Chapter 4

Programme

04 Programme

Johannesburg as incubator for a textile revival

Johannesburg's inner city has established itself as a manufacturing hub, dominating in mostly light industries such as food processing, printing, jewellery, furniture and clothing manufacturing for the last century.

An estimated eighty percent of formal clothing production takes place in Johannesburg's inner city, making it the third most important clothing manufacturing area in South Africa, after the Western Cape and Durban (Kesper 2003:88).

The formal manufacturing economy is dominated by the clothing production industry which is mostly led by small, medium and micro-enterprises (SMMEs). The advantage of SMMEs is its '*high labour absorptive capacity*' (Kesper 2003:98) and although SMMEs don't necessarily have the capacity to drive the entire revival of Johannesburg's inner city, its contribution to the creation of wealth and employment opportunities is promising. Due to its dominance in the formal and informal manufacturing industry, clothing production has been recognised as a key target in achieving this goal (Kesper 2003:97).

Unfortunately the South African textile industry has undergone rapid decline since the late 1990s as a result of cheap mass Chinese imports. This is an issue that has been recognised by the South African government and amidst support and investment to initiate revival, the industry is barely able to survive, let alone expand (Ndalana 2016).

In order for the industry to expand to a point where it is able to export, the supply chain, destroyed by China's cheap imports, first needs to be mended.

Figure 4.1. Left: Retort 2 interior (Author 2017)

Since the early 2000s the majority of resources such as dye houses and laundry services that formed part of the supply chain in South Africa have disappeared, resulting in a broken value chain (Ndalana 2016).

The potent vision of the South African textile and clothing industry is to use human, technological and natural resources in order to establish South Africa as the favoured supplier of manufactured clothing and textiles not only on a domestic scale but also an international scale (Brand South Africa 2002).

Figure 4.2: Textile Manufacturing (Brand South Africa 2017, edited by Author)

Figure 4.3: Furniture Manufacturing (Hospitality Designs 2017, edited by Author)

Figure 4.4: Jewellery Manufacturing (Rand Refinery 2017, edited by Author)

Figure 4.5: Food processing (Kirchhoff 2016, edited by Author)

Built environment theory's focus on the ability of living systems to regenerate and renew themselves amidst disturbances and pressures in order to avoid environmental collapse, has ignited the possibility of architecture becoming the catalyst for urban renewal through the understanding and integration of living systems (Peres, Barker & Du Plessis 2015:1)

Through the application of regenerative design, the possibility arises for architecture to become entirely comprehensive, inclusive of nature and respectful towards every part of a site's biosphere and ecosystem. The natural and living systems that exist on site become the driving force behind the architecture and utilizing these systems and responding to them appropriately, is a vital part of this type of thinking (Littman 2009:1).

An understanding of the theory as well as the context has led to the proposal of an eco-textile emporium as programme for the southern edge of the site.

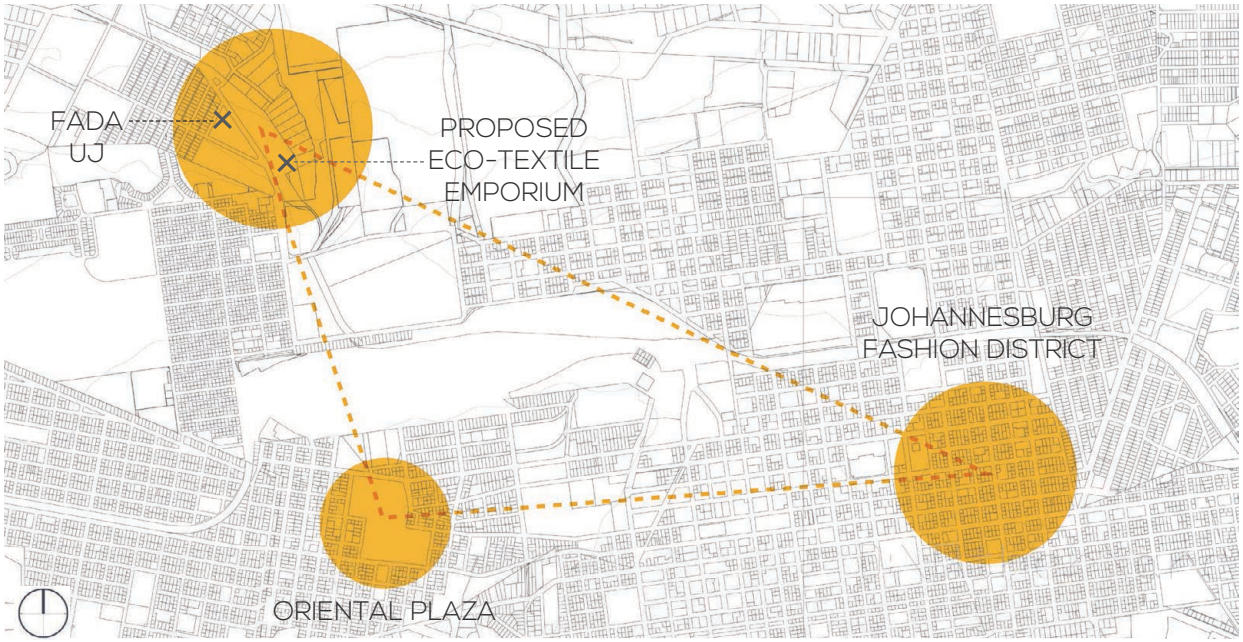


Figure 4.6: Fashion and textile hubs in Johannesburg (Author 2017)

This includes a textile mill where hemp, flax and stinging nettle, grown on the site, are used for the manufacturing of textiles. This provides the opportunity for living system regeneration on site, as the introduction of the plants could lead to the reintroduction of bio-diversity onto the site. A market space where the textiles are sold will contribute to the socio-economic activities on site. Workshops where the FADA fashion design students can transfer their sewing skills to the local community, as well as small rentable workshops for entrepreneurs to start up their businesses and eventually form part of the larger Fashion District in Johannesburg are also envisaged. Sub-programmes include a micro-brewery with tasting room as well as a tea house. Beer and tea are made from the leaves that are separated from the fibres after they have been harvested. The sub-programmes not only contribute to the socio-economic regeneration of the site, but also aid in the reduction of waste in the textile production process, contributing to the overall industrial ecology.

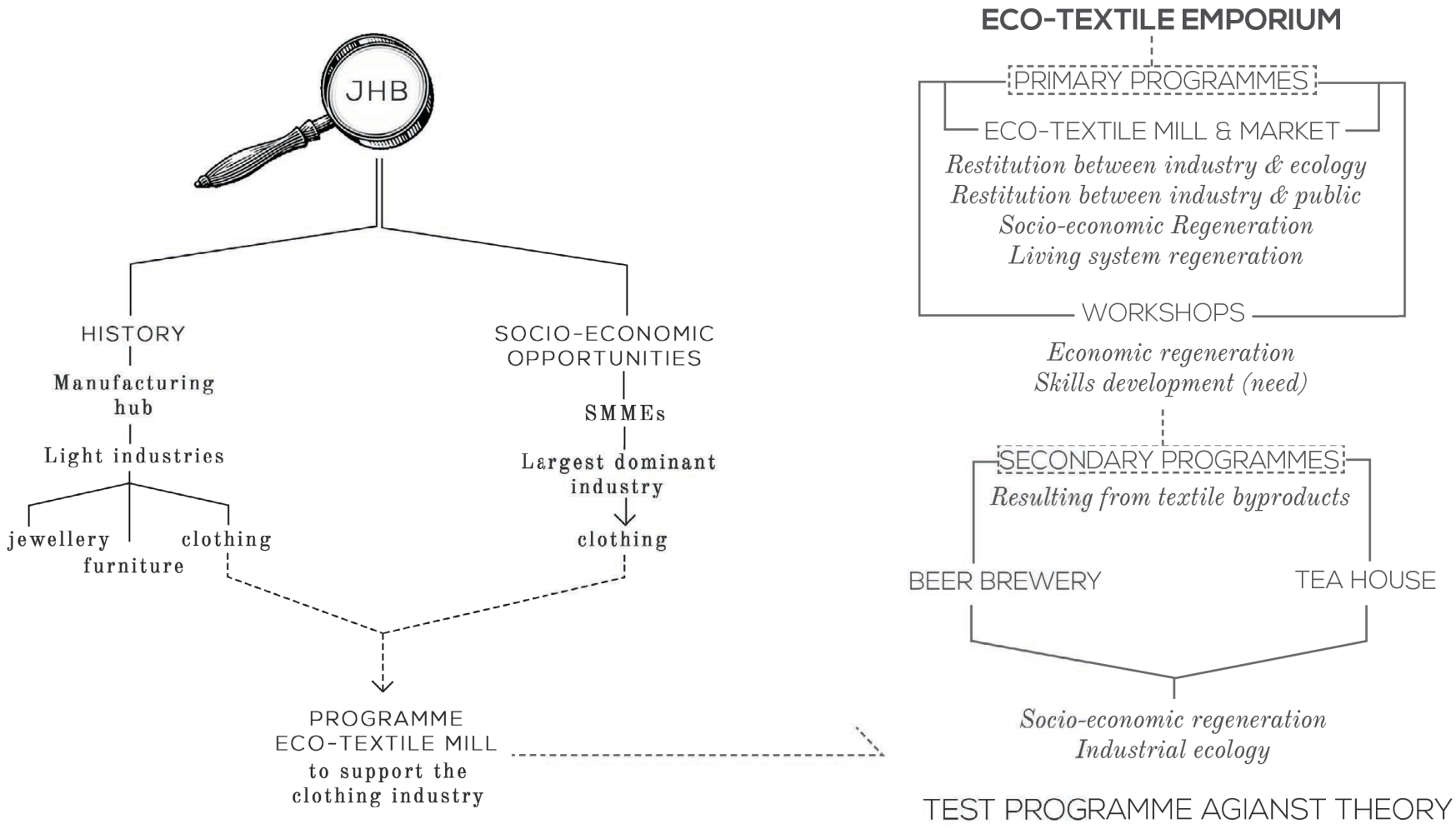


Figure 4.7: Programme outline (Author 2017)

How programme contributes to theory

The introduction of plants needed in the eco-textile market and natural dye house brings back the diversity of species to the site, allowing for the regeneration of living systems. Introducing labour intensive programmes like a textile mill and dye house and the sub programmes of a tea house, textile market, micro-brewery and skill transferring workshops, contribute to the socio-economic regeneration of the site.

Fibre choice justification

Natural fibres as source for textiles

Hemp [Cannabis Sativa]

Hemp was chosen as a fibre due to its rapid growth in the absence of agro-chemicals (Camira 2012:4). Hemp, like flax and nettles, is classified as a bast fibre plant, making it ideal for the manufacturing of textiles (Camira 2012:2). Hemp is also classified as a 'mop crop' as it has the ability to remove heavy metals or other harmful pollutants from the soil (The Hill 2016) and in so doing restoring nutrients to the soil (Delaney & Madigan 2014:161). Although the crop cannot be harvested for consumable purposes after it has been used as a 'mop crop', it can be mixed with lime to produce a building material known as 'hempcrete'.

Due to the current pollution on site, the introduction of hemp as a means of phytoremediation is proposed. The hemp will therefore be planted in the soil before any construction can commence and after the soil has been replenished and phytoremediated, the hemp can then be used to make 'hempcrete' which can be used in the construction of the new proposed dye house. It is proposed that the hemp seeds be given to the essential oils factory for use there in order to contribute to industrial ecology and the minimisation of industrial waste.

Flax [Linum Usitatissimum]

Flax is believed to have been the first crop to be domesticated by humans (Textile learner 2011). Flax has 'superior high textile qualities' (Kozłowski & Mackiewicz-talarczyk 2012:100) and is used in the manufacturing of linen fabric.

According to the Republic of South Africa's Department of Agriculture, Forestry and Fisheries, (2012:1) flax has a variety of uses. Fibre flax and linseed are just some of the products derived from the same plant namely, Linum usitatissimum.

Flax fibre is used for textiles and makes use of the bast fibres of the linseed plant. Linseed oil is a wonderful source of Omega-3 fatty acids and is obtained from the brown seed of the same plant. It is proposed that the seeds be given to the essential oils factory for use there, in order to contribute to the industrial ecology on site.

Stinging Nettle [Urtica Dioica]

Nettles were chosen as one of the natural fibres to produce the eco-textiles due to their perennial nature, rapid growth rate and their ability to grow on brownfield sites (Camira n.d.:3). Nettles are extremely strong and elastic bast fibres, with natural fire retardant properties, which make them ideal for textile manufacturing (Camira n.d.:4). Nettles need no pesticides or herbicides as the plants have a powerful sting which protects them whilst at the same time creating their own unique ecosystem by attracting various birds, butterflies, frogs and even rabbits (Camira n.d.:3). Nettles also have medicinal properties and can be used to flavour tea, beer or soup (Camira n.d.:1).

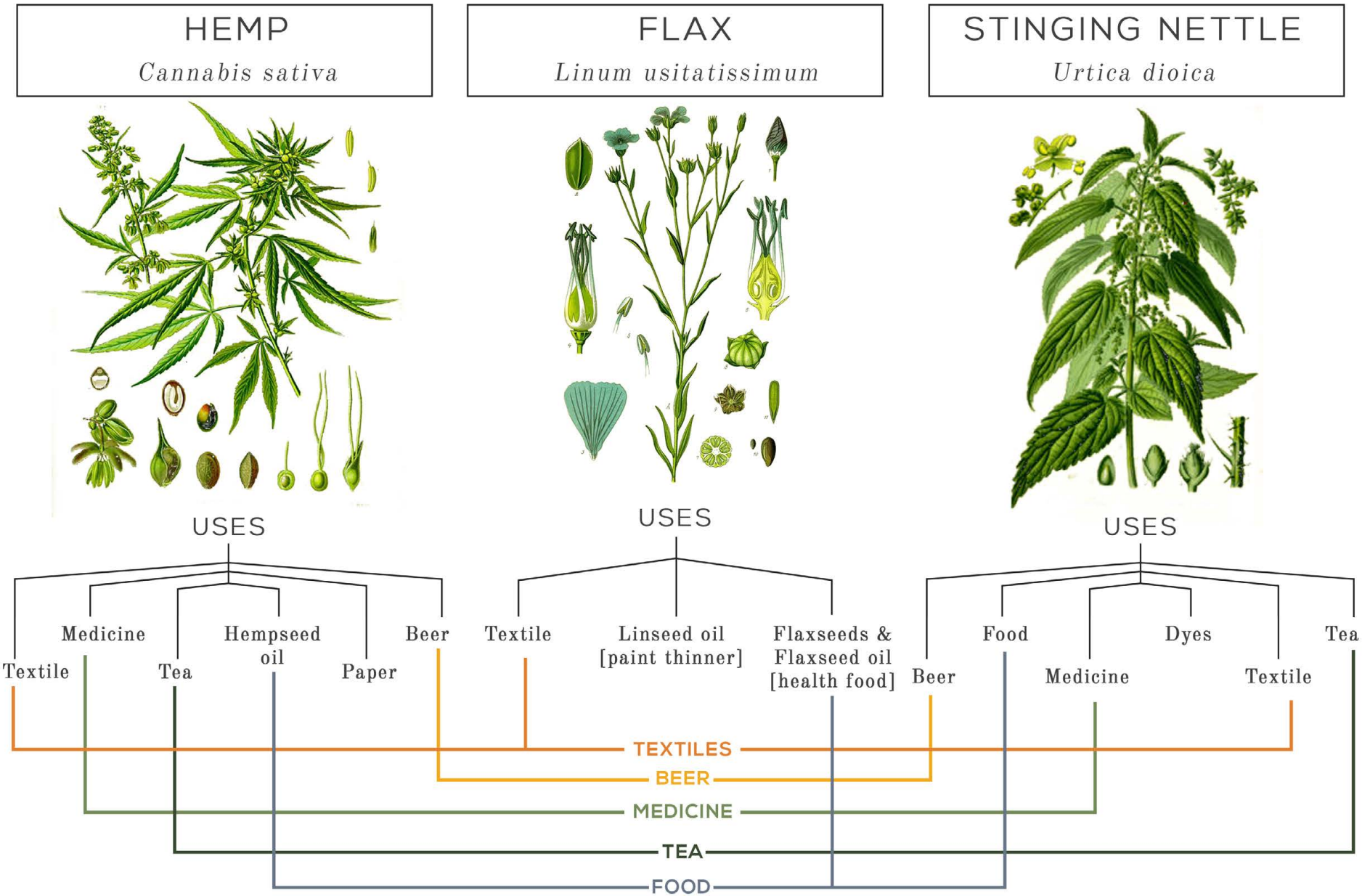


Figure 4.8: Fibres and their uses (Author 2017)

The textile making process

Retting

This process involves the breaking down of the 'gummy substances' (Horne 2012:125) that bind the fibres together. This helps to separate the fibres from the woody part of the hemp's stem more easily (Horne 2012:126). Water retting is just one of the numerous methods of retting hemp fibres. According to Horne (2012:27) this method of retting produces the finest hemp fibres in the shortest amount of time.

Scutching

After the retted fibres have been dried they reach the first stage of the mechanical process. This process involves the breaking down of straw in order to loosen the fibre from its woody core. This is achieved through the use of a machine comprising a series of rollers, which crushes the straw along its length (Horne 2012:131).

After the straw has been crushed it is ready for the scutching stage of the process. The primary purpose of this stage in the process is to remove the remaining hurd that has been loosened by the retting and mechanical breaking processes, but is still attached to the plant fibres. The scutching process ensures softer fibres and this is achieved by sending the fibres through a machine with turbine blades that beat the fibres (Horne 2012:132).

Hackling

This process is used particularly in flax fibre preparation. This process involves the separation of the long fibres from the shorter fibres. This is achieved by combing the fibres over a hackle, a structure with pins or nails embedded in it (All Fibre Arts 2015) or a hackling frame. This process aids in removing any remaining hurd or short fibres and helps in the disentangling and straightening of the fibres (Horne 2012:138).

Spinning

Spinning – Hemp fibre can be spun using either wet spinning or dry spinning. Dry spinning is more commonly used as wet spinning can be a costly process. The fibres are spun into yarn which can be woven to produce textiles (Horne 2012:139).

Weaving

Weaving – Is the process that involves the interlacing of yarn on a loom in order to form fabric (Merriam-Webster 2017).

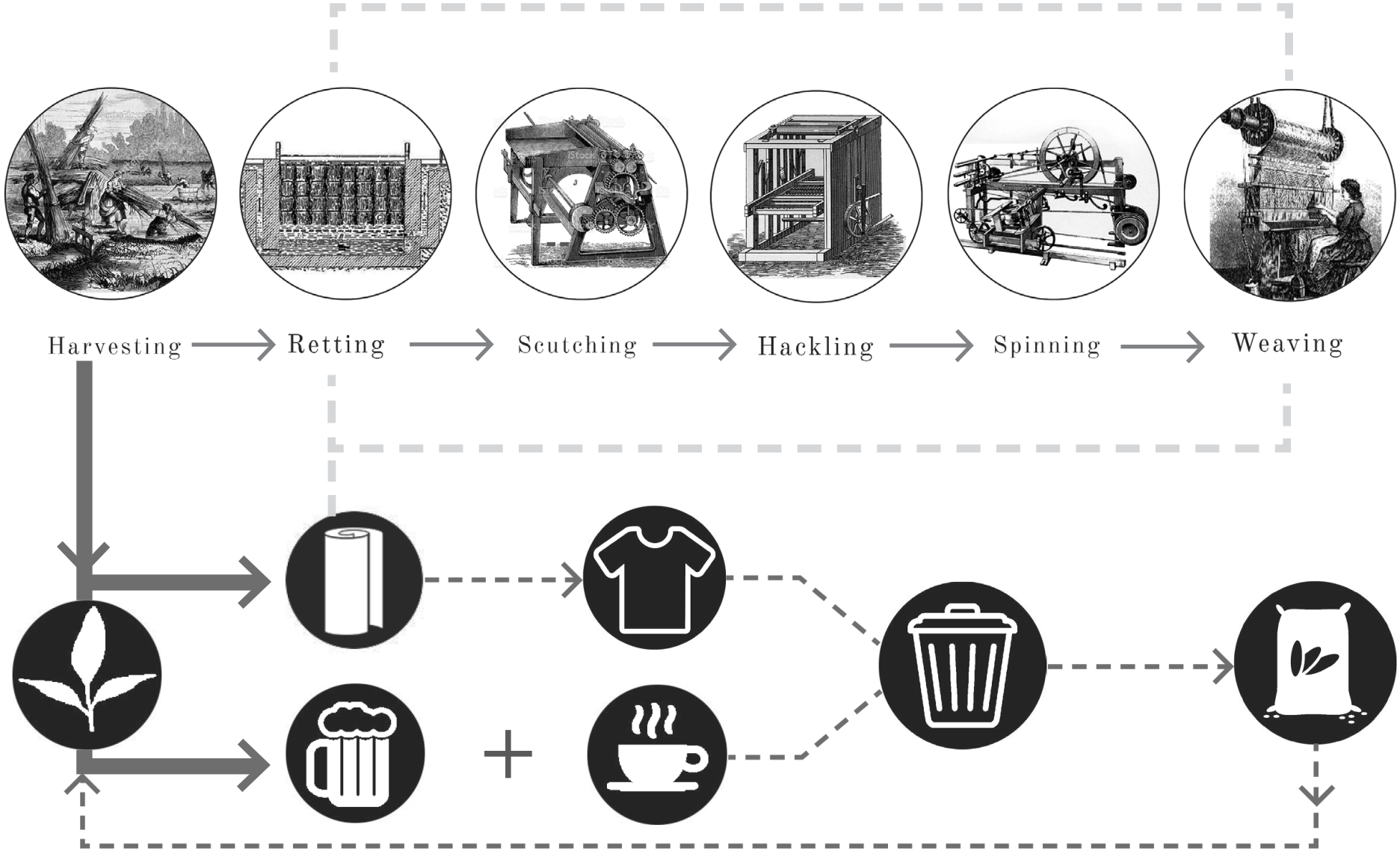


Figure 4.9: Textile manufacturing process as a closed loop system (Author 2017)

Vegetable dye colour chart

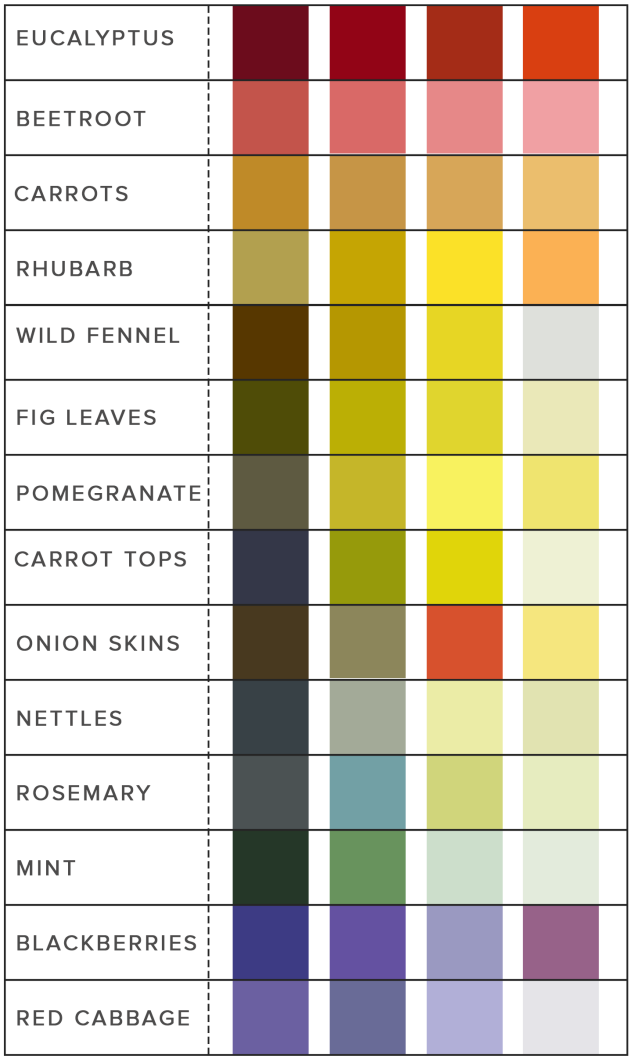


Figure 4.10: Vegetable dye colour chart (Compiled by Author based on Sasha Duerr's Seasonal Color Wheel 2013)

Natural Dyeing

A new but old approach

As the demand for textiles increases, so does the amount of wastewater produced by textile mills and inadvertently the amount of environmental pollution (Khan & Malik 2013:55). Most textile mills make use of harmful chemicals that cause not only environmental problems but health issues as well. Among these harmful chemicals excreted by textile mills, artificial dyes are considered to be the most worrisome.

Most environmental problems, caused by the textile industry, are as a result of untreated dye effluent being discharged into water sources. The effluent containing toxic chemicals causes havoc in the water ecosystems, as these chemicals decrease the oxygen in the water and prevent light from penetrating. Textile effluent is renowned for causing environmental degradation and illness in humans. Many heavy metals can be found in the effluent from textile mills, which is a major concern as these metals are not biodegradable and if ingested can accumulate in the body's major organs causing numerous diseases. It is evident that if this textile effluent is left untreated it will continue to cause harm to terrestrial and aquatic life due to the effects of these toxins, polluting natural ecosystems and inducing health issues.

The answer to these pressing issues lies in the traditional methods of dyeing textiles. Various plants and vegetables, even vegetable skins and offcuts, can be used in the dyeing process. The proposed dye house will make use of plant materials as dye pigment in order to break the pollutive cycle of conventional textile dye houses. Due to the natural composition of the dyes, the water can easily be purified and re-used after a dye cycle has occurred.

Closed loop system

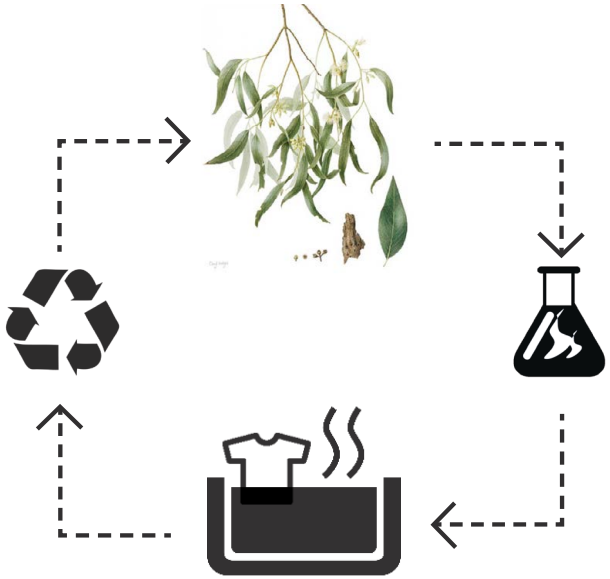


Figure 4.11: Natural deying closed loop system (Author 2017)

Herbal dye colour chart

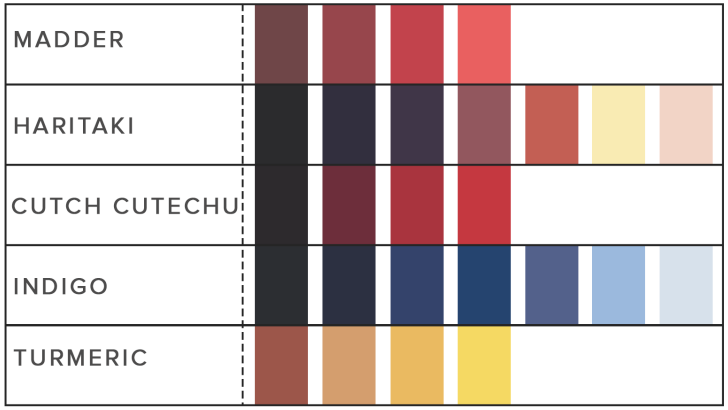


Figure 4.12: Herb dye colour chart (Compiled by Author based on Photoganic herbal dye info 2015)

The natural dye process

Desizing is the first step in the natural dyeing process (Photoganic 2015). This involves soaking the fabric in sea salt water to remove any of the oils or gums applied to the fabric during the weaving process.

After the fabric has been desized, it is **bleached** through the application of a natural bleaching mixture of grass and manure. The fabric is then placed in direct sunlight to complete the bleaching process.

The next step in the process involves the treatment of the fabric with a natural **mordant** such as salt or lemon juice. This ensures that the dye is fixed to the fabric.

Natural **dye is prepared** by boiling the natural plant material in water and letting it cool overnight. It is proposed that all dye mixtures be prepared in the dye laboratory with source materials grown on the site.

After the mordanting process, the fabric is **dyed** with the natural or plant dye by immersing it in a dye pit. Once the fabric has been dyed, it is rinsed and then **finished** off by sprinkling it with water while stretching it on hand rolls.

Graphic representation of natural dyeing process

1. Harvesting plants for dye

2. Preparing and sorting plants for dyes

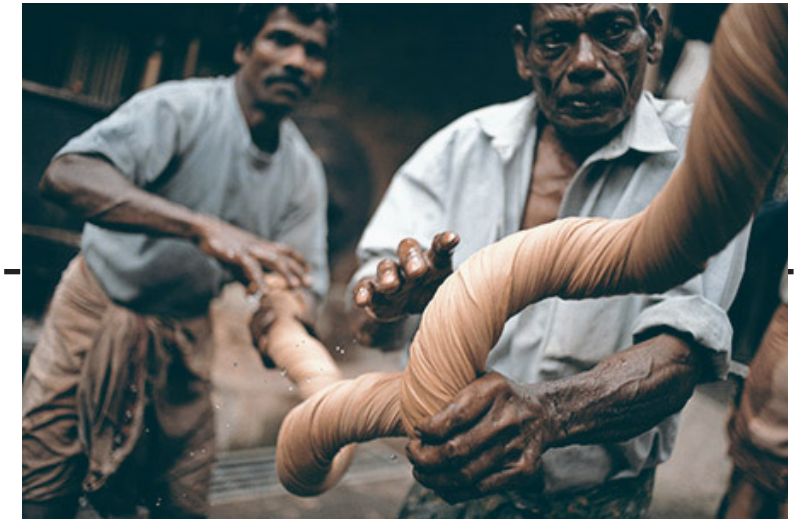
5. Dyeing fabric

6. Fabric soaking in dye

Figure 4.13: Natural Dyeing Process (Five Elements Eco Designs 2012, edited by Author)

3. Mordanting fabric with natural mordants

4. Preparing dye mix



7. Finishing process

8. Drying fabric outdoors

Figure 4.14: (Colouricious 2014)

Spatial requirements

SPACE	FUNCTIONAL REQUIREMENTS	USER EXPERIENCE	USERS	AREA (M²)
ECO-TEXTILE MILL				
THRESHING ROOM				120
STORAGE ROOM	HEMP STORAGE ROOM FLAX STORAGE ROOM NETTLE STORAGE ROOM			35
DRYING ROOM				30
SCUTCHING & HACKLING ROOM				30
SPINNING ROOM				375
SORTING & STORAGE OF TEXTILES				375
STAFF CHANGING ROOM	FEMALE [20] - 4 WCs; 5 WHBs; 2 SHWRS; - 20 x LOCKERS MALE [45] - 6 WCs; 6 URINALS; 7 WHBs; 3 SHWRS - 45 x LOCKERS			375
DYE HOUSE & ADMINISTRATION				
RESTROOMS (SHARED WITH STUDIOS)	FEMALE: - 4 WCs; 4 WHBs, - 1 UNISEX DISABLED WC MALE: - 2 WCs; 3 URINALS, 5 WHBs			16 16
STAFF KITCHEN	BASIN			20
STAFF RELAXATION [TERRARIUM]	SEATING			130
DYE HOUSE	2 x DESIZING TANKS 2 x DYEING PITS 2 x OUTSIDE DRYING RACKS			276
DYE LABRATORY	STORAGE BASINS GAS SOURCE FOR HEATING			85

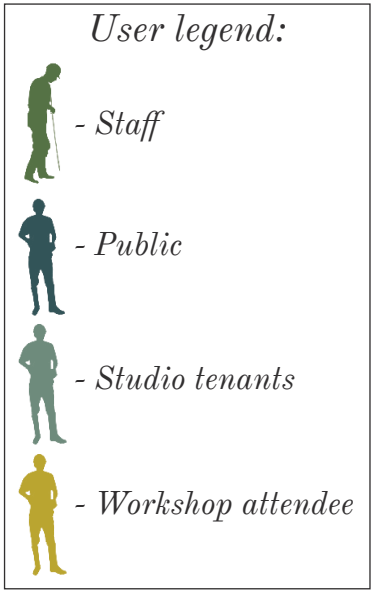


Figure 4.15: Spatial requirements table A (Author 2017)

SPACE	FUNCTIONAL REQUIREMENTS	USER EXPERIENCE	USERS	AREA (M²)
SKILLS TRAINING & RENTABLE SPACE				
WORKSHOPS	WORKSHOP 1 WORKSHOP 2 WORKSHOP 3			70 70 70
RESTROOMS	FEMALE; - 3 WCs; 4 WHBs; - 1 DISABLED WC MALE: - 3 WCs; 4 WHBs; - 1 DISABLED WC			20 20
RENTABLE STUDIOS	STUDIO 1 STUDIO 2 STUDIO 3 STUDIO 4			25 25 25 25
SOCIAL SPACES				
MICRO BREWERY [70 SEATS]	BREWERY TASTING ROOM KITCHEN			55 95 15
TEA HOUSE	KITCHEN TASTING ROOM RESTROOMS FEMALE: - 2 WCs; 2 WHBs - 1 UNISEX DISABLED WC MALE: - 2 WCs; 2 WHBs REFUSE YARD			30 145 10 10 15
ECO-TEXTILE MARKET				
MARKET	INDOOR OUTDOOR RESTROOMS FEMALE: - 4 WCs; 4 WHBs; 1 DISABLED WC MALE: - 2 WCs; 4 URINALS; 3 WHBs - 1 DISABLED WC			410 190 20 20

User experience:
(connection to nature or industry)

 - *Smell*

 - *Taste*

 - *Touch*

 - *Hearing*

 - *Sight*

Figure 4.16: Spatial requirements table B (Author 2017)