Textile waste mapping in Morocco and Tunisia

DELIVERABLE DA.9 (final)
English version

switchmed

Funded by the European Union

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Reverse Resources

1. Introduction and methodology

This document is the final version of the mapping study of the textile waste value chain (post-industrial and pre-consumption) in Tunisia and Morocco, conducted by Blumine and Reverse Resources within the framework of the SwitchMed/MedTest III initiative launched by UNIDO.

The study includes:
o an estimate of the volumes of waste generated by the textile and clothing industry in Morocco and Tunisia by fiber, quality sector and region
o an assessment of the current and potential destinations of textile waste
o a description of the current and potential waste management and recycling value chain
o an analysis of the international scenario in the field of textile waste management
o an analysis of the evolution of textile recycling technologies and current developments
o finally, an elaboration on the more suitable business models from which to select potential pilot cases for the two countries

The methodology for the quantitative estimation of waste, the assessment of current waste destinations and the description of the current and potential waste management and recycling value chain, is based on two main pillars:

1. A survey of a large sample of enterprises, for the collection and analysis of the ratio of waste to materials processed in production in the different sectors of the textile-clothing sector and other qualitative information useful for better understanding the waste management methods of textile and clothing enterprises
2. The creation of an accounting model of physical production flows in the textile-clothing supply chains of both countries: from the availability and import of raw materials, yarns and fabrics, to the production of clothing.

ESTIMATION OF THE WASTE/MATERIAL RATIO

The parameter of the waste/material ratio is estimated by subsector: spinning, weaving, cutting fabrics, manufacture of garments using the information collected from the 100 companies involved in the mapping survey, supplemented by information acquired in other countries.

Given the objective is to estimate an average annual production of waste over the years, changes in the volumes of material stocks are not taken into account and are set at zero in the model.

The waste/material ratio is applied to the volume of fibers processed and the amount of waste generated is calculated at each stage of the supply chain.

Waste/material ratio and waste management information

THE PRIMARY DATA COLLECTION CAMPAIGN

(1) **Target:** all textile and clothing companies
Objective: to extend data collection
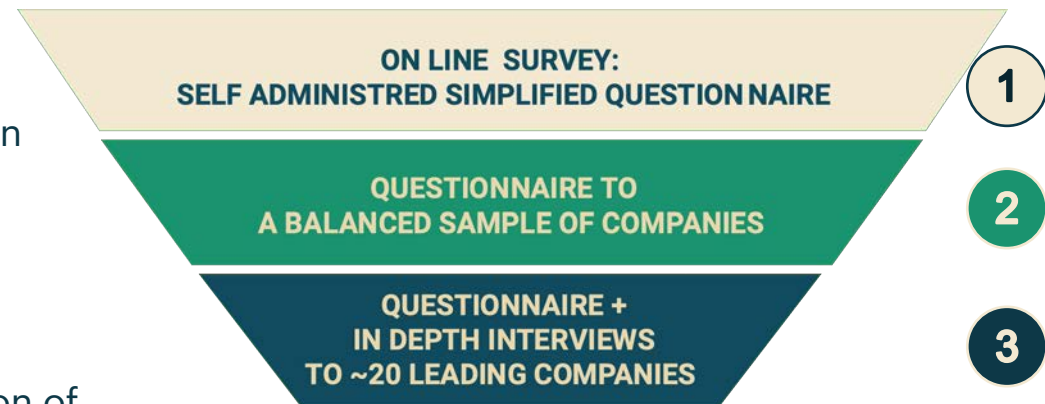**Method:** short on-line questionnaire

(2) **Target:** a balanced sample by sector and size
Objective: to collect richer information, to add qualitative information,
Method: detailed questionnaire in the form of an interview

(3) **Target:** 20 leading companies
Objective: to understand the practices, the challenges and the opportunities
Method: in-depth interview with the participation of the team of international experts. Quantitative data collection + qualitative information, views and perspectives

A THREE-LEVEL FUNNEL STRUCTURE

(1) ON LINE SURVEY:
SELF ADMINISTRED SIMPLIFIED QUESTION NAIRE

(2) QUESTIONNAIRE TO
A BALANCED SAMPLE OF COMPANIES

(3) QUESTIONNAIRE +
IN DEPTH INTERVIEWS
TO ~20 LEADING COMPANIES

Source: *Blumine and Reverse Resources*

RESULT AND EVALUATION OF THE COLLECTION OF INFORMATION

The information collection campaign was blocked by the COVID outbreak in March 2020 when it became difficult if not impossible to contact companies to submit questionnaires or arrange interviews.

In mid-September, the campaign restarted among many difficulties that led to a lower-than-expected participation rate of companies. 100 textile companies were involved in both countries (54 in Tunisia, 46 in Morocco) as well as a total of 8 recycling/waste management companies.

Questionnaires
+ FACE-TO-FACE INTERVIEWS

26

100 COMPANIES INVOLVED

74 QUESTIONNAIRES COLLECTED
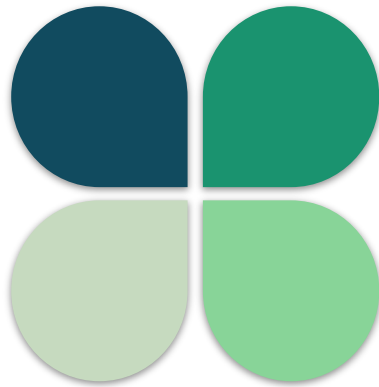
8 WASTE/RECYCLERS
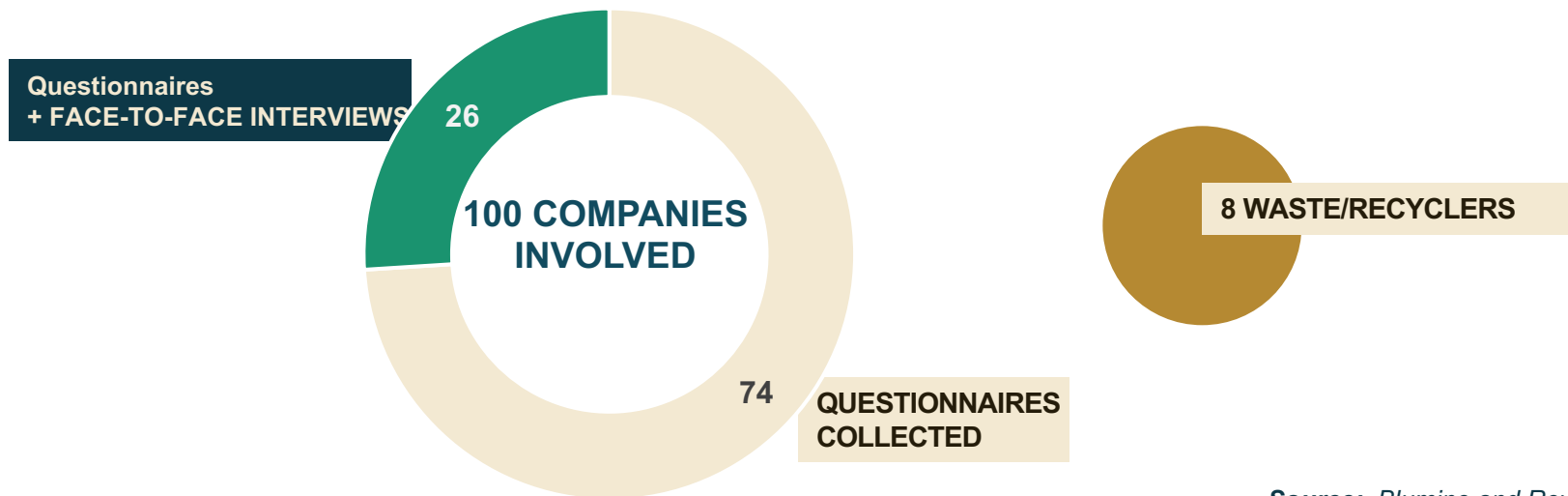
Source: *Blumine and Reverse Resources*

The two samples were merged into a single larger sample of 100 companies to estimate a common waste rate for each subsector for both countries.

THE PRIMARY DATA COLLECTION CAMPAIGN

The sample of enterprises selected for the 3 levels of the survey was extracted from lists created from the combination of different sources including:

- o **In Tunisia:** *The Agency for the Promotion of Industry and Innovation – API; latest available lists of public brand installations (Benetton, C&A, PVH, ASOS, Esprit, G-Star-raw, Next, Levi's, VF, Adidas)*
- o **In Morocco:** *AMITH database; list of exhibitors 2019 Morocco in Mode and Maroc Sourcing; latest available lists of public brand installations (Arcadia Group, Benetton, C&A, G-Star-raw, Inditex, John Lewis, Next, PVH, VF).*

COOPERATION OF NATIONAL FEDERATIONS OF THE TEXTILE AND CLOTHING INDUSTRY (AMITH IN MOROCCO AND FTTH IN TUNISIA)

The Blumine / Reverse Resources team acknowledge the support from AMITH (Moroccan Association of Textile and Clothing Industries) and FTTH (Tunisian Textile and Clothing Federation) for the help in compiling the lists of companies, organizing regional meetings, distributing the online questionnaire, as well as for the revision of documents and general support.

The findings of the mapping remain an independent estimate and by the Blumine/Reverse Resources team.
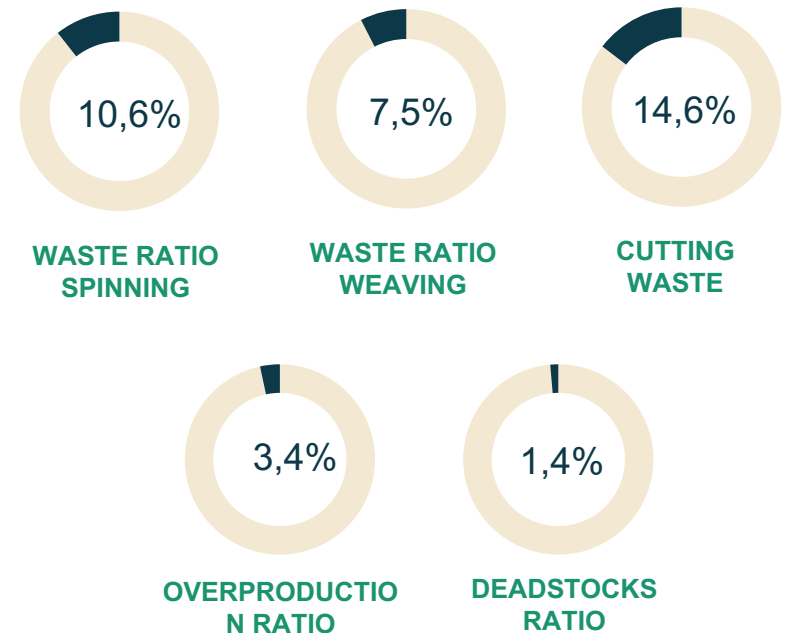
THE WASTE/MATERIAL RATIO BY SECTOR

The fabric cutting and spinning processes have the highest waste rate. The type of fiber strongly influences the waste rate, which is lower for synthetic fibers than for cotton.

Cotton waste generated in spinning is often reused in industry - for example, waste from combed cotton spinning is reused in carded cotton spinning.

The waste rates calculated here are the average for the different fibres.

Although dead stocks of clothing have increased dramatically with the COVID pandemic, the ratio considered in the study is the pre-pandemic level, considered a "normal level".

10,6%

WASTE RATIO SPINNING

7,5%

WASTE RATIO WEAVING

14,6%

CUTTING WASTE

3,4%

OVERPRODUCTIO N RATIO

1,4%

DEADSTOCKS RATIO

Source: *Blumine and Reverse Resources estimates*

Ratio of waste to transformed material

MATERIAL FLOWS ANALYSIS

The method of material flow analysis is an accounting technique to track the physical in/out flows of material into and from the reference system and on the principles of mass conservation(*) (see diagram on the next page)

- The boundaries of the system in question are the national clothing sector in each country.

- At each stage of the supply chain, imports of raw materials and semi-products are the flows into the system.

- At each stage of the supply chain, exports, waste of the chain, retail sales on the domestic market and exits to other industrial sectors are the outflow from the system.

- The materials that remain inside the system are transformed and used in the next stage in the chain.

(*) The accounting of physical flows, is based on the work carried out by the World Resource Institute at the end of the 1990s and subsequently adapted for European countries by Eurostat through the methodology "Economy-Wide Material Flows Accounts"

MATERIAL FLOWS ANALYSIS

A HIGH-LEVEL VIEW OF THE WASTE ESTIMATION MODEL

Source: *Blumine and Reverse Resources*
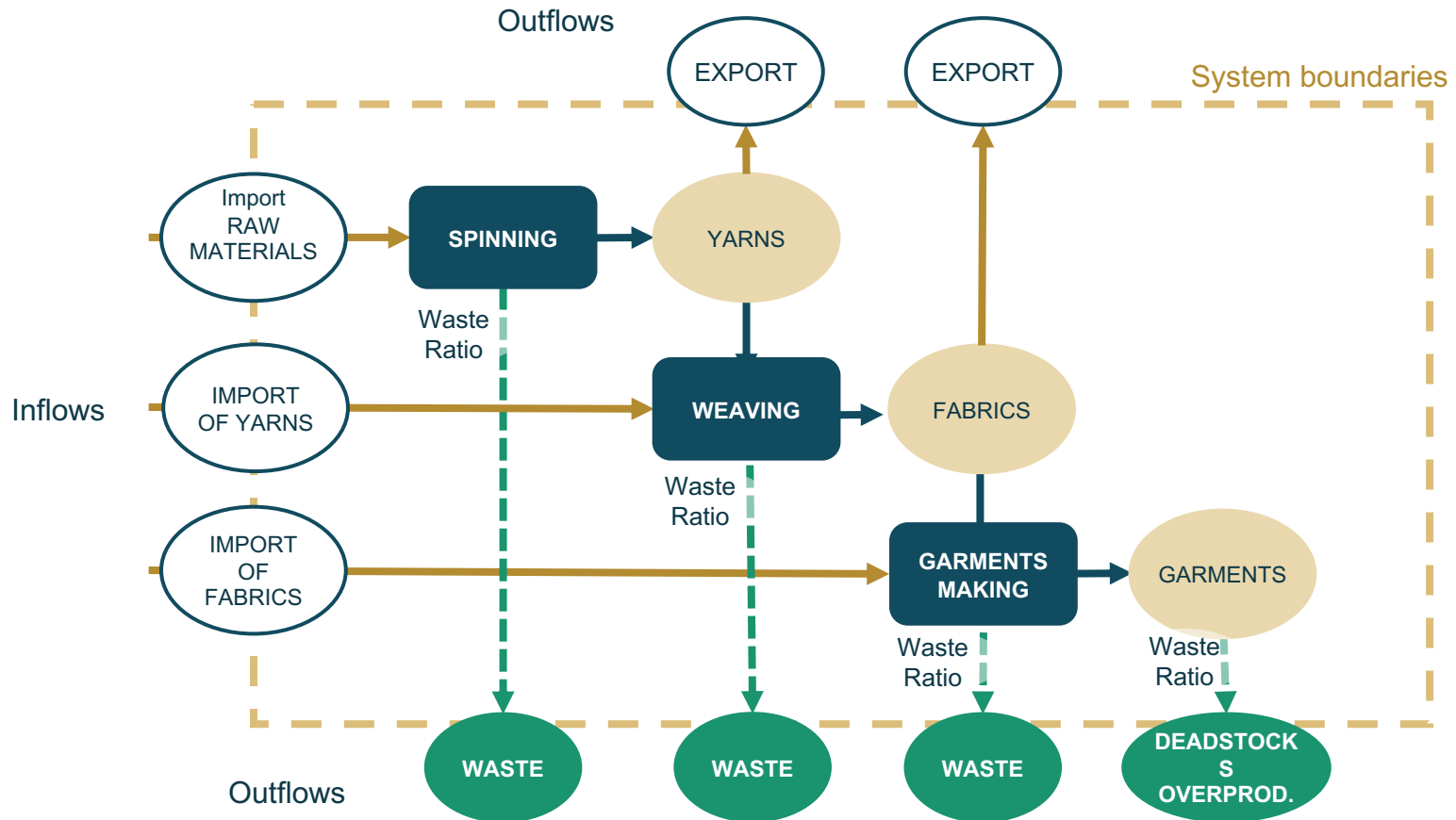
ASSESSING THE USES OF TEXTILE WASTE: THE WASTE HIERARCHY

The concept of waste hierarchy indicates an order of preference for actions aimed at reducing and managing waste and at maximizing the practical benefits - ecologically and economically - of products.

Waste prevention is the preferred option for waste hierarchy models adopted around the world (*).

However, as part of this waste mapping study, we are considering the best management of waste already generated.

When the waste is already generated, the most preferred option is re-use, followed by recycling (upcycling or downcycling).

Another dimension of the waste hierarchy adopted in the study is THE economic potential.

An assessment of the higher or lower value of the fibres produced with the recyclable waste has been implemented.

(*) see, for example, Directive 2008/98/EC of the European Parliament and of the Council or the waste management hierarchy of the United States Environmental Protection Agency.

USAGES CONSIDERÉS DANS LA CARTOGRAPHIE

PREVENTION

RE-UTILISATION

RECYCLING / UPCYCLING / DOWNCYCLING

RECUPERATION D'ENERGIE

MISE EN DECHARGE
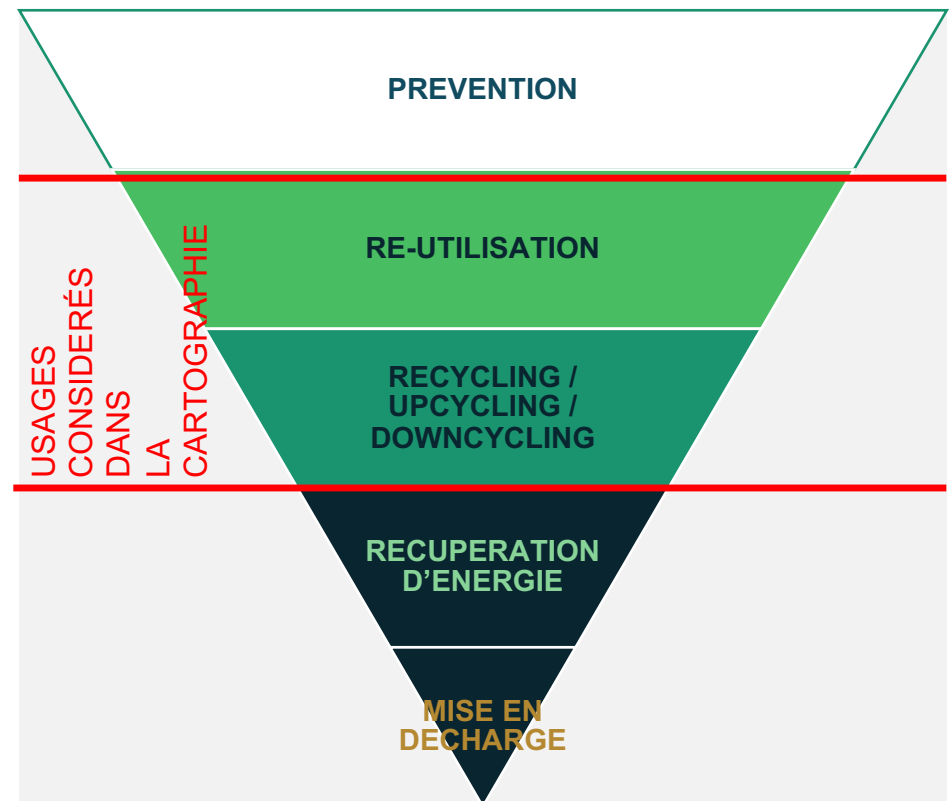
The top level of the waste hierarchy is reuse and includes dead stocks and overproduction of clothing.

The second level is recycling which, in turn, can be divided into two components:

o   higher-value recycling: textile to textile recycling with different technologies, candidate for the closed-loop project by brands.

o   lower-value recycling: candidate for downcycling in upholstery and mattresses or industrial symbiosis projects that target sectors such as nonwovens, automotive, furniture, construction and others

WASTE

Reusable waste   Recyclable waste

Deadstocks   Overproduction   Recyclable waste with higher value   Recyclable waste with lower value

Source: Blumine and Reverse Resources

TANGER

TANGER-TÉTOUAN-
AL HOCEÏMA

OUJDA

RABAT-SALÉ-
KÉNITRA

FÈS

RABAT

CASABLANCA

FÈS-MEKNÈS

CASABLANCA-
SETTAT

BÉNI MELLAL-
KHÉNIFRA

L'ORIENTAL

BÉNI MELLAL

ERRACHIDIA

MARRAKECH-
SAFI

MARRAKECH

DRÃA-TAFILALET

AGADIR

SOUSS-MASSA

GUELMIM

GUELMIM-OUED NOUN

LAAYOUNE

LAÂYOUNE-SAKIA
EL HAMRA

LAAYOUNE

DAKHLA-OUED
ED-DAHAB

2. | Waste mapping in Morocco
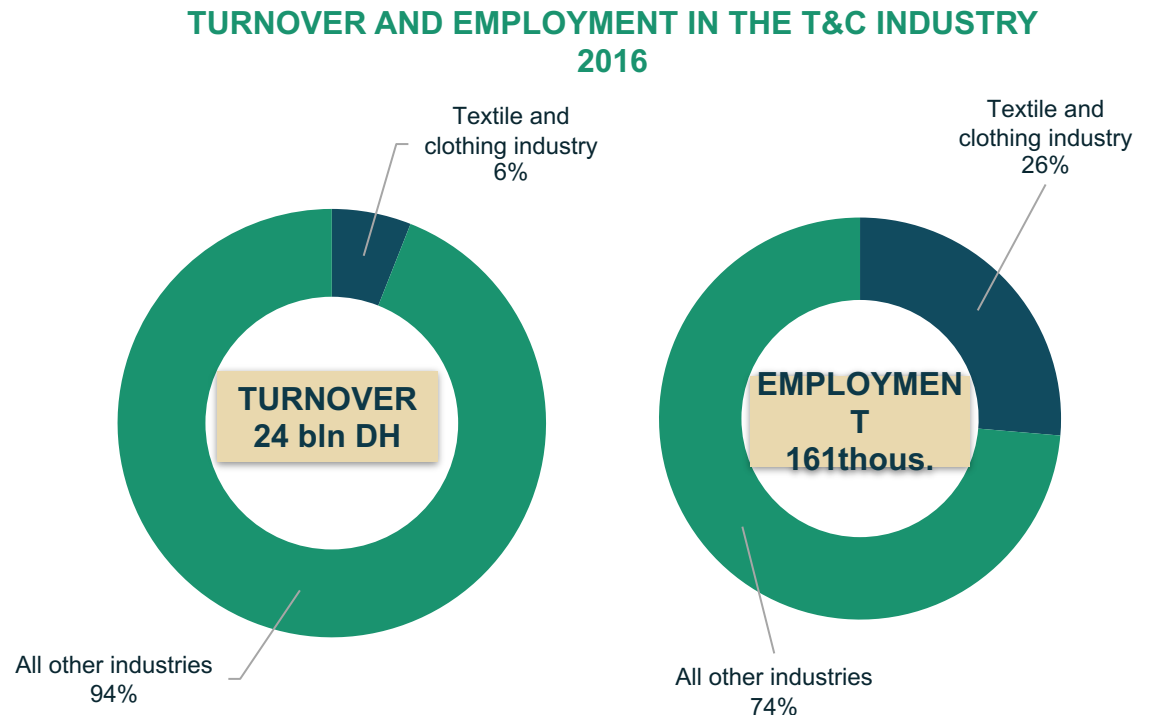
THE MOROCCAN T&C INDUSTRY

More than 1,100 companies produce a billion garments a year, more than half of them as brand subcontractors. *(source: AMITH)*

The textile and clothing sector is the largest industrial employer in Morocco, with more than 160,000 employees, representing 26% of industrial jobs.

In 2016, the annual turnover of the sector was DH 24 billion, or 6% of the total turnover of the country's industry.

It also accounts for 24% of Moroccan merchandise exports.

(source: Haut Commissariat au Plan, Annuaire Statistique du Maroc, 2019)

TURNOVER AND EMPLOYMENT IN THE T&C INDUSTRY 2016
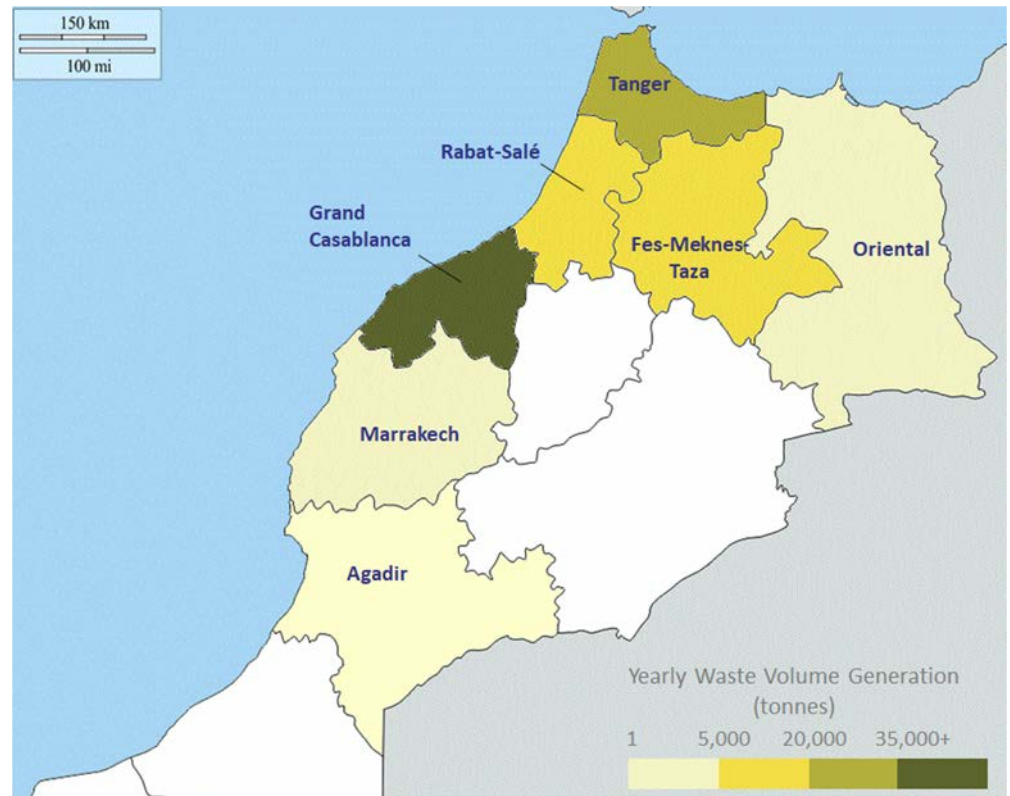
Textile and clothing industry 6%

TURNOVER 24 bln DH

All other industries 94%

Textile and clothing industry 26%

EMPLOYMENT 161thous.

All other industries 74%

Source: Haut Commissariat au Plan

KEY REGIONS OF THE T&C INDUSTRY IN MOROCCO

The T&C industry in Morocco is highly concentrated at regional level.

No updated statistics on the regional distribution of the T&C industry are available. Based on the data available for the most recent years (2014 and 2016), it can be estimated that between 70% and 80% of the entire Moroccan T&C industry is concentrated in two regions, Tangier and Casablanca.

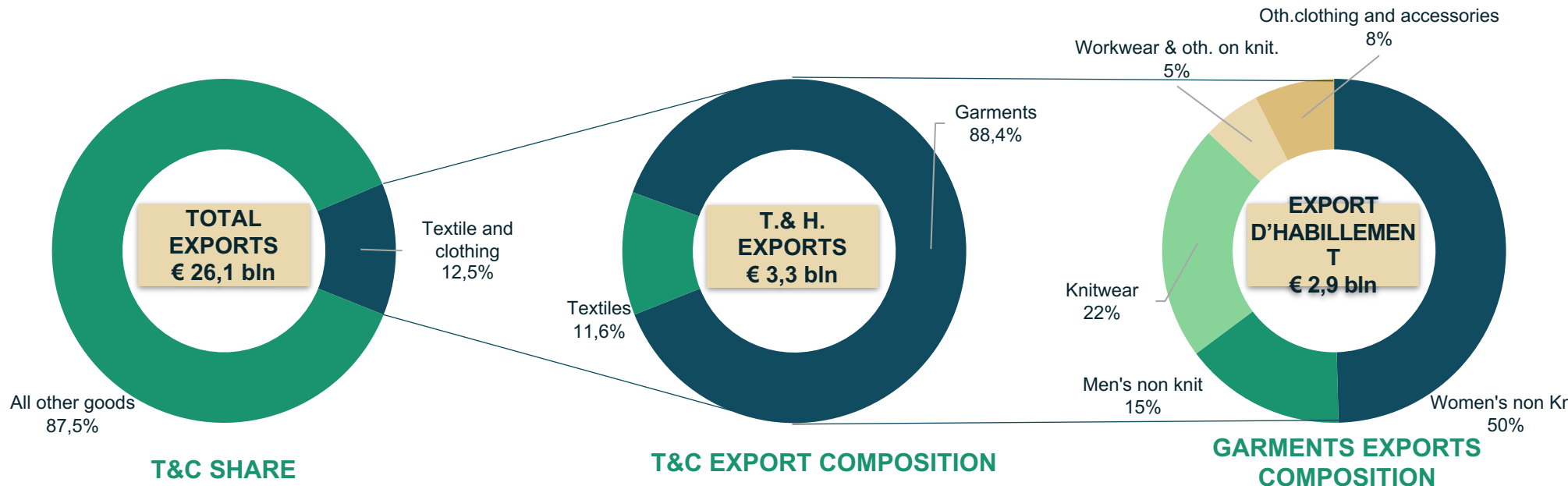Most of the remaining 20%-30% are in the regions of Rabat-Salé and Fez-Meknes

Source: Blumine and Reverse Resources

EXPORTS

With an export value of 3.3 billion euros in 2019, or 12.5% of the country's total exports, the textile and clothing (T&C) industry is one of the main export sectors in Morocco.

Clothing is by far the largest component of the T&C industry's exports with a value in 2019 of €2.9 billion, or 88% of the total.

Among garments, half of exports are women's clothing (not-knitted), 15% men's clothing (not-knitted) and 22% knitwear.

TOTAL EXPORTS € 26,1 bln

Textile and clothing 12,5%

All other goods 87,5%

T&C SHARE

T.& H. EXPORTS € 3,3 bln

Garments 88,4%

Textiles 11,6%

T&C EXPORT COMPOSITION

EXPORT D'HABILLEMENT € 2,9 bln

Oth.clothing and accessories 8%

Workwear & oth. on knit. 5%

Knitwear 22%

Men's non knit 15%

Women's non Kn 50%

GARMENTS EXPORTS COMPOSITION

Source: *Blumine & Reverse Resources calc. on UN Comtrade database*

TRADE BALANCE (physical volumes)

From the point of view of available resources, physical imports represent a contribution of materials to the local economy and physical exports a production of materials that cannot be used in the local economy.

In order to calculate the material flows within the Moroccan textile industry, the physical volume of textile imports and exports in 2019 was taken into account, which amounted to:
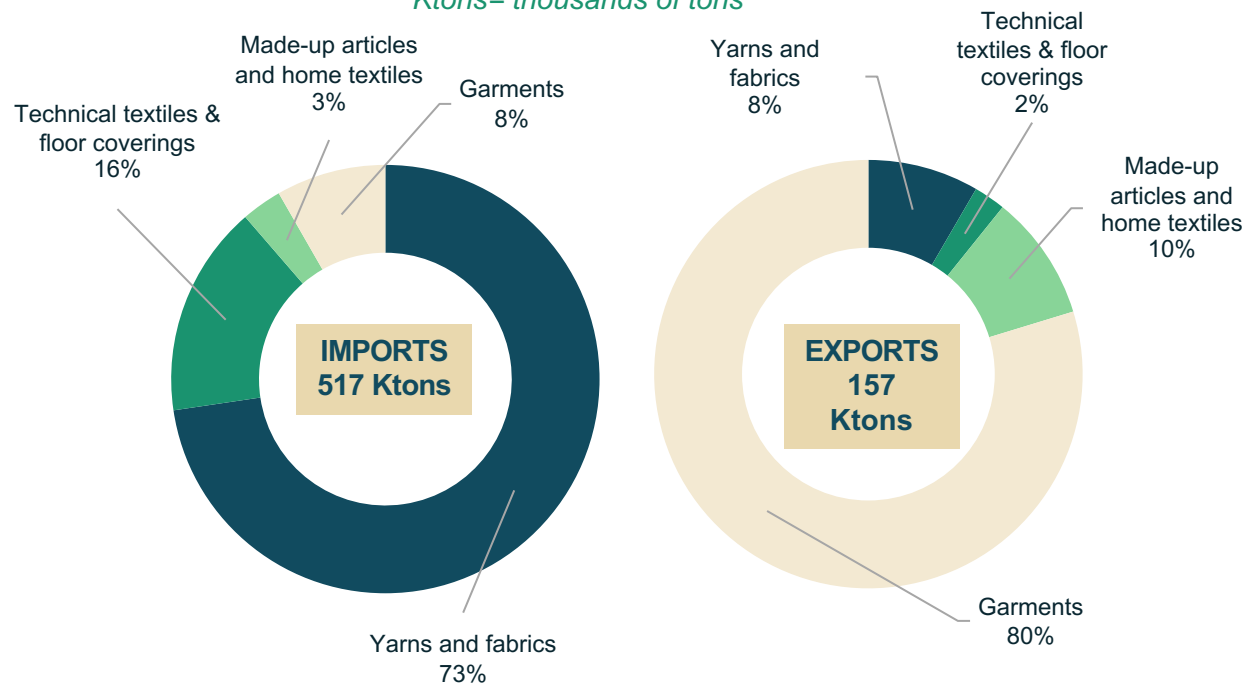
517Ktons of textile materials imported into the country:

o 376Ktons of yarn and fabric which have been transformed into other textile and clothing materials

o 83Ktons of yarns and technical fabrics used in the manufacture of industrial products and floor coverings

o 16Ktons of made-up articles and household textiles

o 43Ktons of clothing

157Ktons of textile and clothing materials exported from the country

TRADE IN TEXTILES AND CLOTHING. 2019

Ktons= thousands of tons

Made-up articles and home textiles 3%
Garments 8%
Technical textiles & floor coverings 16%
IMPORTS 517 Ktons
Yarns and fabrics 73%

Yarns and fabrics 8%
Technical textiles & floor coverings 2%
Made-up articles and home textiles 10%
EXPORTS 157 Ktons
Garments 80%

Source: Blumine & Reverse Resources calc. on UN Comtrade database

TEXTILE MATERIAL FLOWS IN THE MOROCCAN TEXTILE AND CLOTHING INDUSTRY – 2019
Tons
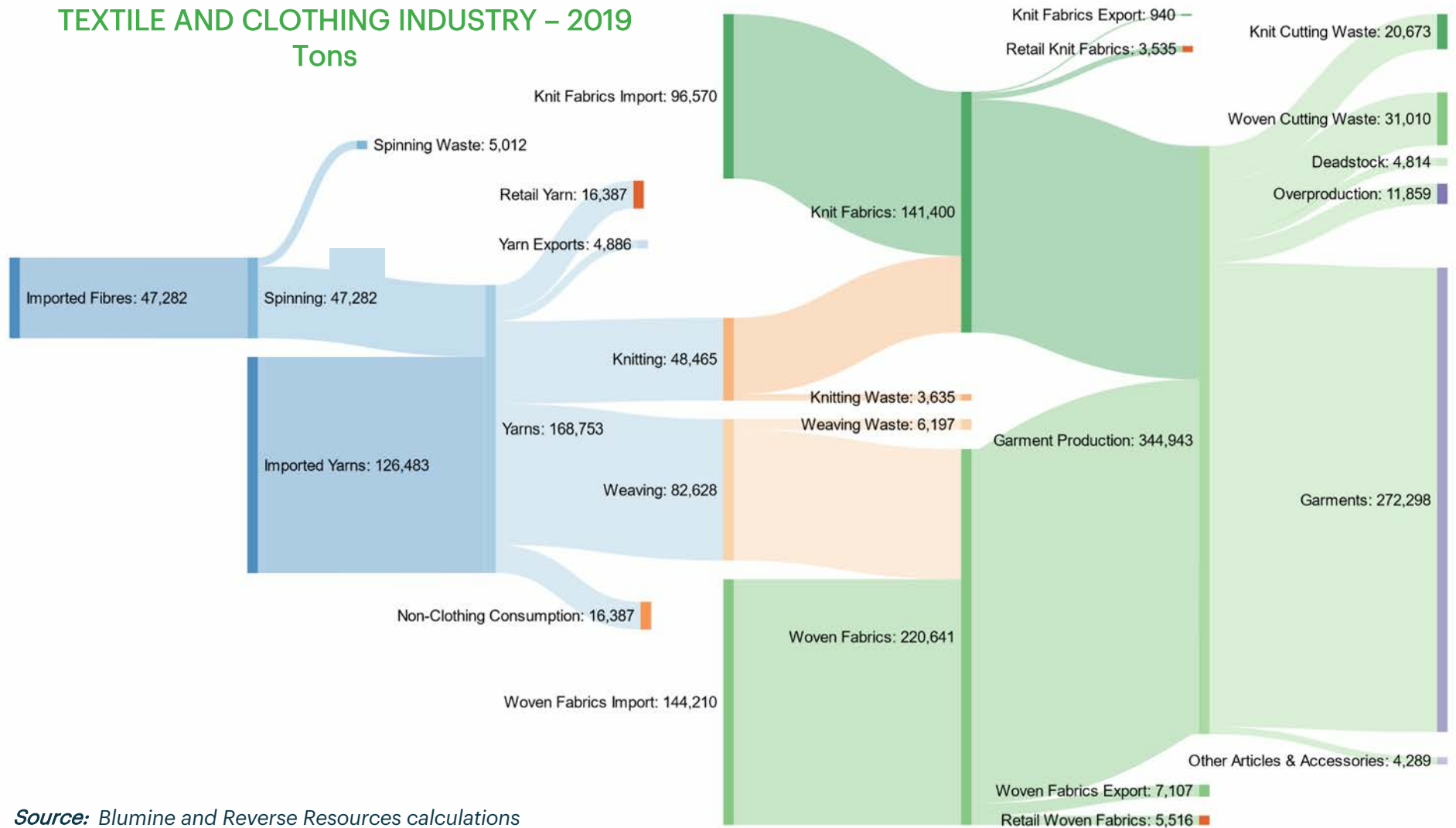
Source: Blumine and Reverse Resources calculations

TEXTILE MATERIAL FLOWS IN THE MOROCCAN TEXTILE AND CLOTHING INDUSTRY – 2019

Ktons = thousands of tonnes

FIBRES

47.3ktons of textile fibers were imported into Morocco in 2019.

YARNS

42.3Ktons of fibre were spun by the domestic spinning sector, in addition to 126.5Ktons of imported yarn. 5Ktons of yarn were exported, 16.4Ktonnes made up for retail sale and 16.4Ktons for non-clothing end-uses. The remaining 131ktons are available for the domestic weaving or knitting industry.

FABRICS

121.3Ktons of woven or knitted fabrics were manufactured, in addition to 240.8Ktons of imported woven or knitted fabrics. 8.1Ktons are for export and 9.1Ktons for retail sale. The remaining 344.9Ktonnes of fabrics available for the manufacture of clothing and home textiles

GARMENTS

293.2Ktons of clothing, were made from available knitted or woven materials, of which 16.7Ktons remained in the warehouses as dead stock or overproduction. 51.6Ktons are cutting waste

Source: Blumine & Reverse Resources calc. sur base de donnés UNComtrade

BY FIBRE

About 1/4 of the waste consists of pure fibers: pure cotton, pure synthetic other pure fibers.

Almost half of the total, however, are cotton blends that can be more difficult to value.

Ktons= thousands of tons

- Manmade cellulosics(*) 6%
- Other Synthetics 6%
- 100% Cotton 14%
- Poly-rich blends 17%
- **TOTAL 83,2 ktons**
- Cotton rich blends 42%
- 100% Polyester 10%
- Other Natural fibres 5%
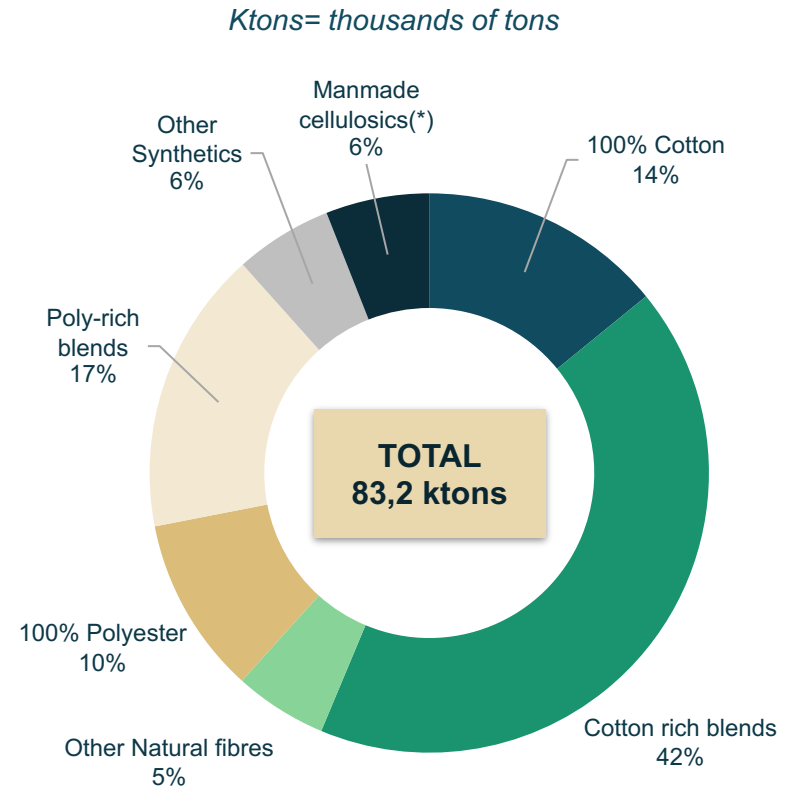
(*) viscose, lyocell, cupro, acetate
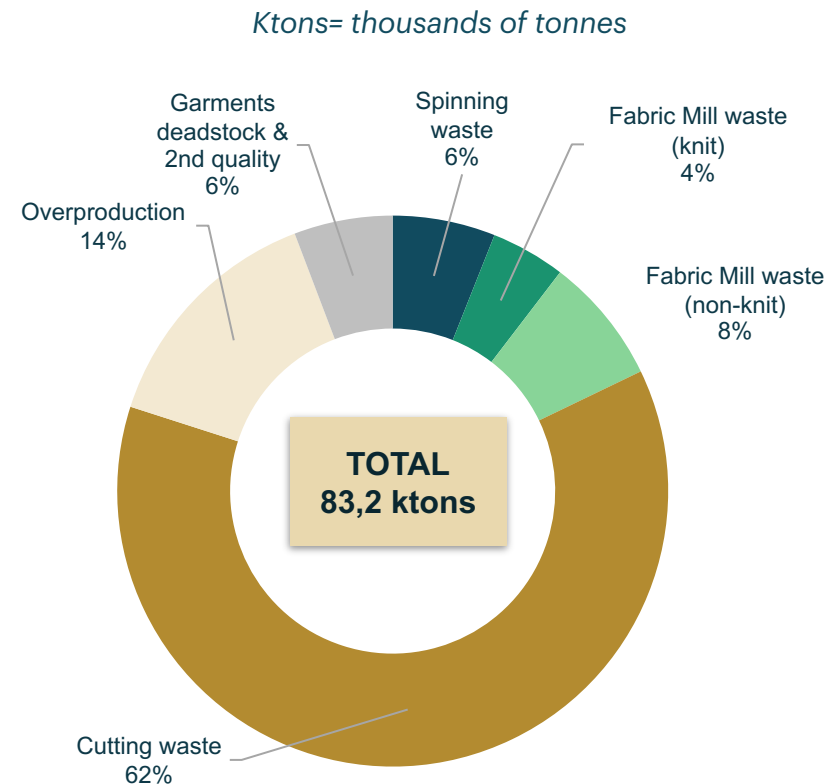
Source: Blumine & Reverse Resource estimates

BY PROCESS

More than 60% of the total textile waste generated by textile processes is cutting waste.

Given the availability of knitted and non-knit fabrics in the supply chain, we can estimate that non- knit cutting waste is about 31Ktons per year and knitting cutting waste is about 21Ktons.

A significant proportion of spinning waste (which accounts for 6% of total textile waste) is already reused in both textile and non-textile processes.

At the other end of the spectrum, an interesting 20% of total waste is made up of finished products, whether deadstock or overproduction.

Ktons= thousands of tonnes

Garments deadstock & 2nd quality
6%

Spinning waste
6%

Fabric Mill waste (knit)
4%

Overproduction
14%

Fabric Mill waste (non-knit)
8%

TOTAL
83,2 ktons

Cutting waste
62%

Source: Blumine & Reverse Resources estimate

In clothing activities, each year are generated:

51.6Ktons of cutting waste
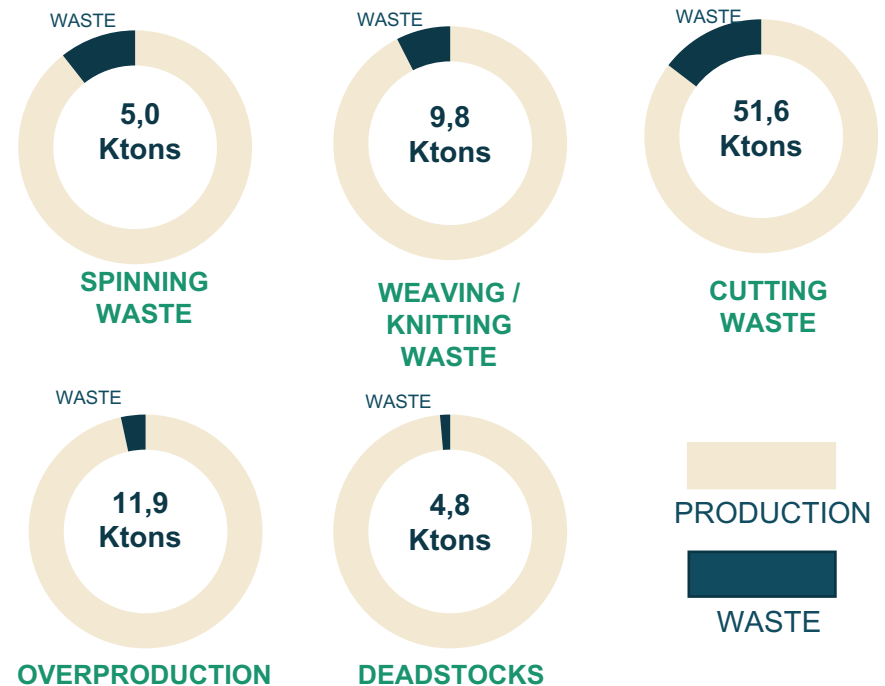
11.9Ktons of overproduction

4.8Ktons the deadstocks

VOLUME OF WASTE BY SUB-SECTOR
Ktons= thousands of tonnes

WASTE
5,0 Ktons
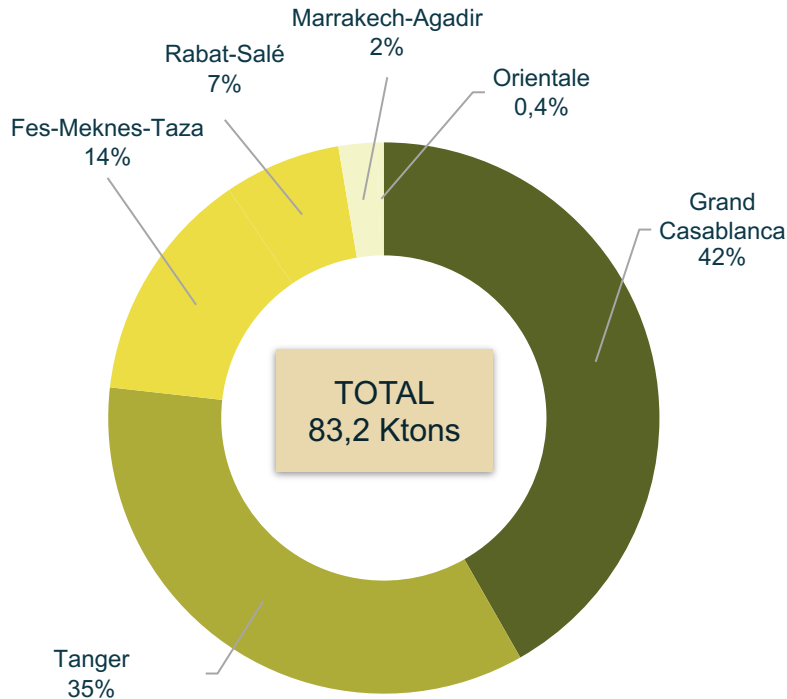**SPINNING WASTE**

WASTE
9,8 Ktons
WEAVING / KNITTING WASTE

WASTE
51,6 Ktons
CUTTING WASTE

WASTE
11,9 Ktons
OVERPRODUCTION

WASTE
4,8 Ktons
DEADSTOCKS

PRODUCTION

WASTE

Source: Blumine & Reverse Resources estimates

DISTRIBUTION PAR REGION
Ktons= thousands tons

Marrakech-Agadir 2%
Rabat-Salé 7%
Orientale 0,4%
Fes-Meknes-Taza 14%
Grand Casablanca 42%
TOTAL 83,2 Ktons
Tanger 35%

source: Blumine & Reverse Resources estimates

150 km
100 mi

Tanger
Rabat-Salé
Grand Casablanca
Fes-Meknes-Taza
Oriental
Marrakech
Agadir

Yearly Waste Volume Generation (tonnes)
1   5,000   20,000   35,000+
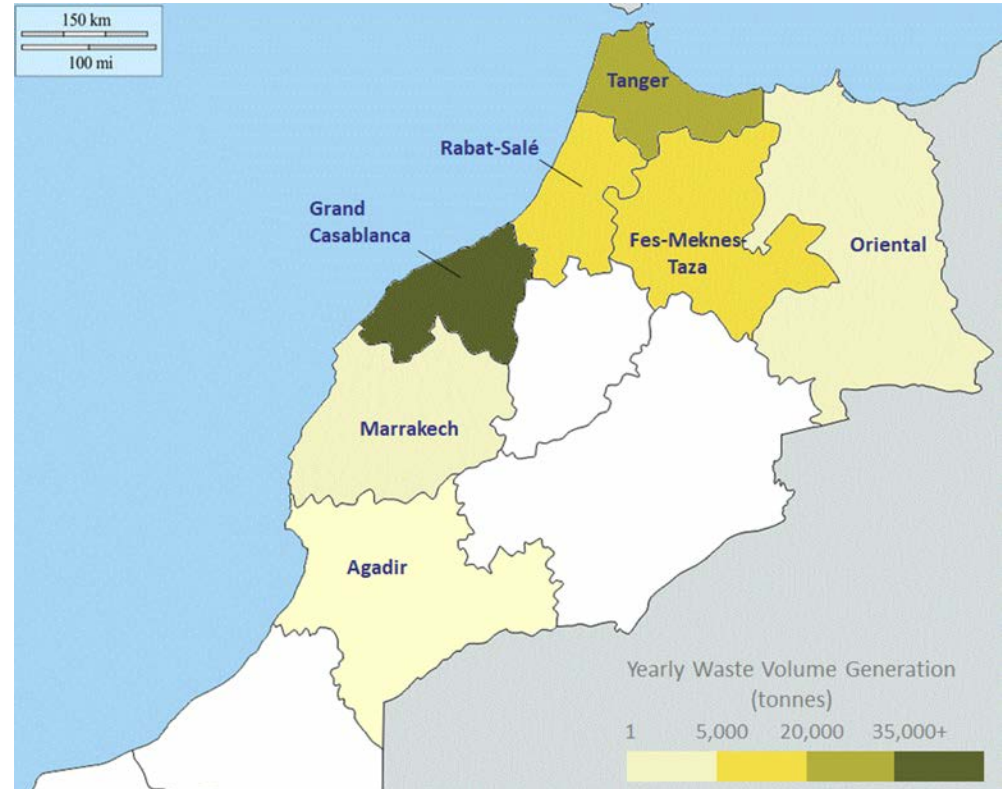
Transport and logistics costs can account for up to 30-40% of the cost of recycling.

Proximity to recycling facilities is therefore a key factor in the development of a recycling value chain.

More than 75% of textile waste in Morocco is generated in just two regions: Greater Casablanca and Tangier.

GEOGRAPHY AND WASTE LOGISTICS

The higher specialization in the Denim sub-sector – with heavier fabrics per m². – compared to the higher Tangier specialization in knitting – gives Casablanca an advantage in terms of the physical amount of waste.

In the Casablanca region, more than 7,000 tons of denim waste are generated each year, which represents nearly 80% of all denim waste in Morocco.

In the third row is the region of Fez-Meknes.

The 3 regions account for more than 90% of the country's textile waste production.
Tangier
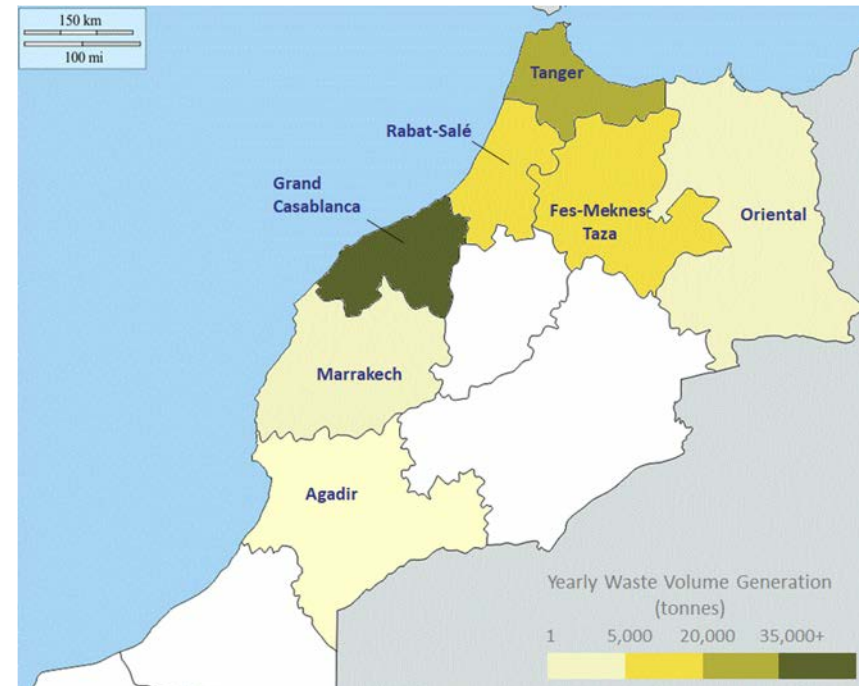
Source: *Blumine & Reverse Resources estimates*

The geographically concentrated structure of the Moroccan T&H industry is an asset to reduce waste transport costs.

In the Tangier Region, about 30Ktons of textile waste production per year are located over a maximum distance of 100Km, with a high concentration in three restricted places: Tangier, Tetouan and Larache.

Similarly, in the Greater Casablanca Region, about 35Ktons of textile waste production per year are located within a radius of 50 Km, around Casablanca.
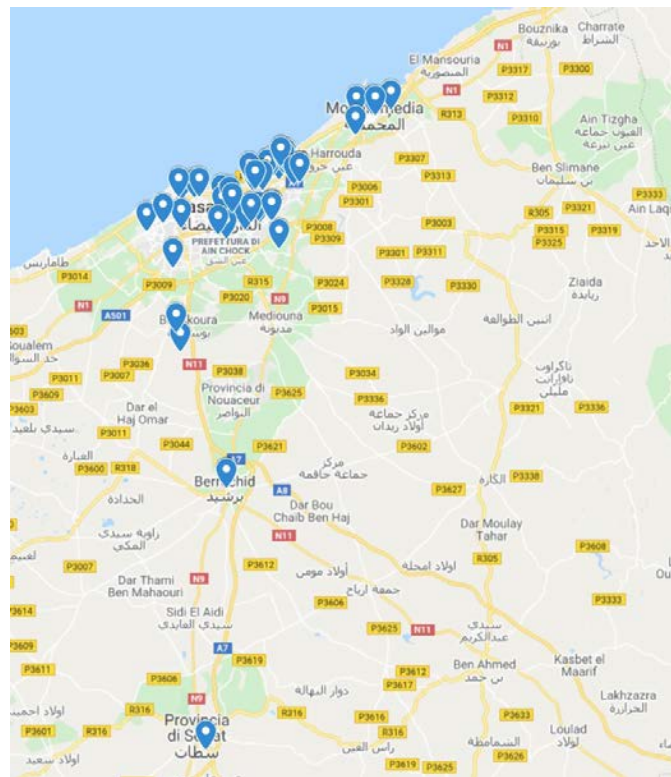
Grand Casablanca
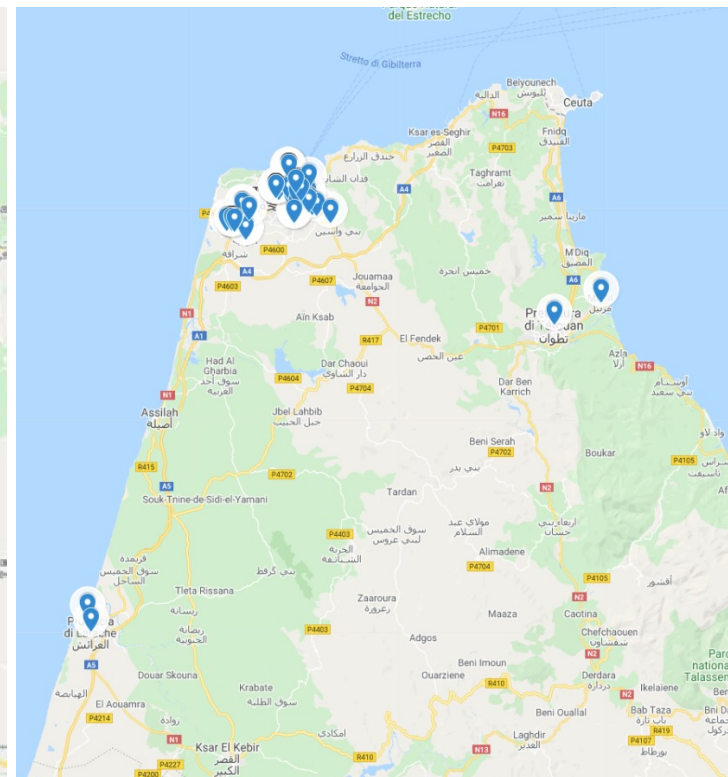
Tanger-Tétouan-Al Hoceïma

Cartes simplifiées couvrant un échantillon de 300 établissements dans le pays
Source: Blumine & Reverse Resources estimates

GRAND CASABLANCA

The industry is mainly composed of small businesses and old infrastructure, with a strong informal sector of management, and reuse of textile waste. The presence of felt and wadding producers and of pet into polyester fiber recyclers are a potential for the region.

TANGER

Good practices exists in the region, in terms of textile-to-fashion recycling and non-woven recycling, with the presence of leaders in the field.
The separation of waste in the factory can be improved.
There is the need to create a real waste market by generalising these practices and involving weaving factories.

RABAT – FES - MEKNES

The management of textile waste has become a real problem for local businesses. There is little storage capacity and little opportunity for recycling.
The traditional carpet industry used to be a destination for textile waste but has now almost disappeared.

What is the potential economic impact of developing a recycling value chain?

If we consider only the higher value textile waste available in the Casablanca region (100% cotton and cotton-rich waste) which accounts for about half of the total textile waste created in the region, there is about 22Ktons of waste per year.

Considering a segregation rate of 80% and a shredding facility capacity utilization of 75%, there is potential room for 8 shredding lines with modern and state-of-art technology: 7 operating at 75% capacity utilization, and one at 58%.

GRAND CASABLANCA

SIMULATION
100% COTTON +
COTTON-RICH
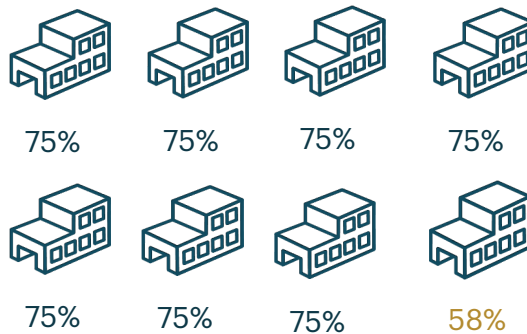
75%   75%   75%   75%

75%   75%   75%   58%

Scenario

✓ 80% of waste is sorted and recycled

✓ Modern shredding line with a capacity of 250 t/month (600-2,500 kg/h x 8 hours/day and 20 days/month)

✓ Maximum capacity utilization of 75%.

source: Blumine & Reverse Resources estimates

Considering only the higher value textile waste available in the Tangier region (100% cotton and cotton-rich waste) which accounts for about half of the total textile waste created in the region, there is about 18Kt of waste per year.

Considering a segregation rate of 80% and a shredding facility capacity utilization of 75%, there is potential room for 7 shredding lines with modern and state-of-the-art technology: 6 operating at 75% capacity utilization and one at 40% capacity.

TANGER

SIMULATION
100% COTTON +
COTTON-RICH

75% 75% 75%

75% 75% 75%

40%

Scenario

✓ 80% of waste is sorted and recycled

✓ Modern shredding line with a capacity of 250 t/month (600-2,500 kg/h x 8 hours/day and 20 days/month)

✓ Maximum capacity utilization of 75%.

source: Blumine & Reverse Resources estimates

Considering only the higher value textile waste available in the Rabat, Fès et Meknès (100% cotton and cotton-rich waste) which accounts for about half of the total textile waste created in the region, there is about 7,2Kt of waste per year.

Considering a segregation rate of 80% and a shredding facility capacity utilization of 75%, there is potential room for 4 shredding lines with modern and state-of-the-art technology: 3 operating at 75% capacity utilization, 1 to 60%

RABAT – FES - MEKNES

SIMULATION
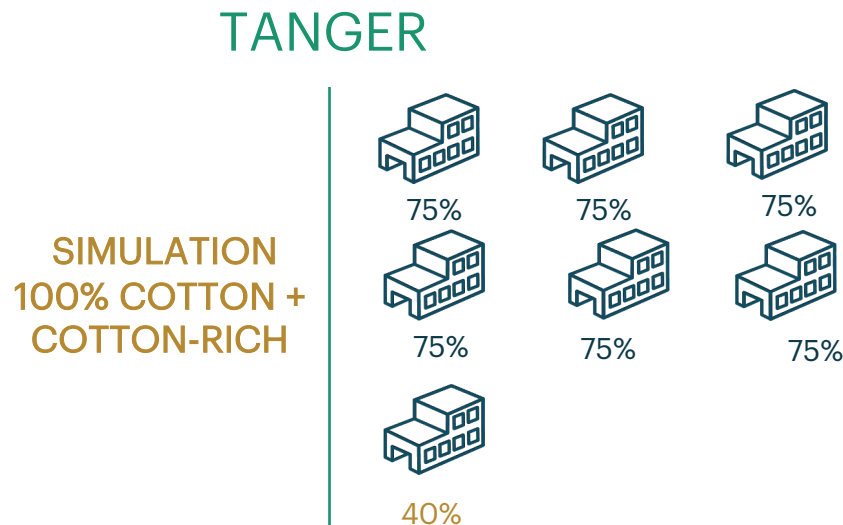100% COTTON +
COTTON-RICH

75%   75%   75%

60%

Scenario

✓ 80% of waste is sorted and recycled

✓ Modern shredding line with a capacity of 250 t/month (600-2,500 kg/h x 8 hours/day and 20 days/month)

✓ Maximum capacity utilization of 75%.

WASTE
83,2 Ktons

Ktons= thousands tons

Re-usable waste
16,7 Ktons

Recyclable Waste
66,5 Ktons

Deadstock
4,8 Ktons

→Stored and reused for a future collection.
→Returned to the contractor's brand (if applicable).
→Sold on the open market.
→Sold to a merchant.
→Cut into small pieces and managed as a cutting waste.

Overproduction
11,9 Ktons

→Stored for about 2 years and then sold at the point of sale or on the local market.
→Shredded and managed as shredded textile waste.

Higher value
26,6 Ktons

→Re-manufacturing (reuse of elements directly in production).
→Chemical recycling of fiber to fiber (high added value).
→Mechanical recycling of fiber to fiber (lower value).

Lower value:
39,9 Ktons

→Downcycling (mechanical recycling with low added value)
→Industrial symbiosis
→Incineration with energy recovery
→Incineration without energy recovery
→discharge

Source: Blumine & Reverse Resources estimates

➢ We separate textile waste from production into 2 main categories: reusable waste (surplus production, find of rolls ...) and recyclable waste (cutting scrap, filaments ...).
➢ The latter category is itself separated into two types of high and low value waste according to their composition and demand on the current market.

Waste hierarchy in Morocco
Potential scenarios

Reusable waste
16,7 Ktons

DEADSTOCK

Legend: ■ Revendu ■ Réutilisé

	Revendu	Réutilisé
MEILLEURS STANDARDS INTERNATIONAUX	2 407,00	2 407,00
STANDARDS INTERNATIONAUX MOYENS	3 129,00	1 685,00

SURPLUS DE PRODUCTION

Legend: ■ Revendu ■ Stocké ■ Jeté ■ Recyclé

	Revendu	Stocké	Jeté	Recyclé
MEILLEURS STANDARDS INTERNATIONAUX	7 708,00	3 913,00		237,00
STANDARDS INTERNATIONAUX MOYENS	4 744,00	3 913,00	2 965,00	237,00

Recyclable Waste:
66,5 Ktons

DÉCHETS DE HAUTE VALEUR

Legend: ■ Recyclé ■ Jeté ■ Downcyclé ■ Réutilisé

	Recyclé	Jeté	Downcyclé	Réutilisé
MEILLEURS STANDARDS INTERNATIONAUX	7 708,00	3 913,00		237,00
STANDARDS INTERNATIONAUX MOYENS	4 744,00	3 913,00	2 965,00	237,00

DÉCHETS DE FAIBLE VALEUR

Legend: ■ Jeté ■ Réutilisé ■ Downcyclé ■ Recyclé

	Jeté	Réutilisé	Downcyclé	Recyclé
MEILLEURS STANDARDS INTERNATIONAUX	2 659,00	5 318,00	17 334,00	14 625,00
STANDARDS INTERNATIONAUX MOYENS	19 968,00		15 974,00	3 994,00

Ktons= thousands tons

Source: Blumine & Reverse Resources estimates

Some cases and good practices exist in the country that demonstrate the use case of a circular textile economy. However, information on current recycling capacity at the country level is scarce or non-existent and official data on recycling capacity and the technologies used are not available.

In addition, we could not find an official list of authorized collectors and recyclers who specialize in or can work with textile waste. Indeed, the authorization and the legal framework for waste management are still to be developed in the country and constitute a key element of the "National Strategy for waste reduction and recovery" (SNRVD) published by the Minister of Energy, Mining and Sustainable Development in 2019**(*)**.

(*) Axe stratégique 1: Renforcement du cadre législative et réglementaire relatif à la réduction valorisation des déchets-Action 4 : Mettre en place un système d'autorisation des entreprises œuvrant dans le recyclage et la valorisation des déchets.

Some indices may come from the size of the recycling capacity of higher value fibres for textile-to-textile recycling, based on trade data.

According to official export data, textile waste exports were 2.3 Ktons in 2019, mainly synthetic fibres.

The trade classification does not distinguish between "shredded" and "non-shredded" wastes. Nevertheless, this data provides an upper limit for an estimate of domestic recycling capacity.

Another interesting measure is the volume of rags exported. In fact, rags can be the result of a low-value recycling process. By limiting the analysis to exports to Europe, we found 2.7Ktons of exports, which, when added to fibre exports, brings the upper limit for estimating the volume of waste transported for export to 3.3Ktons.

source: Blumine & Reverse Resources estimates

FELT, WADDING AND TECHNICAL TEXTILES

The Moroccan textile industry includes leading companies in technical textiles, wadding and non-wovens.

The market for this class of products can range from high to low end, from natural fibers to technological fibers, high and low-tech processes, fashion clothing, bedding, furniture, workwear, automotive and other industrial uses.

Analysis of trade data shows a domestic supply potential for this product class, which has not yet been fully developed: the volume of exports is still limited and the trade balance is negative to a significant extent.

tons 2019

Source: Blumine & Reverse Resources Calc. on UN Comtrade

IMPORTS

Felt	3.005
Nonwovens	25.273
Wadding	685

EXPORTS

Felt	9
Nonwovens	1.576
Wadding	125

TRADE BALANCE

Felt	Nonwovens	Wadding
-2.997	-23.697	-560

Textile factory	Waste management	Recycling	End-use

Textile factory

STRENGTHS
- Large CMT/ clothing manufacturers
- International brands want to manage waste responsibly and increase recycled fibers in collections.

WEAKNESSES
- No waste segregation or sorting in most enterprises
- Low knowledge of waste management laws and regulations

Waste management

STRENGTHS
- A potentially favorable logistics since about 90% of the waste is concentrated in 3 neighboring regions.

WEAKNESSES
- Weak legal framework that needs to be updated
- Widespread informal waste collection sector
- Waste delivered "in bulk" by manufacturers

Recycling

STRENGTHS
- Good practices and use cases exist in the country, both for textile textiles and non-woven textiles.

WEAKNESSES
- Low recycling capacity
- High-quality waste is mainly exported without shredding.
- Need to diversify raw materials in the recycling into nonwovens

End-use

STRENGTHS
- Good practices and use cases exist in the country, both for textile textiles and non-woven textiles.
- Large market and local production capacity for nonwovens and technical textiles.
-

WEAKNESSES
- Limited spinning capacity for higher value recycled waste.
- Low know-how of local companies in spinning recycled fibres.
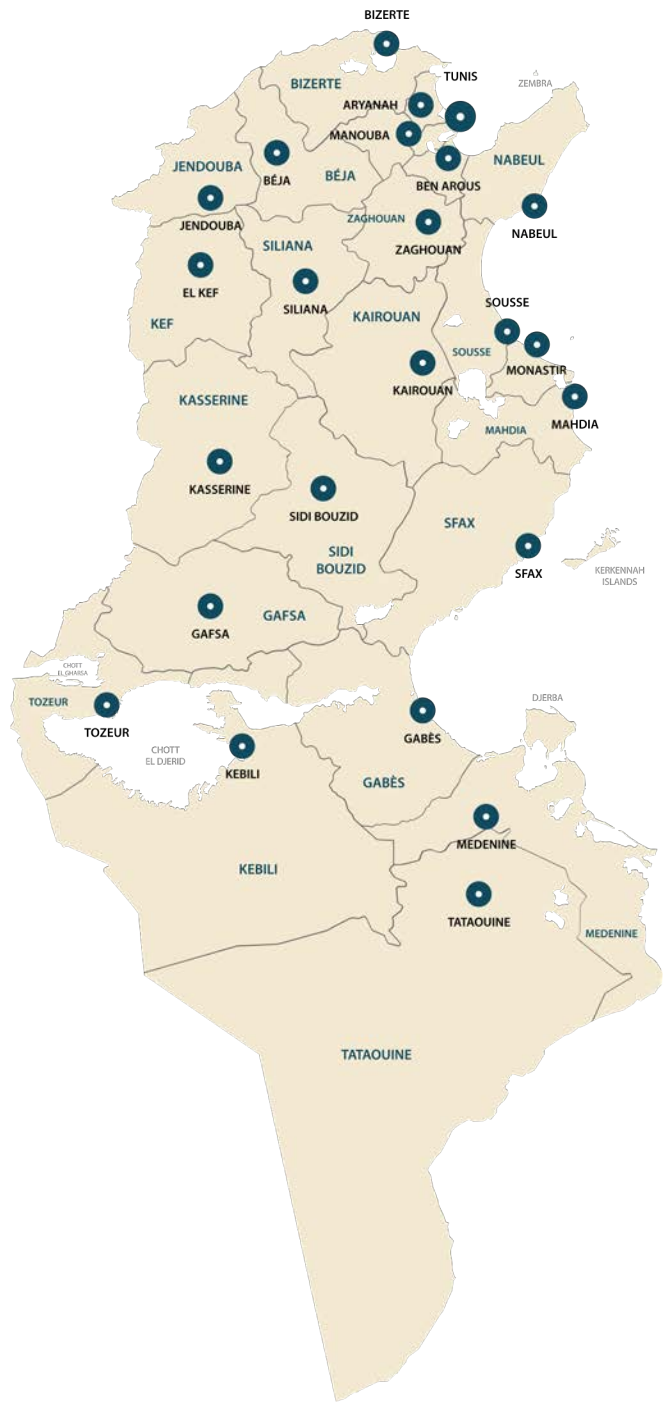
Source: Blumine & Reverse Resources

A BUSINESS DEVELOPMENT POTENTIAL FOR MOROCCO

The Moroccan textile and clothing industry has the assets to become a leader in textile circularity.

Proximity to Europe makes it an ideal candidate to provide quality textile waste to recyclers.

Achieving a successful development needs an increase in the cooperation level among industry players, local authorities, leading brands and technology leaders.

Morocco can also attract investors to install these recycling technologies on its territory, through a more organized management of textile waste oriented towards a circular strategy.

BIZERTE

BIZERTE

TUNIS

ZEMBRA

ARYANAH

MANOUBA

NABEUL

JENDOUBA

BÉJA

BÉJA

BEN AROUS

JENDOUBA

ZAGHOUAN

NABEUL

SILIANA

ZAGHOUAN

EL KEF

SILIANA

KAIROUAN

SOUSSE

KEF

SOUSSE

MONASTIR

KASSERINE

KAIROUAN

MAHDIA

MAHDIA

KASSERINE

SIDI BOUZID

SFAX

SIDI
BOUZID

SFAX

KERKENNAH
ISLANDS

GAFSA

GAFSA

CHOTT
EL GHARSA

DJERBA

TOZEUR

GABÈS

TOZEUR

CHOTT
EL DJERID

KEBILI

GABÈS

KEBILI

MEDENINE

MEDENINE

TATAOUINE

MEDENINE

TATAOUINE

3. | Waste mapping in Tunisia

There are more than 3.000 companies in the Tunisian T&C industry. Enterprises with 10 or more employees numbered 1,860 *(source : Statistiques Tunisie)*

T&C is the largest industrial employer in the country, with a total of 159.000 jobs or 31% of the total manufacturing industries. *(source : APII, 2018)*
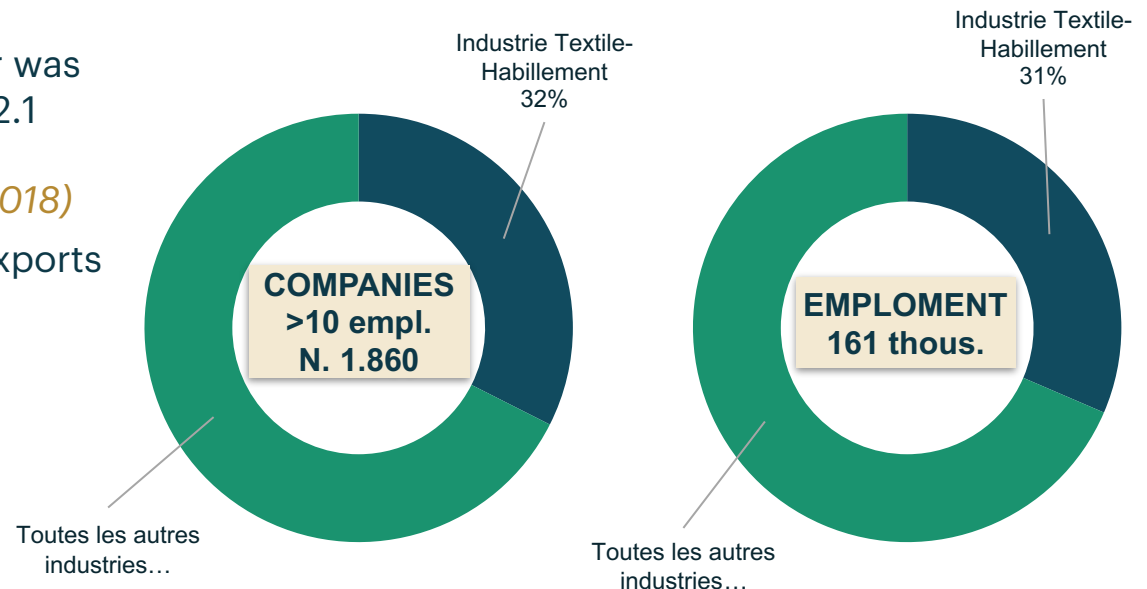
More than 80% of enterprises produce entirely for the export market ("total exporters").

In 2016, the annual income of the sector was DT 5.4 billion, with a value added of DT 2.1 billion, or 16% of the value added of manufacturing industry. *(source : APII, 2018)*

It also accounts for 18% of all Tunisian exports of goods. *(source: UN Comtrade, 2019)*

REVENUE AND EMPLOYMENT IN THE TUNISIAN T&C INDUSTRY
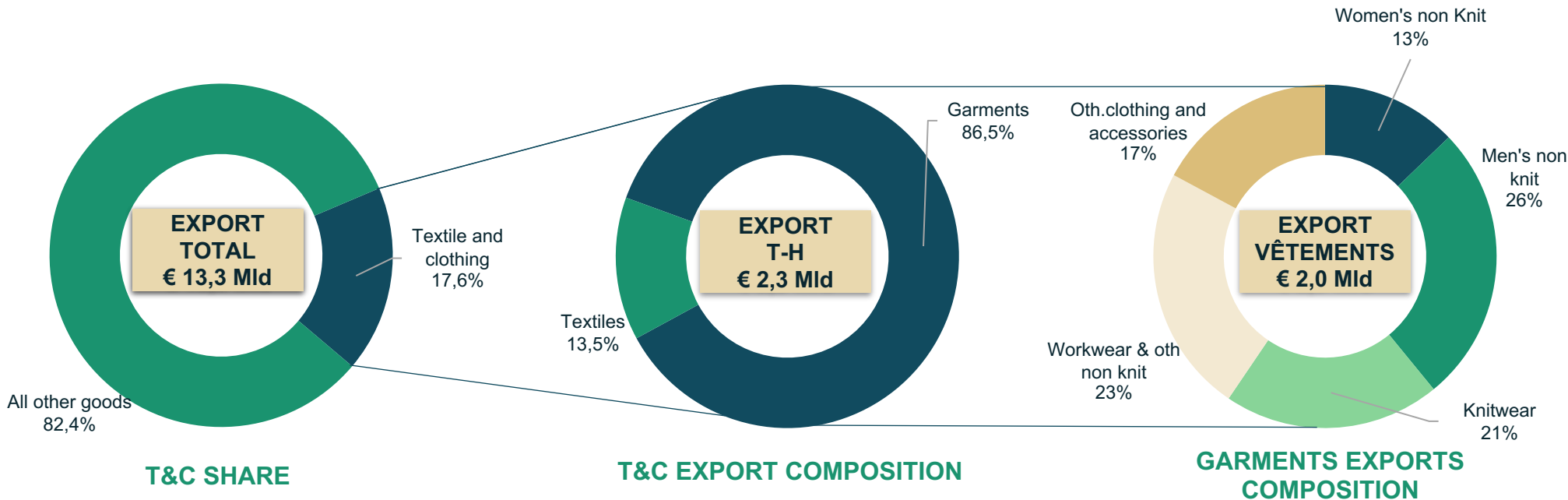*source: INS Tunisie*

Industrie Textile-Habillement 32%

COMPANIES
>10 empl.
N. 1.860

Toutes les autres industries…

Industrie Textile-Habillement 31%

EMPLOMENT
161 thous.

Toutes les autres industries…

Exports

With an export value of 2.6 billion euros in 2019, equal to 17.6% of the country's total exports, the textile and clothing (T&C) industry is one of the main export sectors in Tunisia. Clothing is by far the largest component of the industry's exports with a value in 2019 of 2 billion euros, equal to 86% of the total.

Among garments, 13% of exports are women's clothing (non-kint), 26% for men's clothing (non-knit) and 21% for knitwear, a further 23% includes workwear and other non-knitted clothing.

EXPORT TOTAL € 13,3 Mld

Textile and clothing 17,6%

All other goods 82,4%

T&C SHARE

EXPORT T-H € 2,3 Mld

Garments 86,5%

Textiles 13,5%

T&C EXPORT COMPOSITION

EXPORT VÊTEMENTS € 2,0 Mld

Women's non Knit 13%

Oth.clothing and accessories 17%

Men's non knit 26%

Workwear & oth non knit 23%

Knitwear 21%

GARMENTS EXPORTS COMPOSITION

Source: Blumine & Reverse Resources calc. on UNComtrade database
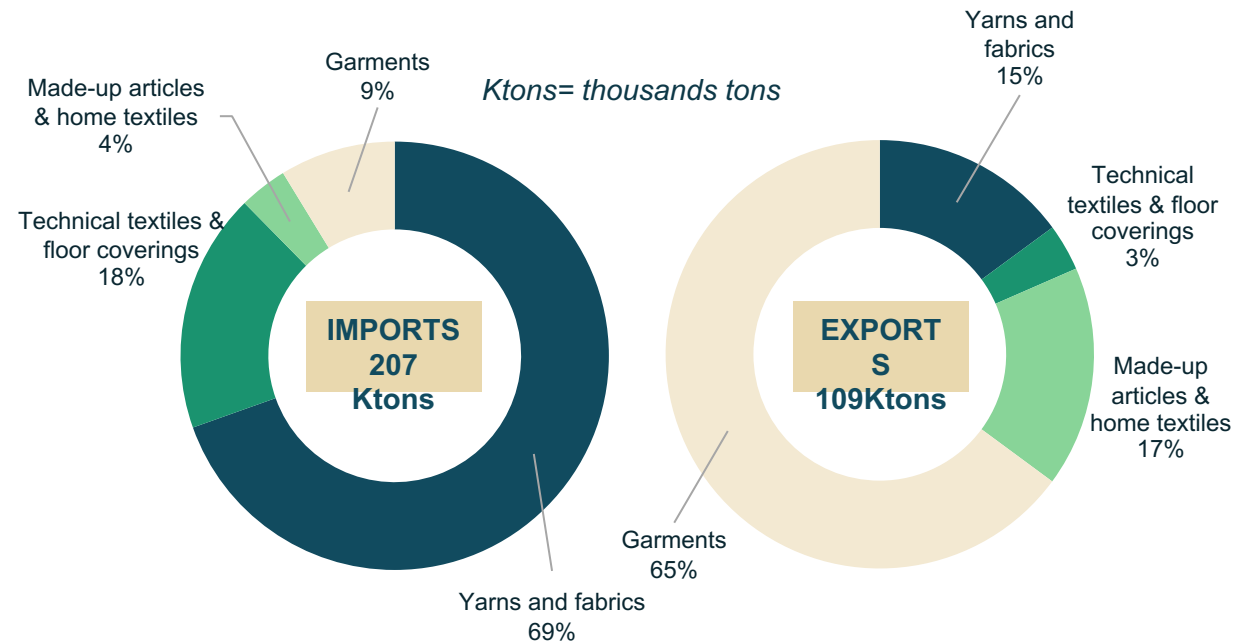
TRADE BALANCE (physical volumes)

207Ktons of textile products were imported into the country:

- 143Ktons of yarn and fabric which have been transformed into other textile and clothing materials
- 37Ktons of yarn and technical fabrics used in the manufacture of industrial products and floor coverings
- 9Ktons of made-up articles and household textiles
- 19Ktons of clothing

109Ktons of textile and clothing materials were exported from the country
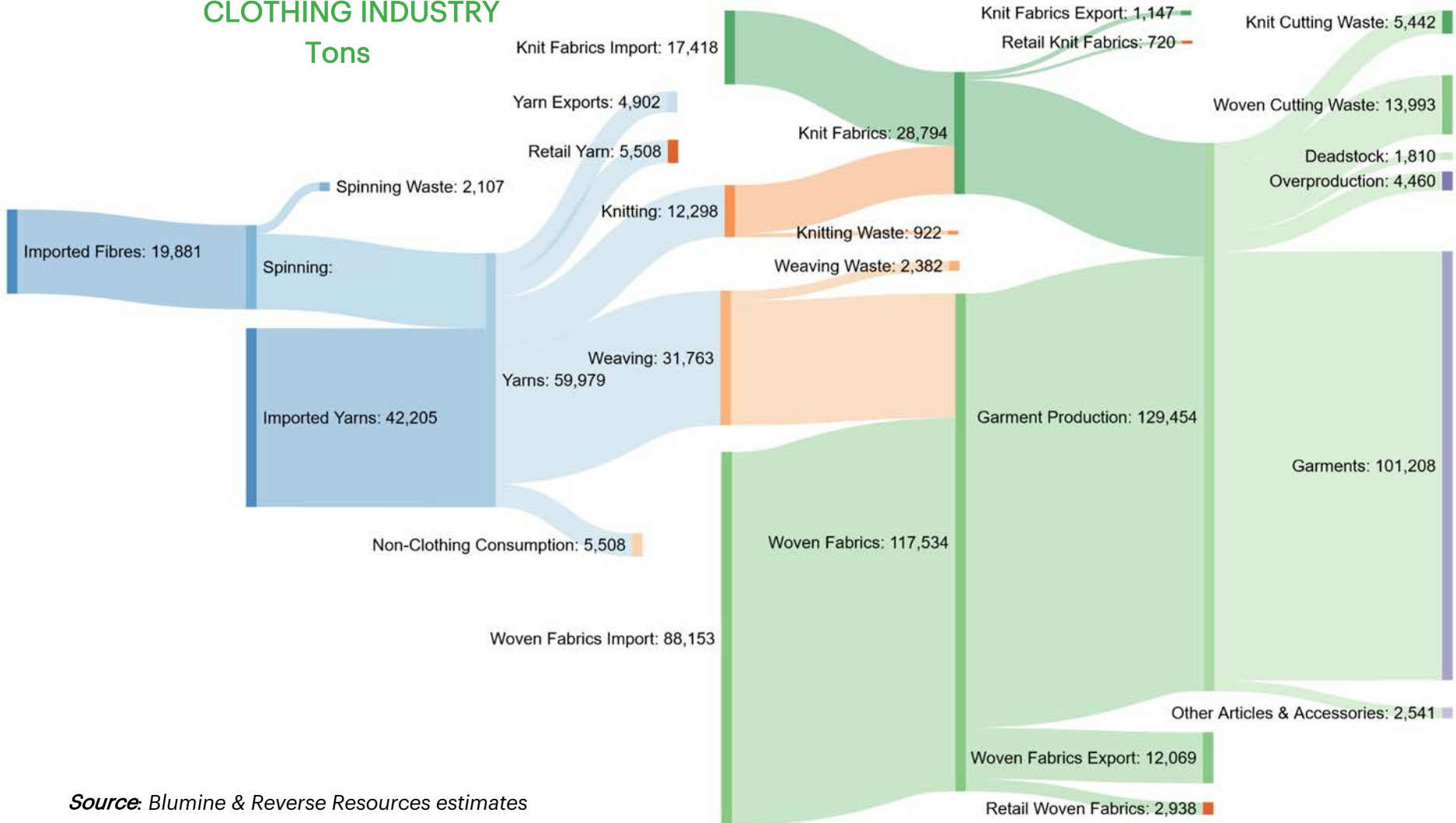
TRADE IN T&C INDUSTRY
Ktons= thousands of tons

Ktons= thousands tons

IMPORTS 207 Ktons

- Garments 9%
- Made-up articles & home textiles 4%
- Technical textiles & floor coverings 18%
- Yarns and fabrics 69%

EXPORTS 109Ktons

- Yarns and fabrics 15%
- Technical textiles & floor coverings 3%
- Made-up articles & home textiles 17%
- Garments 65%

Source: Blumine & Reverse Resources calc. on UN Comtrade database

TEXTILE FLOWS IN THE TUNISIAN TEXTILE AND CLOTHING INDUSTRY
Tons

Knit Fabrics Import: 17,418
Yarn Exports: 4,902
Retail Yarn: 5,508
Spinning Waste: 2,107
Imported Fibres: 19,881
Spinning:
Knitting: 12,298
Imported Yarns: 42,205
Yarns: 59,979
Weaving: 31,763
Non-Clothing Consumption: 5,508
Woven Fabrics Import: 88,153

Knit Fabrics Export: 1,147
Retail Knit Fabrics: 720
Knit Fabrics: 28,794
Knitting Waste: 922
Weaving Waste: 2,382
Garment Production: 129,454
Woven Fabrics: 117,534
Woven Fabrics Export: 12,069
Retail Woven Fabrics: 2,938

Knit Cutting Waste: 5,442
Woven Cutting Waste: 13,993
Deadstock: 1,810
Overproduction: 4,460
Garments: 101,208
Other Articles & Accessories: 2,541

Source: Blumine & Reverse Resources estimates

TEXTILE MATERIAL FLOWS IN THE TUNISIAN TEXTILE AND CLOTHING INDUSTRY – 2019

Ktons = thousands of tonnes

FIBRES

19.9Ktons tons of textile fibers were imported into Tunisia in 2019.

YARNS

17.8K tones were spun by the domestic spinning sector, which was added to 42.2Ktons of imported yarn. Of the total yarn available, 4.9ktons were exported, 11ktons were made up for retail sale or were used for uses other than clothing. The remaining 44 Ktons were available for further processing in the domestic weaving or knitting industry.

FABRICS

40.7Ktons of fabrics or knitwear were made from the available yarns, which was added to 105.6Ktons of imported fabrics or knitwear. Of the total available fabrics, 16.9 Ktons were retailed or exported. The remaining 129Ktons of fabrics were available for the manufacture of clothing and home textiles.
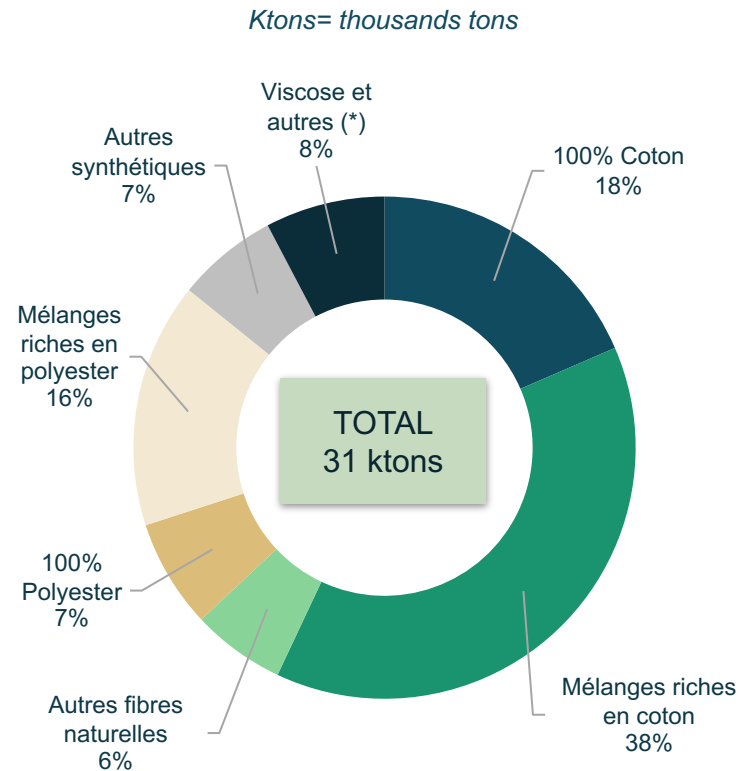
GARMENTS

101.2Ktons of clothing were made from available knitted or woven materials, of which 6.2Ktons remained in warehouses as dead stock or overproduction. 19.4Ktons are cutting waste.

source: Blumine & Reverse Resources estimates

WASTE BY FIBRE

It can be estimated that about 1/4 of the waste is made up of pure fibres: pure cotton, pure synthetic other pure fibres.

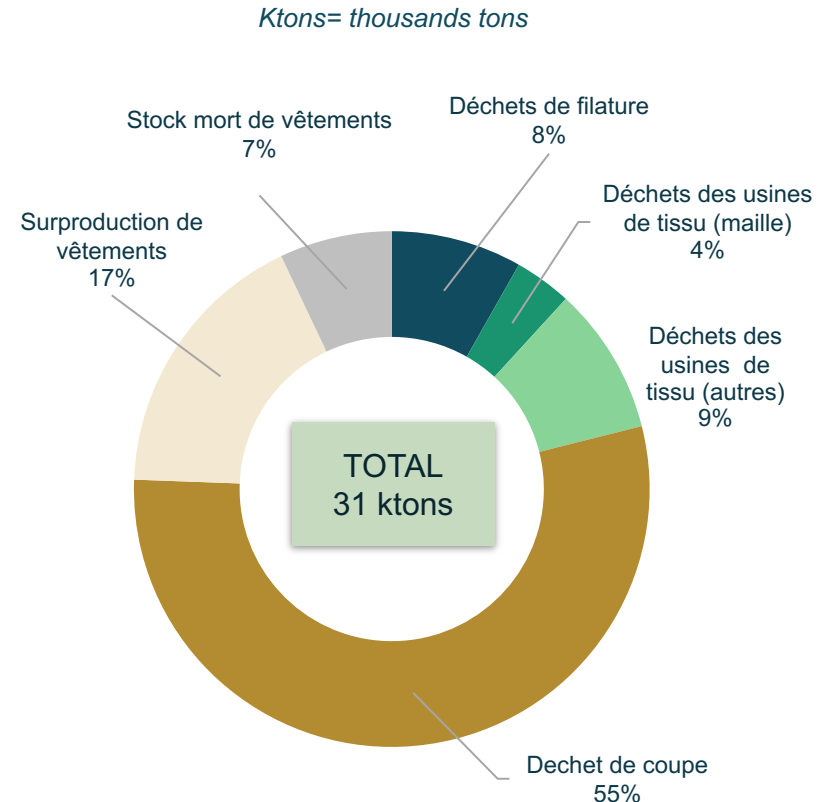Nearly 40% of the total, however, are cotton blends that can be more difficult to value.

Ktons= thousands tons

Viscose et autres (*) 8%

Autres synthétiques 7%

100% Coton 18%

Mélanges riches en polyester 16%

TOTAL 31 ktons

100% Polyester 7%

Autres fibres naturelles 6%

Mélanges riches en coton 38%

(*) viscose, lyocell, cupro,

source: Blumine & Reverse Resources estimates

WASTE BY PROCESS

More than half of the total textile waste generated by textile processes is cutting waste.

It can be estimated that non-knit cutting waste represents about 14.000 tons per year and knit cutting waste about 5.400 tons.

Ktons= thousands tons

Stock mort de vêtements
7%

Déchets de filature
8%

Déchets des usines de tissu (maille)
4%

Surproduction de vêtements
17%

Déchets des usines de tissu (autres)
9%

TOTAL
31 ktons

Dechet de coupe
55%

source: Blumine & Reverse Resources estimates

In the garment-making sub-sector, each year are generated:

o 19.4Ktons of cutting waste

o 4.5Ktons of garments' overproduction

o 1,8Ktons of deadstocks

VOLUME OF WASTE BY SUB-SECTOR

Ktons= thousands of tonnes

WASTE

2,0 Ktons

SPINNING WASTE

WASTE

3,3 Ktons

WEAVING / KNITTING WASTE

WASTE

19,4 Ktons

CUTTING WASTE

WASTE

4,5 Ktons

OVERPRODUCTION

WASTE

1,8 Ktons

DEADSTOCKS

PRODUCTION

WASTE

source: Blumine & Reverse Resources estimates

BY REGION

Others 10%
Monastir 27%
Tunis 4%
Manouaba 4%
Ben Arous 5%
Mahdia 5,3%
Sfax 7%
Sousse 9%
Bizerte 13%
Nabeul 16%

TOTAL 31 Ktons

source: Blumine & Reverse Resources estimates

CENTER-EAST REGION   NORTH-EAST REGION
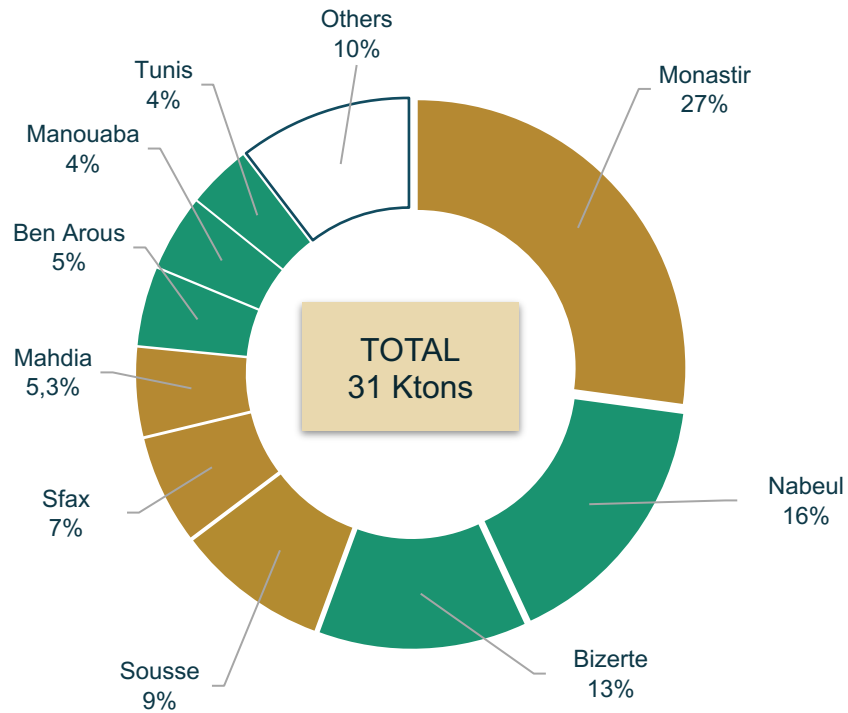
What is the potential economic impact of the development of a recycling value chain in the two macro regions of NORTH-EAST and CENTRE-EAST?

Information on the current size of the existing recycling capacity in the country is difficult to assess accurately.

An official list of approved collectors and recyclers of textile waste is maintained by the ANGED (National Agency for Waste Management). The list was used to organize meetings with recyclers to gather qualitative information.

On the other hand, the authorization list provides little help in the assessment of recycling capacity, as the capacity for collection, transport and simple cutting merges with the capacity for recycling. In addition, it includes companies that collect all types of waste, including but limited to textile waste.

By combining various sources of information, including ANGED, API and face-to-face interviews, we found that:

o a single company with the know-how and the ability to carry out shredding for textile-textile recycling

o about 4 to 5 companies with the know-how and capacity to perform shredding for the recycling of non-woven textile

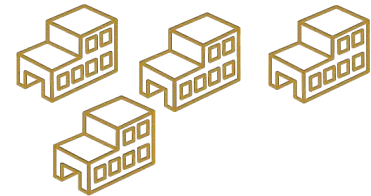o a few other companies that can reduce waste and/or manufacture rags, mops and wipes without shredding

Source: Blumine & Reverse Resources

Gross estimate of recycling capacity by end-use

Higher quality, textile to textile shredding & recycling.

Recycling (cutting or shredding) For non-wovens, mattresses, carpets wadding

Rags, floor-clothes and wipes with no shredding
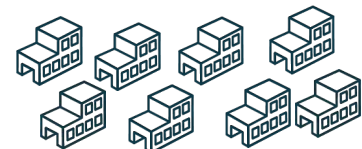
If we consider only the higher value textile waste available in the North-East region (100% cotton and cotton-rich waste) which accounts for about half of the total textile waste created in the region, there is about 8Ktons of waste per year.

Considering a segregation rate of 80% and a shredding facility capacity utilization of 75%, there is potential room for 3 shredding lines with modern and state-of-art technology, 2 operating at 75% capacity utilization, one at 60%

NORT-EAST REGION

SIMULATION
100% COTTON +
COTTON-RICH

75%   75%   60%

Scenario

✓ 80% of waste is sorted and recycled

✓ Modern shredding line with a capacity of 250 t/month (600-2,500 kg/h x 8 hours/day and 20 days/month)

✓ Maximum capacity utilization of 75%.

Source: Blumine & Reverse Resources estimates

If we consider only the higher value textile waste available in the Center-East region (100% cotton and cotton-rich waste) which accounts for la moitié du total des déchets textiles créés dans la région, il y a environ 8,4Ktons de déchets par an.

Considering a segregation rate of 80% and a shredding facility capacity utilization of 75%, there is potential room for 3 shredding lines with modern and state-of-art technology, operating at 75% capacity utilization.

CENTER-EAST REGION

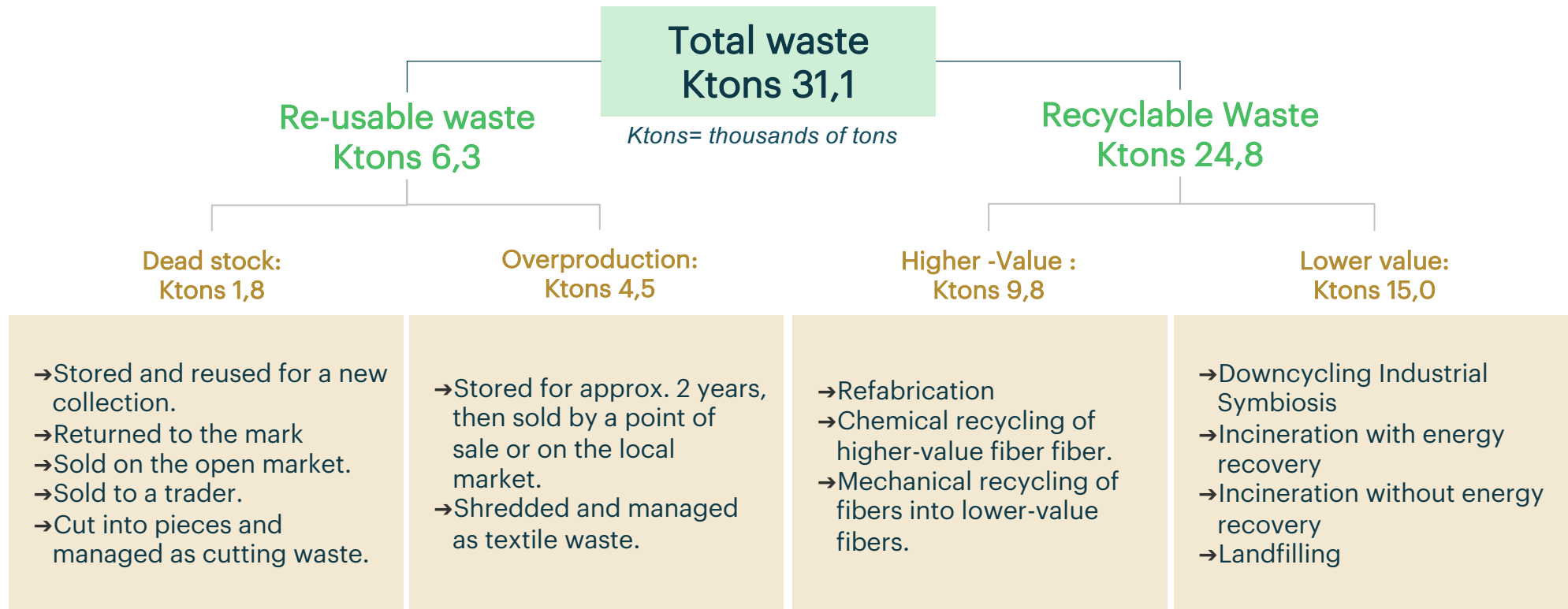SIMULATION
100% COTTON +
COTTON-RICH

75%   75%   75%

Scenario

✓ 80% of waste is sorted and recycled

✓ Modern shredding line with a capacity of 250 t/month (600-2,500 kg/h x 8 hours/day and 20 days/month)

✓ Maximum capacity utilization of 75%.

Source: Blumine & Reverse Resources estimates

**Total waste
Ktons 31,1**

Ktons= thousands of tons

**Re-usable waste
Ktons 6,3**

**Recyclable Waste
Ktons 24,8**

**Dead stock:
Ktons 1,8**

**Overproduction:
Ktons 4,5**

**Higher -Value :
Ktons 9,8**

**Lower value:
Ktons 15,0**

➜Stored and reused for a new collection.
➜Returned to the mark
➜Sold on the open market.
➜Sold to a trader.
➜Cut into pieces and managed as cutting waste.

➜Stored for approx. 2 years, then sold by a point of sale or on the local market.
➜Shredded and managed as textile waste.

➜Refabrication
➜Chemical recycling of higher-value fiber fiber.
➜Mechanical recycling of fibers into lower-value fibers.

➜Downcycling Industrial Symbiosis
➜Incineration with energy recovery
➜Incineration without energy recovery
➜Landfilling

source: Blumine & Reverse Resources estimates

➢ We separate textile waste from production into 2 main categories: **re-usable waste** (surplus production, end of rolls …) and **recyclable waste** (cutting scrap, filaments …).

➢ The latter category is itself separated into two types of high and low value waste according to their composition and demand on the current market

Re-usable waste: 6,3 Ktons

DEADSTOCK

SOLD OR STORED
67%

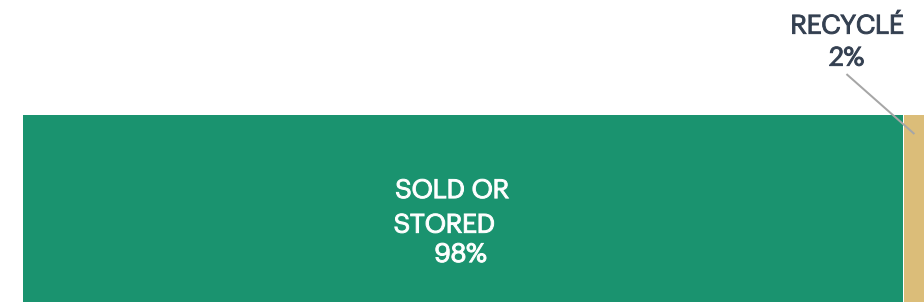INTERNAL REUSE
33%

AVERAGE INTERNATIONAL STANDARDS

SOLD OR STORED
50%

INTERNAL REUSE
50%
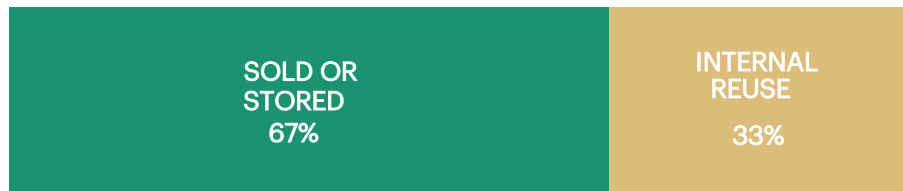
BEST INTERNATIONAL STANDARDS

OVERPRODUCTION

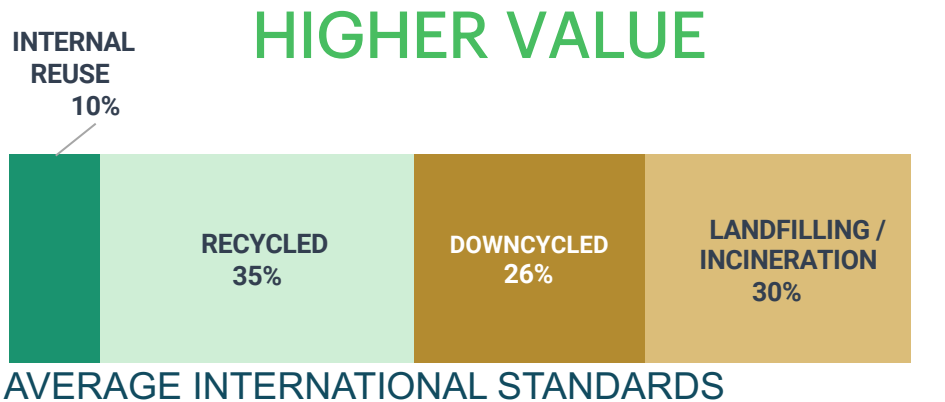RECYCLÉ
2%

SOLD OR STORED
73%

LANDFILLIN/ INCINERATION
24%

AVERAGE INTERNATIONAL STANDARDS

RECYCLÉ
2%

SOLD OR STORED
98%

BEST INTERNATIONAL STANDARDS

Source: Blumine & Reverse Resources estimates

Recyclable waste: 24,8 Ktons

HIGHER VALUE

INTERNAL REUSE 10%

| INTERNAL REUSE 10% | RECYCLED 35% | DOWNCYCLED 26% | LANDFILLING / INCINERATION 30% |

AVERAGE INTERNATIONAL STANDARDS

DOWNCYCLED 15%

LANDFILLING / INCINERATION 9%

| INTERNAL REUSE 20% | RECYCLED 55% | | |

BEST INTERNATIONAL STANDARDS

LOWER VALUE

RECYCLED 10%

| RECYCLED 10% | DOWNCYCLED 40% | LANDFILLING / INCINERATION 50% |

AVERAGE INTERNATIONAL STANDARDS

| RECYCLÉ 20% | DOWNCYCLED 50% | LANDFILING / INCINERATION 30% |

BEST INTERNATIONAL STANDARDS

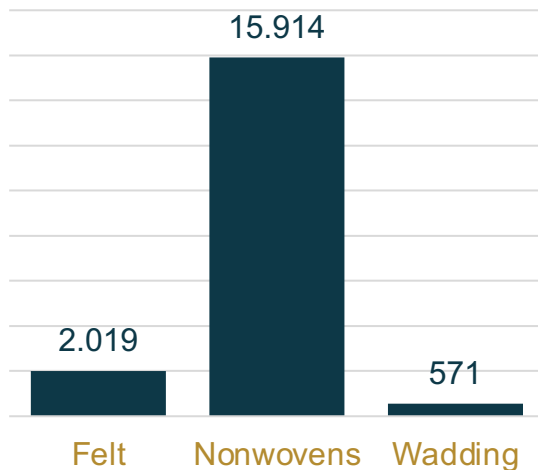*Source*: Blumine & Reverse Resources estimates

- ✓ The capacity to recycle high-quality fibres in clothing is limited by the spinning capacity in the country. The API database lists 6 spinning companies but only 2 with more than 100 employees

- ✓ Synthetic fiber waste, mainly acrylic, is recycled in the carpet industry, data suggests that volumes are very small.

- ✓ Most of the high-quality waste, 100% cotton and rich in cotton, is exported to Europe, mainly to Italy, Spain, and to Turkey, most of which is not shredded. (from 3 to 4ktons), the export classified as "recycled cotton" is minimal.

- ✓ Textile waste is also classified as "rags", which can be the result of a recycling process with low added value (without shredding). By limiting the analysis to export to Europe – which should receive the higher value materials – Tunisia exports 4.8 Ktons, which include rags, mops and wipes, as well as cut cotton waste.

- ✓ It can be estimated that overall exports of recycled materials do not exceed 6Ktons.

✓ Analysis of import/export data shows that the domestic supply potential of this product class is not yet fully developed.

✓ The volume of exports is still limited and the trade balance is negative by a significant amount. Especially in nonwovens, local production capacity is almost absent and represents a critical gap that should be filled.
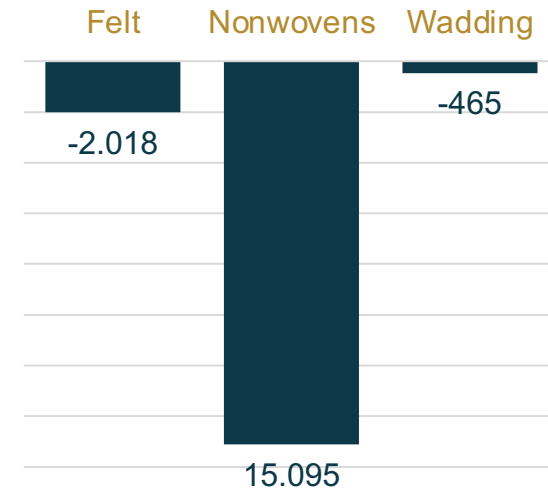
IMPORT
Tons 2019

Felt	Nonwovens	Wadding
2.019	15.914	571

EXPORT
Tons 2019

Felt	Nonwovens	Wadding
1	819	106
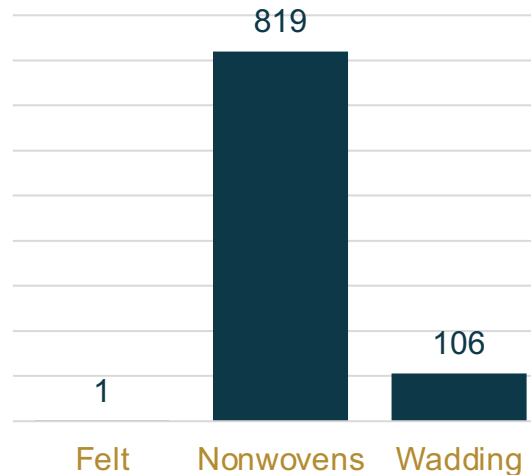
BALANCE COMMERCIALE
Tons 2019

Felt	Nonwovens	Wadding
-2.018	15.095	-465

Source: Blumine & Reverse Resources
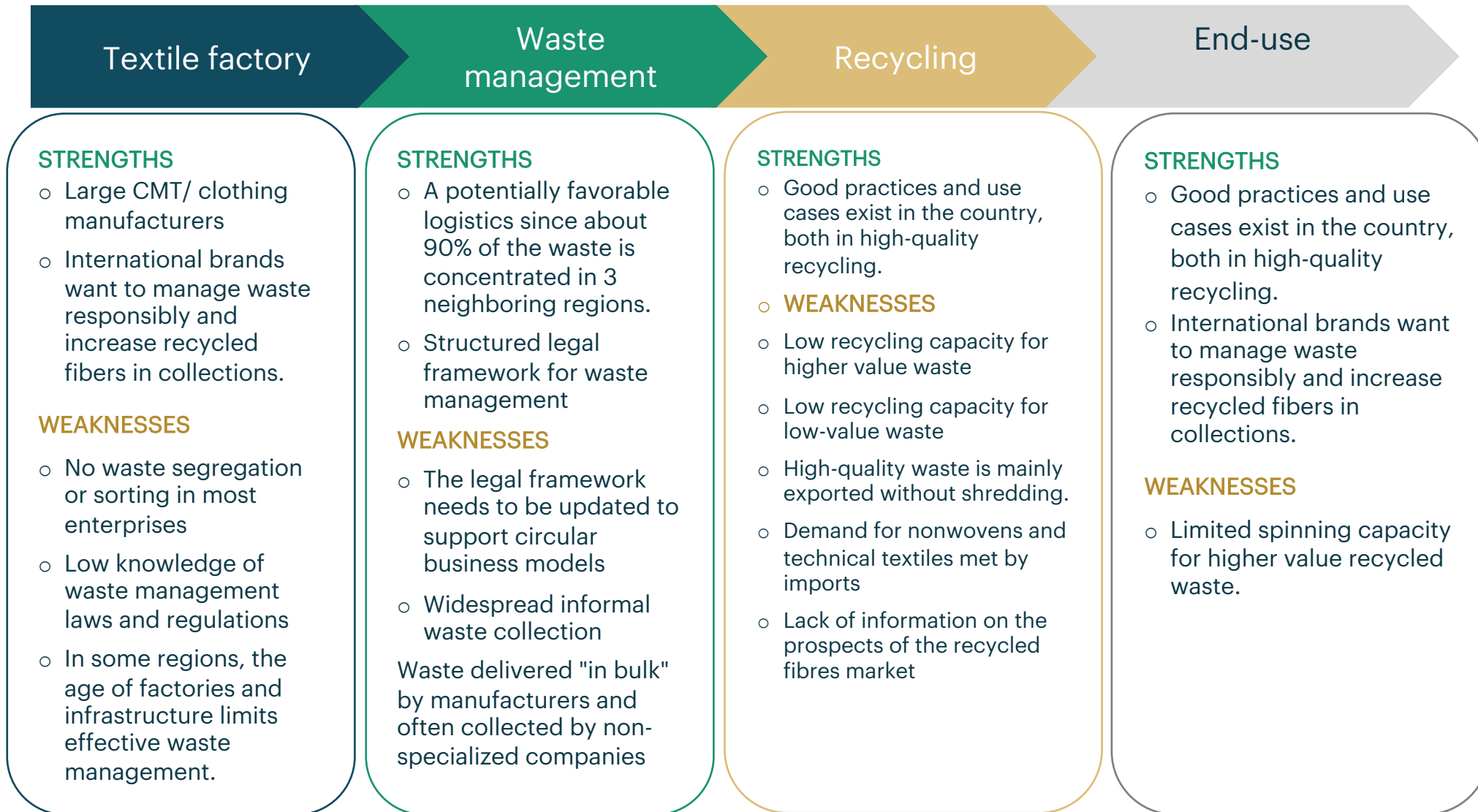Calc. on UN Comtrade

The mapping study and this report focus on post-industrial and pre-consumption waste. Post-consumer waste is outside the scope of the analysis. There is, however, a link with the *"friperie"* trade.

The *friperie* is an important and controversial market in Tunisia for post-consumer waste (domestic or imported). Le Décret n° 95-2396, décembre 1995, laying down detailed rules for the import, processing and distribution of *"friperie"* states:

Art. 5 *«Pour bénéficier du régime de l'entrepôt industriel, l'industriel doit s'équiper de matériels de coupe et d'effilochage agréés par le ministère de l'industrie pour la transformation industrielle des articles de la friperie.»*

Companies in the *"friperie"* market must have an internal shredding capacity – which, as an internal processing capacity, is not precisely regulated by the Specifications for waste management set by the Ministry of the Environment and ANGED.

This shredding capacity is largely underused and could become a driver for the recycling of post-industrial waste. A qualitative analysis of the current destination of materials recycled by the *"friperie"* sector suggests that they are mainly sold to the non-woven sector.

Textile factory	Waste management	Recycling	End-use

Textile factory

STRENGTHS
- Large CMT/ clothing manufacturers
- International brands want to manage waste responsibly and increase recycled fibers in collections.

WEAKNESSES
- No waste segregation or sorting in most enterprises
- Low knowledge of waste management laws and regulations
- In some regions, the age of factories and infrastructure limits effective waste management.

Waste management

STRENGTHS
- A potentially favorable logistics since about 90% of the waste is concentrated in 3 neighboring regions.
- Structured legal framework for waste management

WEAKNESSES
- The legal framework needs to be updated to support circular business models
- Widespread informal waste collection

Waste delivered "in bulk" by manufacturers and often collected by non-specialized companies

Recycling

STRENGTHS
- Good practices and use cases exist in the country, both in high-quality recycling.

WEAKNESSES
- Low recycling capacity for higher value waste
- Low recycling capacity for low-value waste
- High-quality waste is mainly exported without shredding.
- Demand for nonwovens and technical textiles met by imports
- Lack of information on the prospects of the recycled fibres market

End-use

STRENGTHS
- Good practices and use cases exist in the country, both in high-quality recycling.
- International brands want to manage waste responsibly and increase recycled fibers in collections.

WEAKNESSES
- Limited spinning capacity for higher value recycled waste.

Source: Blumine & Reverse Resource

A BUSINESS DEVELOPMENT POTENTIAL FOR TUNISIA

The Tunisian textile and clothing industry has the assets to become a **leader in textile circularity.**

Proximity to Europe makes it an ideal candidate to provide quality textile waste to recyclers.

Achieving a successful development needs an increase in the cooperation level among industry players, local authorities, leading brands and technology leaders.

Tunisia can also attract investors to install these recycling technologies on its territory, through a more organized management of textile waste oriented towards a circular strategy..

Funded by the
European Union

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20144 - Milan, Italy

Telliskivi 60
10412 - Tallinn, Estonia