

TEXTILE REUSE AND RECYCLING IN GREECE, FACT OR FICTION?

Efthymios Gravas¹, Georgios Priniotakis²

¹ *University of West Attica, Athens, Greece*

² *University of West Attica Athens, Greece*

egra@uniwa.gr; gprin@uniwa.gr

ABSTRACT

The paper consists of a general review concerning the reuse and recycling of textile products from raw materials to final products throughout time. The review is categorized, creating a map indicating the procedures used and making comparisons with the current status in different countries. By general consensus all publications strongly support the view that textile reuse and recycling reduce environmental impact but they also stress the necessity to experiment with other allocation methods for incoming recycled materials. From the existing review arises one basic assumption, however, that textile garments are better reused rather than recycled. Finally, although Greece has an “infant” experience in the reuse and recycling of textile products, there is plenty of room for applications and further research as there seems to be growing interest both by governments and local authorities to involve themselves in such challenging pursuits. To what extent, such ambitious pursuits so far have “borne fruit”, remains to be seen!

Key Words: TEXTILES ,GARMENTS, REUSED, RECYCLE, GREECE

1. INTRODUCTION

The global demand for textile products over the years has been continuously increasing as a result of the population increase, rapid fashion changes, low cost products and the expansion of advertising through the media (1). From existing data, about seventy percent of textiles produced are derived from petrochemicals giving rise to carbon dioxide emissions, while the rest thirty percent are dominated by natural fibres, such as cotton and wool (2). In view of all this, what cannot be ignored is the environmental impact produced especially by the different wet treatment processes, which are some of the major source of toxic emissions (3), while the other processes such as yarn spinning, knitting and weaving rely on fossil energy use causing emissions of CO₂ parts.

Textile reuse refers to various means by extending the practical service life of textile products by transferring them to new owners (4), with or without prior modification (e.g. mending). This can for example be done through renting, trading, swapping, borrowing and inheriting, facilitated by second hand shops, flea markets, online marketplaces, charities and clothing libraries, practices that have been around for perhaps hundreds of years.

Textile recycling, on the other hand, most often refers to the reprocessing of pre- or post-consumer textile waste for use in new textile or non-textile products. Textile recycling routes are typically classified as being either mechanical, chemical or, less frequently, thermal. This is in many cases a simplification of reality, as recycling routes often consist of a mix of mechanical, chemical and thermal processes. For example, chemical recycling most often refers to a recycling route in which the polymers are depolymerised (in the case of synthetic polymer fibres derived from petrochemicals, such as polyester) or dissolved (in the case of natural or synthetic cellulosic fibres, such as cotton and viscose). Having thus been disassembled to molecular levels, monomers or oligomers are polymerised again, and the new polymers spun into new fibres. However, prior to the dissolution, the recycled material is most often mechanically treated. Moreover, thermal recycling often refers to the conversion of PET flakes, pellets or chips into fibres by melt extrusion, but the flakes, pellets and chips have been produced from PET waste by mechanical means, which is why this recycling route

is sometimes referred to as mechanical recycling (5). Furthermore, the term thermal recycling is easily confused with thermal recovery, which is when textile waste is incinerated to generate heat and/or electricity (6). To complicate things further, incineration with energy recovery is occasionally labelled as recycling, although the term recycling most often refers solely to material recycling (as is the case in the present paper).

In case that a fabric of a product is produced from recycling materials and reused in new products, it is referred as recycling fabric or as material reuse recycling, sometimes this is referred to as material reuse (7). If the fabric is disassembled, but the original fibres are preserved, this is fibre recycling. If the fibres are taken apart, but the polymers are remained, this is a recycling polymer. On the other hand if the polymers/oligomers are disassembled, but the monomers are preserved, this is monomer recycling. Of course there are various means of achieving these types of recycling results, simply by combining various mechanical, chemical and thermal processes. Reference (8) presents the above recycling directions. If the recycled material is of low quality than the original product, then it is termed “downcycling”. Today, textile recycling routes are in most cases “downcycling”. For example, home textiles and garments are “downcycled” into industrial rags, low-grade blankets, insulation materials and upholstery (9). In case that a product from recycling material is of higher value or quality than the original one then it is specified “upcycling”. Through wear and laundry the length of constituent fibres is reduced which means the fibre recycling yields product materials of lower quality than original unused fibres. Of course there is an exception to this rule when mixing original yarns with recycling yarns (10). Another case is the man-made fibres where the quality after recycling remains unchanged.

Terms like “open loop “ and “closed loop” are also used to classify the way of recycling of a textile product. “Open loop” recycling refers to a process in which the material of an “A” stage is recycled and then transformed to a “B” product which can have different appearance and properties. The term “close loop” recycling is used when a product after recycling is transformed into an identical product (11, 12). A good example of “close loop” recycling is the case of a T-shirt which being recycled into T-shirt of the same or different size, colour and perhaps quality.

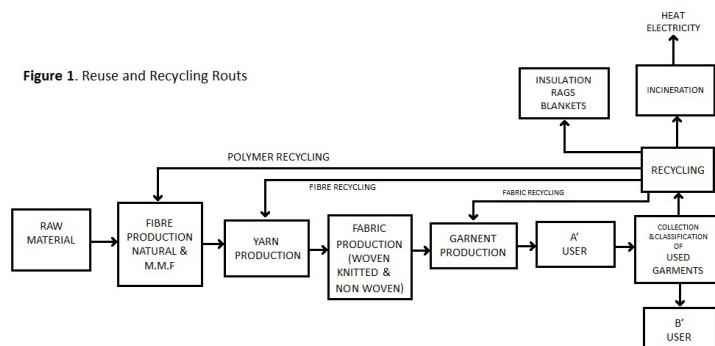


Fig.1 presents the various stages described above. It is important to mention that the collection and classification of the used garments take place from private companies and the all process of recycling may involve different countries. For example the collection of used garments take place in Greece, the classification and recycling may take place in other countries. The second User may obtain the item from non-profit organisations, special shops, open or flea markets.

2. TEXTILE REUSE AND RECYCLING IN EUROPE

According to Textile Recycling Association the European countries positively involved into textile reuse and recycling are: the United Kingdom, France, the Netherland, Germany,

Belgium, Poland and Spain. According to existing data it has been estimated that 1,500,000 tonnes of textiles are collected per annum. Only the Netherlands in Europe has set a target for textile collection of 5 kg of textiles per capita per annum.

All companies involved in the process of reuse and recycling of textiles have realized that the quality of the collected textiles has been trending downwards constantly for several years. The rise in textile imports from Asia and the growth of low-cost clothing stores across Europe are the principal reasons behind this decline. Consumer habits have changed. For example the English prefer to buy clothes more frequently but of lesser quality while the Dutch keep their clothes longer. Individuals are increasingly choosing to sell their best quality used clothing over the Internet.

Also the policy for collecting old clothes has changed, for example, in Belgium, individuals have to pay for their rubbish collection, by weight or per bag. They, therefore, prefer to dispose of all their textile waste in (free) bins. A similar situation exists also in the Netherlands, where the government has drummed the target of 5 kilos of recycled clothing per capita per annum into the heads of its citizens, driving the Dutch to fill the bins with anything resembling textiles.

The advantage of cloth reusing and recycling is to prolong its useful life and, therefore, reduce the need to produce new cotton or synthetic fibres. For instance, in France, ways to recycle the non-reusable portion of collected textiles are continuously under study and should significantly enhance the life cycle of textiles used for clothing. A significant percentage of recycled products are used by the automobile industry to create thermal and acoustic insulation material for motor vehicles. Moreover, the manufacturing sector uses 15% of collected textiles as rags. In Poland, the waste from recycling is used to make paper or rags for industry.

The consumption of second-hand clothing meets a real need in Europe, mainly for the underprivileged. In the Netherlands, an estimated 3/4 of clothing sold in second-hand shops is purchased by people between 30 and 65 years old, who are living on less than average income. Also in the Netherlands, between 50 and 100 tonnes of second-hand clothing are donated and 300 to 400 tonnes are sold at reduced prices (generally a 50% discount) to needy people.

According to a U.K. industry source, about 50% of collected textiles are reused, and about 50% are recycled. In Italy, the used garments after selection classified into different categories and dispatch: 30% to East Europe, 5% to West Europe, 10% to Asia, 5% to Middle East, 10% to South Africa and 40% to Africa.

3. TEXTILE REUSE AND RECYCLING IN GREECE

A detailed questionnaire was developed in order to help with the present study, aimed at people of all ages, residing in Athens, Thessaloniki and Larissa. The sample consisted of 300 people whose age ranges are presented in Fig. 2.

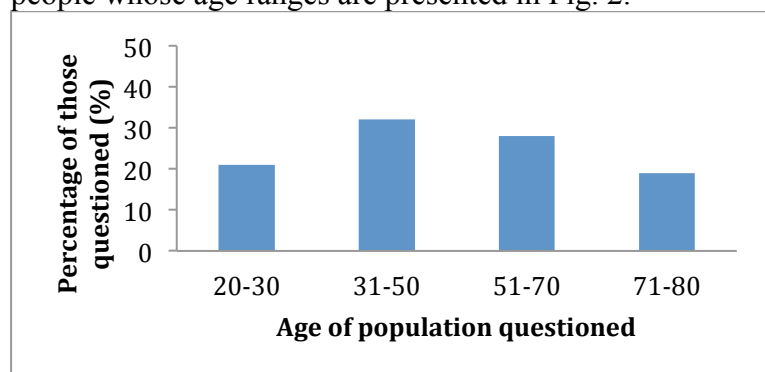


Fig. 2 Distribution of Age Groups

What appears to be of great interest is the answers presented by 70-80 year olds who provided some useful facts concerning their experience with mainly the reuse of garments. For example, in the post-war period, 1950 and roughly until the early 1970s, the Greeks, naturally, depended on reused garments to a great extent. Another point which perhaps is of the same interest is that not a single piece of clothing was ever destroyed or thrown away! It was either passed on to some other member of the family or given away to other families to be used. In the worst case, unneeded clothes would be turned into rags to be used for cleaning or very often cloths used in making mattresses or pillows (11%). An estimated of 85% of clothes were reused, while only about 4% was disposed of, one way or another.

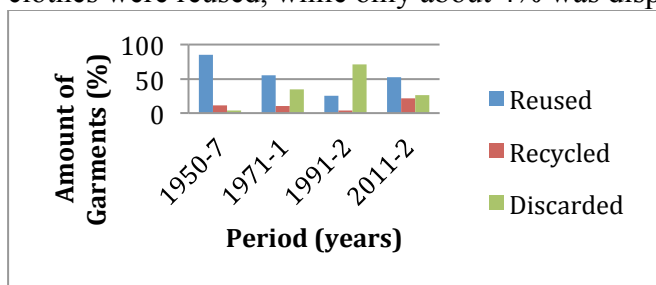


Fig. 3 Treatment of used garments

However, it goes without saying that, with the passing of time and the economic growth which followed, the amount of reused clothes grew smaller (55% in the period 1970-90) while the discarded or disposed of clothes increased (35%), as the working class enjoyed a higher standard of living due to the development of the State and the salary raises. This tendency also continued and in the next twenty year period 1990-2010, where only 25% of “old” clothes were reused, with 71% unfortunately ending up in landfills.

The turning point for the Greek economy came in about 2010 when Greece entered IMF! That is when the old practice of garment reuse started to increase (52%). Because of the warm climate, most of the garments worn are cotton. Cotton garments like T-shirts, therefore, can be worn throughout the year, cost very little (about 5-7 Euros) to replace, in which case they can easily be discarded when they have outlived their time. As a result of this, the percentage of disposed clothes still remains high 26%. Also the amount of the reused garments increases (52%) mainly because of the economic recession which has made people sensitive enough to offer unused clothes to the Church, which in turn offers them to underprivileged families.

TABLE 1: Towns involved in Reuse & Recycling Garments Programme and the amounts of garments collected

Municipality of	Starting Year	2017 (Kg)	2018 (Kg)
Thessaloniki	2016	105,300	178,800
Lagatha	2016	45,200	75,600
Pellas	2017	-	35,250
Naousas	2016	41,500	62,900
Kavala	2017	-	41,700
Kilkis	1016	38,500	62,800
Larisa	2016	95,380	127,100
Trikala	2017	-	36,600
Kalamaria	2016	36,800	67,100
Total		362,680	687,850

What is clear, therefore, is that until 2010 there is no organised Programme of Reuse and Recycling of Garments in Greece. The collection and distribution of old clothes is in the hands of the local Governments and the Church. The first attempts for more active involvement in Reuse and Recycling of Garments programmes were made in 2012-13 by a number of local authorities in Greece but they failed for various reasons. It was not until 2015

that the first serious attempts started to be effective when private companies produced some comprehensive programmes for the reuse and recycling of garments. These companies are responsible for organising the collection, transportation and sorting of garments. The local authorities offer some spots within the cities where special containers are placed by garment recycling companies for the collection of clothing. Until the time the present article was completed, over 60 local authorities in Greece had enrolled in the programme called Reuse and Recycling of Garments. It is obvious from Table 1 that the people's response is overwhelming, since in one year the amounts collected in each town have almost doubled. In order to create public awareness of Clothing Reuse & Recycling, the private recycling companies often provide educational materials at their websites regarding garment recycling and its importance. Colorful bins help describe what articles of clothing are accepted (Fig. 4). Once collected, clothing is classified into three groups: reuse, rags, and fiber. Typically this is a manual sorting process that requires expertise in identifying various types of material. Recyclers report that about one-half of donated garments can be reused. Some recyclers bale this clothing for export to developing countries, while some garments are used domestically for sale in thrift shops.



Fig. 4 Colourful bin placed in public place

Unfortunately, until now, there is no recycling plant on Greek soil where garments are collected, sorted and recycled. That is why, all the clothes collected in the country are transported to Bulgaria or Germany depending on the terms in the contracts made with the private recycling companies. The only commitment the private companies have towards the local authorities who participate in the programme is that after sorting of the garments, 30-40% of good quality garments will return to them so as to be distributed to local people who are impoverished or in desperate need of them.

4. DISCUSSION-CONCLUSION

What can be deduced from the research and the data obtained is that the people in Greece for a period of seventy or so years has been fully accustomed the term “reused” and this derives from their basic need for survival. There were a number of coincidences which contributed to a variety of garments being reused to such an extent that unique skills were developed as a result.

This phenomenon has continued into the present time where a large number of workshops have been established specializing in making drastic alterations to garments or simply enough to improve their appearance, which might be a reason why a more systematic collection of used garments by local authorities has been so late to arrive (2016), especially at a time when most European Union Countries already developed this institution decades ago.

Another factor that might not have contributed to the recycling of garments is a number of special conditions prevalent in Greece as for example, a) mild weather enjoyed over a period of 8-10 months where light-weight clothes are worn, most of which are inexpensive and can be easily discarded after their use, b) the total absence of heavy industry, car manufacture and so on, where recycled garments can be used as insulating materials and c) the construction of

buildings in Greece is mainly of bricks and concrete rather than wood which is the case with many countries in northern Europe where large quantities of insulating materials are also required, which is perhaps one more adverse factor in the development of recycling of garments in Greece.

Finally, it can be said with a great degree of certainty that the Greek people are fully aware of what the term “garment reused” entails and refers to. On the contrary, “recycling” of garments is still in its infancy. Although Greek governments are aware of the importance of garment recycling, they need to cooperate more systematically at local authority level to raise awareness of people and its benefits to the environment. It is a task that is more easily attainable in our day and age since we can base our own efforts on the previous experience of other European countries which have been through the process and have seen some encouraging results both in their economies but mostly concerning the environment.

5. REFERENCES

1. The Fiber Year Consulting, 2015. *The Fiber Year 2015, World Survey on Textiles and Nonwovens*. Issue 15. April 2015.
2. Lenzing, 2017. *The Global Fiber Market in 2016*. Available at: <http://www.lenzing.com/en/investors/equity-story/global-fiber-market.html> (Accessed June 2017).
3. Roos, S., Posner, S., Jönsson, C., Peters, G.M., *Is unbleached cotton better than bleached? Exploring the limits of life cycle assessment in the textile sector*. *Cloth. Text. Res. J.* 3 (44), 2015b, 231-247.
4. Fortuna, L.M., Diyamandoglu, V., *Optimization of greenhouse gas emissions in second-hand consumer product recovery through reuse platforms*. *Waste Manag.* 66, 2017, 178-189.
5. Shen, L., Worrell, E., Patel, M.K., *Open-loop recycling: a LCA case study of PET bottle-to-fibre recycling*. *Resour. Conserv. Recycl.* 55, 2010b, 34-52.
6. Schmidt, A., Watson, D., Roos, S., Askham, C., Poulsen, P.B., *Gaining benefits from discarded textiles -- LCA of different treatment pathways*. TemaNord 2016, 537. <https://doi.org/10.6027/TN2016-537>. Nordic Council of Ministers.\
7. Zamani, B., Svanström, M., Peters, G., Rydberg, T., *A carbon footprint of textile recycling: a case study in Sweden*, *J. Ind. Ecol.* 19 (4), 2015, 676-687.
8. Ellen MacArthur Foundation, *A New Textiles Economy: Redesigning Fashion's Future*. Available at: www.ellenmacarthurfoundation.org/publications (Accessed December 2017).
9. Schmidt, A., Watson, D., Roos, S., Askham, C., Poulsen, P.B., *Gaining benefits from discarded textiles - LCA of different treatment pathways*. TemaNord 2016, 537. <https://doi.org/10.6027/TN2016-537>. Nordic Council of Ministers.
10. Palme, A., Idstrom, A., Nordstierna, L., Brelid, H., *Chemical and ultrastructural changes in cotton cellulose induced by laundering and textile use*, *Cellul* 21, 2014.4681-4691.
11. Ekvall, T., *Principles for allocation at multi-output processes and cascaderecycling*. In: *Proceedings of the European Workshop on Allocation in LCA*, CML, Leiden, 1994, pp. 91-101.
12. Klopffer, W., *Allocation rule for open-loop recycling in life cycle assessment*, *Int. J. Life Cycle Assess.* (1), 1996, 27-31.