where it leads (Ingold 2010). Similar to the carpenter, Lucas, Martin and Tayoun reflect a similar attitude in embracing the sensuous qualities of their respective material and craft. This highlights the tremendous untapped potential in the material sensitivity & knowledge of an existing network of skilled crafters in Madrid, which values the material over the immaterial and the physical over the mental.





# EXTRACTING MATERIAL

*chapter 2*





## CH.2 EXTRACTING MATERIAL (WHERE)



*“There was no plan, and the outcome—far from conforming to the dictates of a prior design—better resembled a patchwork quilt” (Harvey, 1974)*

Starting with craftsmen and extending towards materials raises questions about the sources of material extraction in Madrid and their influences on local dynamics. One of the most apparent connections would be the influence of Granite due to Madrid’s proximity to the Piedra Berroqueña region in the Guadarrama Mountains. This region supplies most of the construction granite used in Madrid and consists of a number of quarrying towns. In the past, the “architect was literally a master among builders”, who actively engaged on site and coordinated a team of masons (Ingold 2009). The building was not conceived independently in advance of construction, but in engaging with the stone in a tangible process of wooden formwork and string guides. Unlike architects that think of a building as a complete thing, the stonemason understood the process as a sequence of rhythm, play and flow. The variability and unpredictability of the material was embraced, in which there was no plan and “better resembled a patchwork quilt” (Ingold 2009). This highlights the additive and collective process in crafting granite.

The sociological dimension inherent in granite craftsmanship is evident in the quarrying towns of Madrid, where traditions of granite extraction and hewing persist. The historical significance of the granite is reflected in the stone-related etymology of towns such as Berrocal meaning granite boulders outcrop in Spanish and Alpedrete relating to piedra meaning stone in Spanish (Freire-Lista 2016). This is specifically evident in the historical mining towns, such as Alpedrete, Zarzalego and Colmenar Viejo that continue practicing hewing (cutting stone through hand tools) (Figure 6). Historically, the laborious process of selecting, drilling, splitting and transporting rough-cut granite blocks required a group of masons. The brotherhood and approach towards materials naturally permeated into the fabric, ritual and traditions of the town. This influence is particularly evident in Alpedrete with centuries of history in granite quarrying. The monolithic and durable quality of granite was often chosen for monumental buildings, such as the city hall of Alpedrete and Asunción de Nuestra Señora Church. The material’s dependability also manifested in Alpedrete’s infrastructure, exemplified by structures like the Amaniel aqueduct and the Rosario Bridge, which remain in operation. Moreover, the abundance of quality granite in Alpedrete also extended into everyday rituals, such as washing basins, drinking troughs, street paving, fountains, benches and cattle route milestones (Figure 7) (Freire-Lista 2015). This highlights how the crafting of granite transcended the confines of industry, and permeated into everyday social practices, thus fostering a more robust material culture centered around granite. Although the output of Alpedrete quarry industry has declined, the lasting cultural influence persists in the form of monuments honoring quarrymen, geological quarry museums and annual quarrymen competitions (Figure 7).

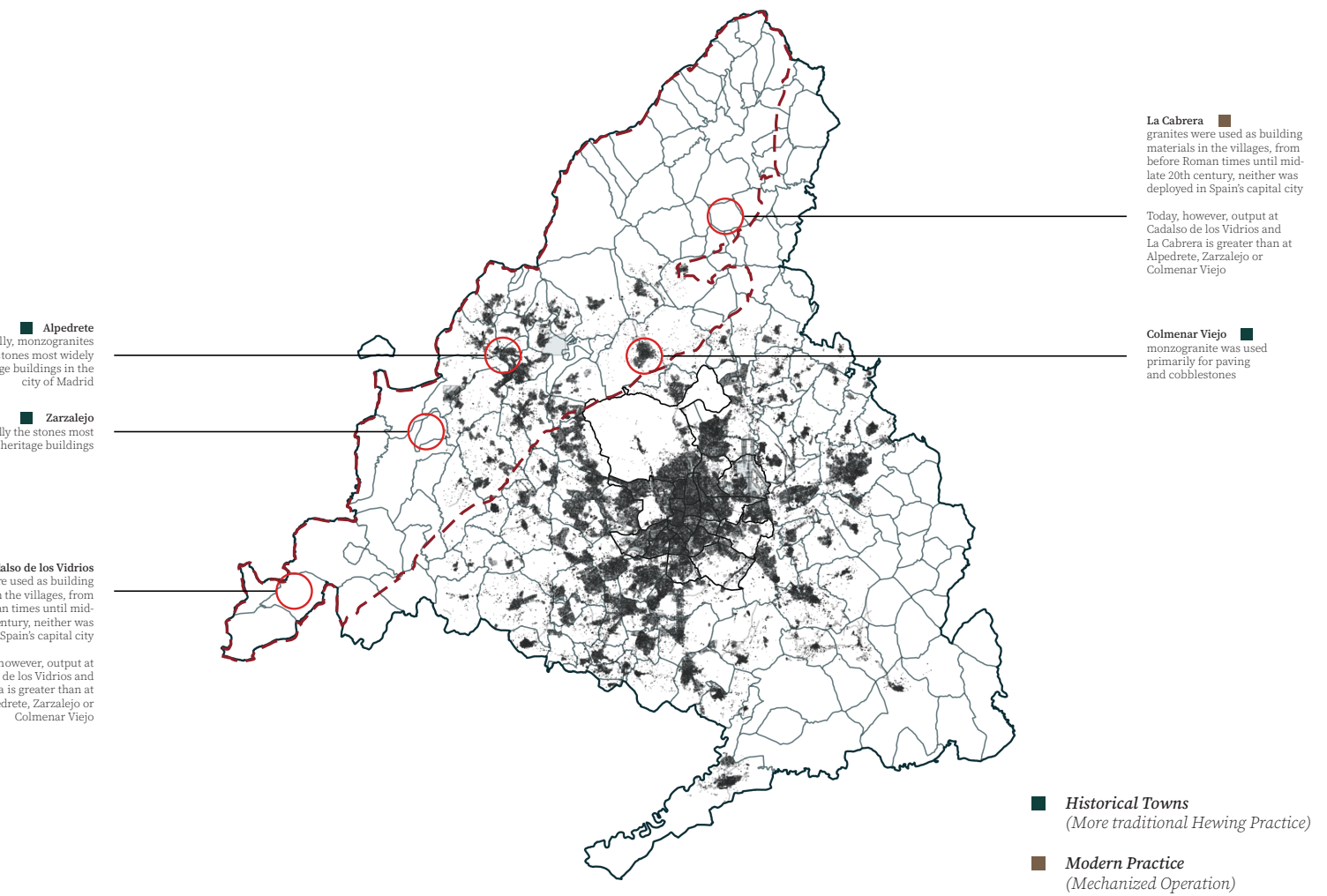
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**Figure 6** - mapping of historic and new granite quarry towns in Madrid. Further detailing the specific typologies associated with the supply. (Author's mapping)



**Figure 7** - granite related material culture and ritual: traditional hewing practice, Colmenar Viejo quarrymen competition, bullet holes on ashlars from Spanish Civil War, granite furniture in the form of fountain (left to right) (Freire-Lista 2015, 2016).



## EXTRACTING MATERIAL



**Figure 8** - Differences in past and present extractive processes: overgrown landscape of historic outcrop quarry in Alpedrete and invasive quarry operation in La Cabrera (left to right) (Freire-Lista 2016).

The temporal discussion of the granite industry also sparks consideration of the evolving material culture within quarrying towns. The 2000 historic quarries in Madrid mainly consisted of small shallow quarries that removed top outcrops approximately 1-1.5 meters deep due to the limitation of manual labor. In reaction to gradual depletion of these shallow sources, commenced a transition towards larger operations and more invasive processes (Figure 8). Today, output at Cadalso de los Vidrios and La Cabrera is greater than the historical towns in Alpedrete, Zarzalejo and Colmenar Viejo (Freire-Lista 2016). The once intimate family-run quarries have been replaced by large corporate operations, in which mechanization focusing on speed and efficiency, has degraded the once intimate rituals of material extraction. Despite these dramatic changes, there is an awareness in the importance of conserving tangible heritage manifested in various forms of scattered ruins including debilitated Optical Telegraph Towers, grinding stones of flour mills, granite cones to crush olives or shoeing pens at Villavieja de Lozoya (Freire-Lista 2015). Moreover, the material scars of disused mining sites serve as a reminder of a historical quarry industry within fourth nature landscapes.

Many quarry's remain abandoned and have been naturally recolonized by plant communities. A mixture of native and newly migrated species, "representing adaptation to the forces shaping the environments of the Anthropocene". Many landscape scholars have theorized the benefits of an adaptable Fourth Nature system that enables the dynamic dialogue of interdisciplinary factors in material, ecology and culture. Contrary to the negative connotations associated with invasive species, hybrid plant communities occupy particular niches that can increase biodiversity and even support endangered species without excessive maintenance or inputs needed. Instead of a static "pure" approach to preserving said quarries in a nostalgic past, the quarries have embraced self regulating vegetative assemblages that are well adapted to the contaminants found at post-industrial sites (Bakshi 2020). Some historic towns like Alphenrethe have leveraged these potential synergies, into a vibrant blend of industrial quarries and novel vegetative communities for human use. In the Alphenrethes Canteras park, natural hiking trails weave between overgrown quarry filled pools acting as points of refuge from heat and provide opportunities of play (Figure 9). Furthermore, the emotive power of such landscapes have the capacity to communicate meaning and nostalgia, that generate "new understandings of changes" (Bakshi 2020). A shifting perspective towards the fluidity of heritage landscapes to be in dialogue with change, simultaneously maximizing its social and future values. This underlines the misinformed disadvantages associated with aging landscapes. Presenting an opportunity to develop more diverse aging landscapes intertwined within everyday play and rituals, thereby enriching material culture.



**Figure 9** - Fourth Nature spaces of water filled quarry pools, element of play and interaction (Google Maps).









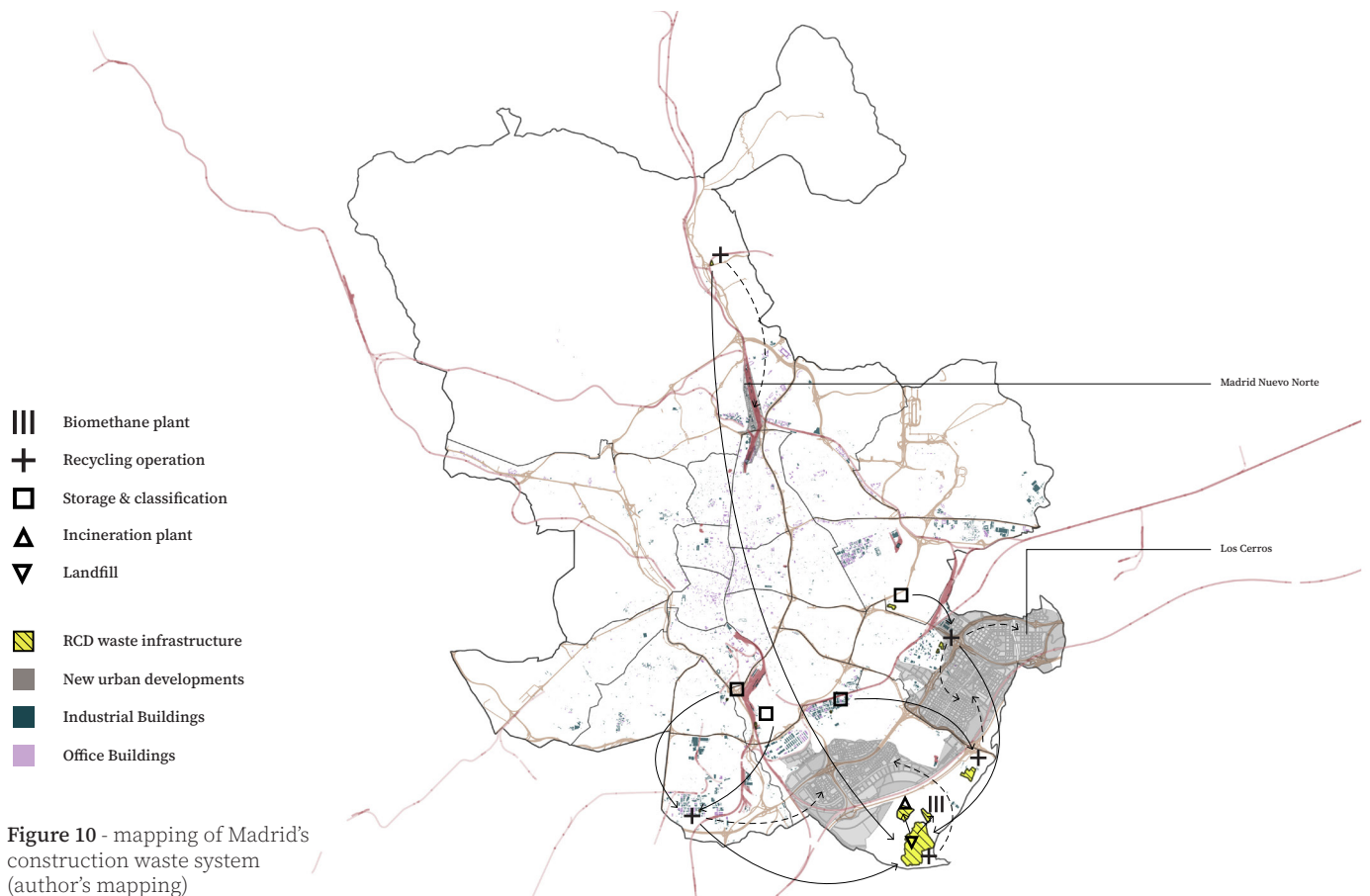
# AGEING MATERIAL

*chapter 3*



# CH.3 AGING MATERIAL (WHAT/WHY)

The fourth nature landscapes of Alpedretes quarry pools reminiscent of an industrial past or the bullet holes visible on ashlars of Madrid’s heritage buildings reflecting a tumultuous political past, highlight the importance of design towards unexpected trajectories of wear (Figure 7) (Freire-Lista 2016). As elicited from John Bergers story of the carpenter’s workshop, wherein each beam bears the scars of a carpenter’s axe and in “following the grain that reveals the provenance of every beam from a tree once growing in the forest” (Ingold 2009). Over time, the workshop slowly deteriorates and reaches its end, where planks are dismantled to be sold for a good price. This story illustrates how things are not static but endowed with a narrative of time. To embrace the wear of things, as they are alive and bound for leakage.



This brings into question, what is the end life cycle of materials in urban Madrid? The current waste system of Madrid is managed by Residuos de Construcción y Demolición (RCD). Waste is differentiated into level one and two, being waste from excavation and earthworks, or construction, repair and demolition respectively (Figure 11). Level two waste characterized as heterogeneous in composition, undergoes a process of initial storage (prior classification takes place), then brought to a transfer station (if traveling long distances) and finally a classification plant. Within the plant, waste is sorted for further treatment or rejected for the landfill (Figure 10). Waste deemed suitable for recycling, then undergoes a process of crushing and further categorized into byproducts. Based on the 2006-2017 RCD regional plan, of the 5.8 million tons of annual waste generated only 4.3% undergo treatment. This is a reflection of poor classification during construction and demolition in which waste becomes



highly heterogeneous and deemed untreatable. The consequence of mismanagement is reflected in 69% of waste being disposed into authorized landfills. Moreover, the overall costs needed in correctly classifying waste outweigh incentives in proper management, in which 28% of waste are discharged in unauthorized facilities (Plan de Gestión 2017). Even when the composition of waste is more homogeneous like the surplus/residual earth & stone materials for level one waste, the guidelines for reuse are limited. Within the regional plan a single page outlines the aspirations towards 100% of level RCD and vaguely describes the use of said materials towards rehabilitating degraded spaces within mining operations (Plan de Gestión 2017). The existing conditions of the waste management in Madrid highlight the severe limitations in its current sustainability system that relies on techno fixes like recycling. Not only does recycling require high costs, intensive labor and energy, but more importantly it ignores the intrinsic issue of over consumption. Furthermore, the excessive processing of materials into substandard byproducts degrade material qualities and heritage present in the built environment. Nevertheless, these flaws also present an opportunity to transition Madrid's waste system towards reuse and repair.



**Figure 11** - diagram of Madrid's waste processing system from collection to byproduct for recycling (author's diagram)

## AGING MATERIAL

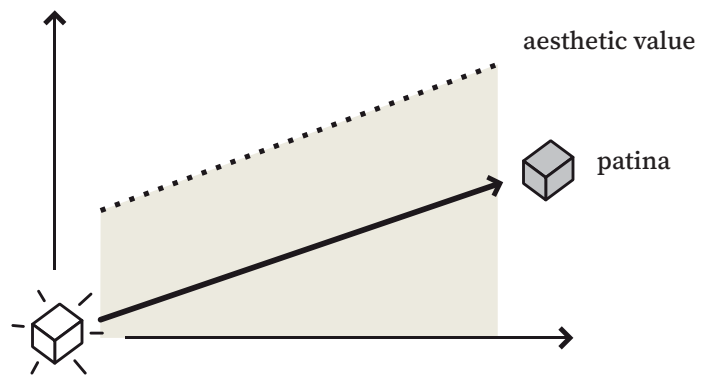
The construction sector uses no less than half of the Earth's raw material and in Spain, the construction and demolition sector contributes 30.8% towards waste (most of any indicator) (Baker-Brown 2021). In response to the unsustainable practices of current waste systems, which perpetuate excessive material consumption, the European Union has increasingly prioritized a transition from "energy efficiency" to "resource efficiency" (Baker-Brown 2021). This imbalance can be attributed to the lack of requirements towards reuse and its non-binding nature. The absence of regulations is evident in the statistic that less than 1% of materials discarded during construction or demolition are effectively reused in the EU (Smeyers 2022). These circumstances are also evident in Madrid, in which reuse is severely underutilized. In the 2017-2024 Management Plan of RCD, recycling remains a priority, with reuse and recycling often being treated interchangeably or simultaneously, as if they entail the same requirements (Plan de Gestión 2017). One company spearheading reuse in Europe and leading the Interreg FCRBE in Northwestern Europe is Rotor, a cooperative design practice based in Belgium. Outlined in their report "The Reclamation Audit 2023", reflects the potentials of reuse to seamlessly blend into existing waste management systems. In many contexts, like Madrid it is mandatory to conduct an inventory of hazardous waste prior to demolition or renovation, which could be combined simultaneously with a reclamation audit. However, there are still limitations in integrating both processes as current waste audits are structured in relation to material categories based on Eural Codes (Seys 2015). To effectively utilize the hybrid quality of reclaimed construction products would require additional care in extraction beyond an audit. When materials are deemed suitable for reclamation, it involves craftspeople in the process of selecting, dismantling, sorting and cleaning of the material to be sold on the reclaim market (Paulet 2022). Generally this service is conducted by reclamation operators that specialize in supplying materials for an existing market. The issue with the current overreliance on reclamation dealers is that they often prioritize economic viability over exploration of new pathways. Furthermore, the biased expertise in their market segments also limits the identification of more innovative and less common reuse opportunities (Smeyers 2022). This highlights the need for a more creatively driven practice that would stimulate and move beyond existing products in the reuse market, through embracing the variability of aging materials.

Madrid's absence of a reclamation market presents an opportunity to initiate an alternative system that embraces the wear and aging of materials, synergizing with existing material culture and rituals, and extending beyond. The dismantling, cleaning and cutting of reclaimed materials from skilled workers is not simply a pragmatic matter, but entails an aesthetic and emotional evaluation (Boniver 2010). This evaluation of material wear encompasses a multitude of actors with their anchored expertise and tacit knowledge such as: craftsman, maintenance managers, cleaning personnel, engineers, scientists and more. Highlighting the underappreciated actors in the everyday care and maintenance of buildings, and the need to recognize the competencies of these skilled actors that are not always regarded as experts (Hiller 2023). The need to empower this epistemological domain of physical and reproductive labor in manual skill and craft expertise. In Madrid, this begins with empowering the varied historic craftsmen that can catalyze the exchange of material expertise towards a more mature attitude in hybrid design embracing wear. Moreover, enriching and galvanizing other invisible actors to contribute in this discourse of working with the existing.





**Figure 12** - traditional style Minka bath where exterior elements of wear blend seamlessly with interior



**Figure 13** - depending on material approach, wear can be embraced and sought as aesthetic quality, as exemplified by patina (Boniver 2010).

Moving beyond reuse towards an overall reparative approach, which would seek “to work with what is already there, respecting both the materials and actors involved” (Hiller 2023). This does not constitute a return to a pristine past, but acknowledging available materials in their ecological and social contexts. Utilizing existing conditions as a starting point likened to fourth nature design, and embracing them with critical examination. The first alteration moves an object from the present condition to one of transformation and has the capacity to influence subsequent trajectories of material alterations. As elicited by Alfred Gell, “objects acquire incomparable social agency” after long repeated periods of physical contact, such as: abrasion on a metal door handle, “beaten track” that suggest alternative pathing in a park or the smoothed chalked walls in outdoor rock climbing (Boniver 2010). Revealing wear as an index, which reflects the subconscious collective tacit stance towards an object. Furthermore, wear also contributes to the construction of collectivity, culture, and ritual, as demonstrated in Junichiro Tanizaki’s “In Praise of Shadows”. Tanizaki illustrates Western thought that “attempt to expose every speck of grime and eradicate it”, alluding to the western consumerist obsession with the new, the intact, the pristine (Tanizaki 1977). In Eastern thought, he emphasizes that elements of elegance often arise from what might typically be perceived as unclean or unsanitary. These qualities are often preserved and even idealized, in which the “grime, soot and weather... the colors and the sheen that call to mind the past that made them” (Figure 12) (Tanizaki 1977). In Japanese culture wear is not interpreted in relation to the negative connotations of decay, but embraced as aging and patina (Figure 13). Comparably, by empowering the diverse stakeholders involved in the crafting of repair and reuse in Madrid, there could be a transformative impact on the urban fabric, fostering an ethos that values wear. This process could simultaneously reshape public perception and appreciation for aging architectural expressions. Through sustained and recurrent everyday rituals that involve interaction with material wear, a sense of community and cultural identity could be cultivated. Underlined in Rotor’s *usus/usures*, describes how wear of this kind can “uphold a community of users over time” and is “full of positive resonance for people keen on continuing the rite or culture in question” (Boniver 2010). In embracing an architectural expression of aging at various scales, that begins with craftsmen, to crafters of various specialities, which proliferates into everyday ritual and culture of the layman. Synthesizing various knowledge domains towards a collective niche and network, an urban commons of skilled crafters in material wear.

# CONCLUSION

Crafting materials in Madrid underscores the historic significance of craft guilds, whose influence persists in the urban fabric today. These guilds played pivotal roles in both knowledge dissemination and material production, forming a thriving network deeply intertwined with local life. The productive epistemological domain in craftsmanship characterized by slow and repetitive play enabled material quality. However, the rise of the Machine and Digital ages prioritized innovation and efficiency over craftsmanship's flexibility and variability, leading to its decline. Despite this, remnants of historical building craftsmen in Madrid endure, bound by a unique tacit process fostering empathy between maker and material. This stimulates a transition towards an ecology of materials, diverging from the hylomorphic model and embracing varied, heterogeneous materials. Moreover, highlighting untapped potential in the material sensitivity and knowledge of Madrid's skilled crafters, who prioritize material, making, and the physical.

Beginning with crafting material and extending to extracting material in Madrid, this exploration delves into granite mining towns in the Guadarrama Mountains. Through an examination of stone masons' extractive and crafting practices, it's evident that these activities transcend industry, and permeate into daily ritual and cultivated material culture. A temporal discussion highlights, the material scars of abandoned quarries serve as a reminder of a historical quarry industry within fourth nature landscapes. Rather than preserving them statically, they embrace self-regulating vegetative assemblages adapted to post-industrial sites. The Alpedretea Canteras park features natural hiking trails weaving between quarry-filled pools, offering both refuge from the heat and opportunities of play. This highlights misunderstandings about material wear and proposes embracing diverse aging landscapes intertwined within everyday play and rituals, thereby further enriching material culture.

The abandoned quarries of Alpedretea, reveals wear as an index and the need to design towards unexpected trajectories of aging. The discussion leads to the end life cycle of materials through contextualizing Madrid's current waste system. Through careful analysis, highlights the severe limitations of current material life cycle strategies in Madrid, that relies on techno fixes like recycling, incurring high costs, intensive labor, energy and more importantly degrades material qualities into byproducts. Presenting an opportunity to transition Madrid's waste system towards reuse and repair. Rotor's analysis of the current reclamation market that prioritizes economic viability, underscores a need for a more creatively driven practice that would stimulate and move beyond existing products in the reuse market. Moving beyond reuse towards an overall reparative approach, an alternative system that embraces the variability of aging materials, synergizing with existing material culture and rituals, and extending beyond. This begins with empowering this epistemological domain of physical and reproductive labor in manual skill and craft expertise through the network of traditional craftsmen of Madrid. Moreover, galvanizing overlooked actors in care and maintenance, enriching discourse by exchanging their material expertise towards a more comprehensive hybrid architectural expression embracing the heterogeneity of wear. The transformative influence of embracing wear in the urban fabric, can foster a collective ethos and culture towards material aging. In synergizing knowledge domains at various scales towards design with wear, flourishes into an interdependent network, an urban commons of crafters in Madrid.



# BIBLIOGRAPHY

## Main Sources:

- Aging: reuse, life-cycle, policy Baker-Brown, Duncan. “*FutuREuse: How to Build a Roadmap*.” FCRBE, October 1, 2021.
- Aging: post industrial landscapes, novel communities Bakshi, Anita, and Frank Gallagher. “*Design with Fourth Nature*.” *Journal of Landscape Architecture* 15, no. 2 (May 3, 2020): 24–35. <https://doi.org/10.1080/18626033.2020.1852690>.
- Aging: Wear, Patina, Material Culture, Ritual Boniver, Tristan, Lionel Devlieger, Maarten Gielen, Michaël Ghyoot, Benjamin Lasserre, Melanie Tamm, Ariane d’Hoop, and Benedikte Zitouni. *Usus/Usures*. Éditions de la Communauté française Wallonie-Bruxelles, 2010.
- Aging: reclamation feasibility and scale case studies Chaussebel, Célia, and Mathilde Doutreleau. “*32 Detailed Project Sheets*.” FCRBE, 2023.
- Extraction: historic granite mining towns, culture/ritual Freire-Lista, David Martin, Rafael Fort, and María José Varas-Muriel. “*Alpedrete Granite (Spain). A Nomination for the ‘Global Heritage Stone Resource’ Designation*.” *Episodes* 38, no. 2 (June 1, 2015): 106–13. <https://doi.org/10.18814/epiiugs/2015/v38i2/006>.
- Extraction: granite quarry, changing industry, culture/ritual Freire-Lista, David Martín, and Rafael Fort. “*Heritage Stone. The Piedra Berroqueña Region: Candidacy for Global Heritage Stone Province Status*.” *Geoscience Canada* 43, no. 1 (March 14, 2016): 43–52. <https://doi.org/10.12789/geocanj.2015.42.076>.
- Aging: reparative approach, repair the practice, repair knowledge domains Hiller, Krieger, Nehmer, Attia, and Jason W. Moore. *The Great Repair: Politics for a Society of Repair*. ARCH+, 2023.
- Material: ecology, flows, embracing heterogeneity Ingold, Tim. “*Bringing Things to Life: Creative Entanglements in a World of Materials*.” *Vital Signs: Researching Real Life*, April 2008, 1–16.
- Material: productive quality of crafting, weaving and meshwork Ingold, Tim. “*The Textility of Making*.” *Cambridge Journal of Economics* 34, no. 1 (2009): 91–102. <https://doi.org/10.1093/cje/bep042>.
- Material: homomorphic model, objects, things, alchemy Ingold, Tim. “*Toward an Ecology of Materials*.” *Annual Review of Anthropology* 41 (2012): 427–442. doi: <https://doi.org/10.1146/annurev-anthro-081309-145920>.
- Crafting: handcraft, craftsmanship, digital-hand McCullough, Malcolm. *Abstracting Craft: The Practiced Digital Hand*. Cambridge, MA: The MIT Press, 1996.
- Crafting: historic craft and guild network in Madrid Nieto Sánchez, José Antolín. “*The Return of the Guilds: A View from Early Modern Madrid*.” *Journal of Social History* 50, no. 2 (2016): 247–272. <https://doi.org/10.1093/jsh/shw056>.

## BIBLIOGRAPHY

- Aging: Madrid waste system “*Plan de Gestión de Residuos de Construcción Y Demolición.*” RCD, 2017.
- Crafting: guild, tacit, play, deteriorating principles Sennett, Richard. *The Craftsman*. New Haven: Yale University Press, 2008.
- Aging: reclamation potentials and limitations Smeyers, Tijn. “*The Reclamation Audit.*” FCRBE, December 2022.
- Aging: culture and wear in material sensibility Tanizaki, Junichiro. *In Praise of Shadows*. Leete’s Island Books, 1977.
- Aging: new innovative reuse strategies Topalov, Hugo, Victor Meesters, and Coralie Van Pottelsberghe. “*FCRBE Pilot Operations.*” FCRBE, 2021.
- Other Sources:**
- Crafting: technocentric, mass customization, fabrication Carpo, Mario. *Beyond Digital: Towards a New Materiality of Architecture*. The MIT Press, 2023.
- Crafting: manufacturing, making Croxford, Ben. *Foundries of the Future: A Guide for 21st Century Cities of Making*. TU Delft Open, 2020.
- Aging: european waste statistics Eurostat. “*Waste Statistics.*” ec.europa.eu, January 2023. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste\\_statistics#Total\\_waste\\_generation](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics#Total_waste_generation).
- Crafting: creative, technology, economic growth Florida, Richard. *The Rise of the Creative Class*. Basic Books, 2014.
- Aging: disruptive potentials of reuse in material lifecycle Ghyoot, Michael. “*Objectif Réemploi.*” BBSM, June 2017.
- Multiplicity: human/non-human, intensities, synergies Latour, Bruno. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford University Press, 2007.
- Crafting: Madrid street names and historical relationships Ortigas, Maria Isabel Gea. *Los Nombres de Las Calles de Madrid*. Ediciones La Libreria, 2020.
- Crafting: reclamation market, embedded carbon, processing Paulet, Sebastien, and Lea Bottani-Dechaud. “*Material Sheet: Reuse Toolkit.*” FCRBE, February 2022.
- Crafting: tacit, additive, slow time, material quality “*Richard Sennett: Craftsmanship.*” October 12, 2016. Educational video, 44:56. <https://youtu.be/nIq4w9brxTk?si=DZfKhv0vVSRl94cp>
- Aging: reuse logistics Seys, Sophie, Lionel Billiet, Maarten Gielen, and Michaël Ghyoot. “*Handbook for Reuse Offsite.*” Rotor, September 29, 2015.
- Multiplicity: layered, networked, de/reterritorialization Sheppard, Lola. “*From site to territory.*” *Bracket 2 (Goes Soft)* (2013): 179-184.
- Material: Homo Faber, makers movement, industry 4.0 Zaera-Polo, Alejandro, and Hyungmin Pai. *Imminent Commons: Urban Questions for the Near Future*. Actar, 2022.