

Well dressed?

The present and future sustainability of clothing and
textiles in the United Kingdom.

Technical annex

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Introduction

This technical annex presents technical background details for the report “Well dressed? The present and future sustainability of clothing and textiles in the United Kingdom”, 2006, ISBN 1-902546-52-0. The first part of the report looks at the flow of material through the UK arising from present day demand for clothing and textiles. The second part of the report explores the possibility that the UK’s demand could be met in different ways. Five person-years of work leading to the report were funded by the Landfill Tax Credit scheme, through the Biffaward scheme administered by the Royal Society of Wildlife Trusts and with 10% funding from Marks and Spencer.

This technical annex is intended to be valuable for people who want to learn more about the technical details in preparing the report.

The United Kingdom clothing and textile mass balance

The numbers and the two figures in the “Well dressed?” report on page 18-21 are primarily based on these sources:

- Detailed HM Revenue & Customs 2004 trade data by value and quantity covering chapters 50 to 63 in the “Combined Nomenclature” classification system. Downloaded from <http://www.uktradeinfo.com/>
- Detailed UK 2004 production data by value and quantity provided by the British Apparel & Textile Confederation (BATC) and using the PRODCOM classification system (PRODUcts of the European COMmunity).

In addition various other sources were used (see list on page 13).

On the following pages the sums and numbers used for further analysis later in this mass balance section or numbers directly presented in the “Well dressed?” report are high-lined in bold. In addition other especially important details and assumptions are also marked in bold.

Import and export of fibres in 2004 by mass

Detailed HM Revenue & Customs 2004 trade data in the "Combined Nomenclature" classification system downloaded from www.uktradeinfo.com/	Quantity kg	
	Total Imports	Total Exports
5001 :SILKWORM COCOONS SUITABLE FOR REELING	25,138	1,758
5002 :RAW SILK, NEITHER SPUN NOR THROWN	27,206	171
5003 :SILK WASTE, INCL. COCOONS UNSUITABLE FOR REELING, YARN WASTE AND GARNETTED STOCK	298,376	161,177
5101 :WOOL, NEITHER CARDED NOR COMBED (EXCL. COTTON)	52,971,567	41,690,159
5102 :FINE OR COARSE ANIMAL HAIR, NEITHER CARDED NOR COMBED (EXCL. WOOL, HAIR AND BRISTLES USED IN THE MANUFACTURE OF BROOMS AND BRUSHES, AND HORSEHAIR FROM THE MANE OR TAIL)	3,136,151	1,106,387
5103 :WASTE OF WOOL OR OF FINE OR COARSE ANIMAL HAIR, INCL. YARN WASTE (EXCL. GARNETTED STOCK, WASTE OF HAIR AND BRISTLES USED IN THE MANUFACTURE OF BROOMS AND BRUSHES, AND OF HORSEHAIR FROM THE MANE OR TAIL)	5,480,838	7,036,252
5104 :GARNETTED STOCK OF WOOL OR OF FINE OR COARSE ANIMAL HAIR, NEITHER CARDED NOR COMBED	38,227	109,119
5105 :WOOL AND FINE OR COARSE ANIMAL HAIR, CARDED OR COMBED, INCL. COMBED WOOL IN FRAGMENTS	7,356,068	7,228,757
5201 :COTTON, NEITHER CARDED NOR COMBED	18,836,273	159,130
5202 :COTTON WASTE, INCL. YARN WASTE AND GARNETTED STOCK	11,276,667	516,336
5203 :COTTON, CARDED OR COMBED	13,626,886	30,182
5301 :FLAX, RAW OR PROCESSED, BUT NOT SPUN; FLAX TOW AND WASTE, INCL. YARN WASTE AND GARNETTED STOCK	864,063	189,086
5302 :HEMP 'CANNABIS SATIVA', RAW OR PROCESSED, BUT NOT SPUN; TOW AND WASTE OF TRUE HEMP, INCL. YARN WASTE AND GARNETTED STOCK	954,983	3,413,905
5303 :JUTE AND OTHER TEXTILE BAST FIBRES, RAW OR PROCESSED, BUT NOT SPUN; TOW AND WASTE OF SUCH FIBRES, INCL. YARN WASTE AND GARNETTED STOCK (EXCL. FLAX, HEMP AND RAMIE)	281,340	9,353
5304 :SISAL AND OTHER TEXTILE FIBRES OF THE GENUS AGAVE, RAW OR PROCESSED, BUT NOT SPUN; TOW AND WASTE OF SUCH FIBRES, INCL. YARN WASTE AND GARNETTED STOCK	41,527	5,532
5305 :COCONUT, ABACA 'MANILA HEMP OR MUSA TEXTILIS', RAMIE AND OTHER VEGETABLE TEXTILE FIBRES N.E.S., RAW OR PROCESSED, BUT NOT SPUN; TOW AND WASTE OF SUCH FIBRES, INCL. YARN WASTE AND GARNETTED STOCK	21,411,450	49,019
5501 :SYNTHETIC FILAMENT TOW AS SPECIFIED IN NOTE 1 TO CHAPTER 55	3,617,569	1,391,374
5502 :ARTIFICIAL FILAMENT TOW AS SPECIFIED IN NOTE 1 TO CHAPTER 55	4,094,113	13,030,435
5503 :SYNTHETIC STAPLE FIBRES, NOT CARDED, COMBED OR OTHERWISE PROCESSED FOR SPINNING	184,137,671	45,090,580
5504 :ARTIFICIAL STAPLE FIBRES, NOT CARDED, COMBED OR OTHERWISE PROCESSED FOR SPINNING	10,250,429	1,038,735
5505 :WASTE OF MAN-MADE FIBRES, INCL. NOILS, YARN WASTE AND GARNETTED STOCK	19,147,649	27,347,634
5506 :SYNTHETIC STAPLE FIBRES, CARDED, COMBED OR OTHERWISE PROCESSED FOR SPINNING	3,158,621	7,635,451
5507 :ARTIFICIAL STAPLE FIBRES, CARDED, COMBED OR OTHERWISE PROCESSED FOR SPINNING	15,315	3,554
Sum 50-55	361,048,127	157,244,086
Sum 50-53 - Raw natural fibre	136,626,760	61,706,323
Sum 55 - Man-made fibres	224,421,367	95,537,763
Sum 55 - Man-made fibres adjusted (suppressed data for this chapter estimated to be 50% fibres and 50% fabrics (intermediate products) - see suppressed raw data below)	224,421,367	153,750,953
Total fibres	361,048,127	215,457,276
55 - SUPPRESSED FOR - :MAN-MADE STAPLE FIBRES	0	116,426,379
50 (silk alone)	350,720	163,106
51 (wool and other animal hair)	68,982,851	57,170,674
52 Cotton	43,739,826	705,648
53 Other natural fibres	23,553,363	3,666,895
55 Man-made fibre	224,421,367	153,750,953
Total fibres	361,048,127	215,457,276

Import and export of yarns in 2004 by mass

Detailed HM Revenue & Customs 2004 trade data in the "Combined Nomenclature" classification system downloaded from www.uktradeinfo.com/	Quantity kg	
	Total Imports	Total Exports
5004 :SILK YARN OTHER THAN THAT OF SCHAPPE OR BOURETTE (EXCL. THAT PUT UP FOR RETAIL SALE)	178,435	30,001
5005 :YARN OF SCHAPPE OR BOURETTE (EXCL. THAT PUT UP FOR RETAIL SALE)	73,412	43,420
5006 :YARN OF SILK, SCHAPPE OR BOURETTE, PUT UP FOR RETAIL SALE; SILKWORM GUT	32,376	58,515
5106 :CARDED WOOL YARN (EXCL. THAT PUT UP FOR RETAIL SALE)	9,688,196	6,825,510
5107 :WORSTED YARN OF WOOL (EXCL. THAT PUT UP FOR RETAIL SALE)	6,835,023	1,882,499
5108 :CARDED OR WORSTED YARN OF FINE ANIMAL HAIR (EXCL. THAT OF WOOL OR THAT PUT UP FOR RETAIL SALE)	354,028	1,150,734
5109 :YARN OF WOOL OR FINE ANIMAL HAIR, PUT UP FOR RETAIL SALE	225,922	535,554
5110 :YARN OF COARSE ANIMAL HAIR OR OF HORSEHAIR, INCL. GIMPED HORSEHAIR YARN, WHETHER OR NOT PUT UP FOR RETAIL SALE (EXCL. HORSEHAIR AND YARN NOT JOINED TOGETHER)	7,335	18,119
5204 :COTTON SEWING THREAD, WHETHER OR NOT PUT UP FOR RETAIL SALE	501,298	432,545
5205 :COTTON YARN OTHER THAN SEWING THREAD, CONTAINING >= 85 % COTTON BY WEIGHT (EXCL. THAT PUT UP FOR RETAIL SALE)	18,640,255	6,094,403
5206 :COTTON YARN OTHER THAN SEWING THREAD, CONTAINING > 50 % TO < 85 % COTTON BY WEIGHT (EXCL. THAT PUT UP FOR RETAIL SALE)	5,341,998	118,180
5207 :COTTON YARN OTHER THAN SEWING THREAD PUT UP FOR RETAIL SALE	4,956,235	226,141
5306 :FLAX YARN	3,466,985	1,377,701
5307 :YARN OF JUTE OR OF OTHER TEXTILE BAST FIBRES OF HEADING 5303	3,004,985	379,458
5308 :YARN OF OTHER VEGETABLE TEXTILE FIBRES; PAPER YARN (EXCL. FLAX YARN, YARN OF JUTE OR OF OTHER TEXTILE BAST FIBRES OF HEADING 5303 AND WOOL YARN)	368,050	197,064
5401 :SEWING THREAD OF MAN-MADE FILAMENTS, WHETHER OR NOT PUT UP FOR RETAIL SALE	1,802,755	1,829,445
5402 :SYNTHETIC FILAMENT YARN, INCL. SYNTHETIC MONOFILAMENTS OF < 67 DECITEX (EXCL. SEWING THREAD AND YARN PUT UP FOR RETAIL SALE)	146,924,813	27,914,553
5403 :ARTIFICIAL FILAMENT YARN, INCL. ARTIFICIAL MONOFILAMENT OF < 67 DECITEX (EXCL. SEWING THREAD AND YARN PUT UP FOR RETAIL SALE)	4,425,819	487,618
5404 :SYNTHETIC MONOFILAMENT OF >= 67 DECITEX AND WITH A MAXIMUM DIAMETER OF <= 1 MM; STRIP AND THE LIKE, E.G. ARTIFICIAL STRAW, OF SYNTHETIC TEXTILE MATERIAL, WITH AN APPARENT WIDTH OF <= 5 MM	7,242,556	9,881,106
5405 :ARTIFICIAL MONOFILAMENT OF >= 67 DECITEX AND WITH A MAXIMUM DIAMETER OF <= 1 MM; STRIP AND THE LIKE, E.G. ARTIFICIAL STRAW, OF SYNTHETIC TEXTILE MATERIAL, WITH AN APPARENT WIDTH OF <= 5 MM	16,406	3,026
5406 :MAN-MADE FILAMENT YARN, PUT UP FOR RETAIL SALE	421,160	110,934
5508 :SEWING THREAD OF MAN-MADE STAPLE FIBRES, WHETHER OR NOT PUT UP FOR RETAIL SALE	1,154,266	217,937
5509 :YARN OF SYNTHETIC STAPLE FIBRES (EXCL. SEWING THREAD AND YARN PUT UP FOR RETAIL SALE)	25,492,109	1,519,581
5510 :YARN OF ARTIFICIAL STAPLE FIBRES (EXCL. SEWING THREAD AND YARN PUT UP FOR RETAIL SALE)	9,063,324	333,396
5511 :YARN OF MAN-MADE STAPLE FIBRES, PUT UP FOR RETAIL SALE (EXCL. SEWING THREAD)	1,096,452	616,167
Sum 50-55	251,314,193	62,283,607
50-53 - Natural yarns	53,674,533	19,369,844
54-55 (ex suppressed for 54) : Man-made yarns	197,639,660	42,913,763
54-54 (including suppressed) : Man-made yarns	197,639,660	97,364,014
Total yarns	251,314,193	116,733,858
54: SUPPRESSED FOR - :MAN-MADE FILAMENTS	0	54,450,251
50 - Silk	284,223	131,936
51- Wool and other animal hair	17,110,504	10,412,416
52 Cotton	29,439,786	6,871,269
53 - Other natural fibres like flax	6,840,020	1,954,223
54-54 Man-made (from above)	197,639,660	97,364,014
Total yarn	251,314,193	116,733,858

Import and export of fabrics in 2004 by mass

Detailed HM Revenue & Customs 2004 trade data in the "Combined Nomenclature" classification system downloaded from www.uktradeinfo.com/	Quantity kg	
	Total Imports	Total Exports
5007 .WOVEN FABRICS OF SILK, SCHAPPE OR BOURETTE	943,096	610,907
5111 .WOVEN FABRICS OF CARDED WOOL OR OF CARDED FINE ANIMAL HAIR (EXCL. FABRICS FOR TECHNICAL USE OF HEADING 5911)	2,391,468	3,349,391
5112 .WOVEN FABRICS OF COMBED WOOL OR OF COMBED FINE ANIMAL HAIR (EXCL. FABRICS FOR TECHNICAL PURPOSES OF HEADING 5911)	1,743,432	3,375,579
5113 .WOVEN FABRICS OF COARSE ANIMAL HAIR OR OF HORSEHAIR (EXCL. FABRICS FOR TECHNICAL USE OF HEADING 5911)	36,970	13,059
5208 .WOVEN FABRICS OF COTTON, CONTAINING >= 85 % COTTON BY WEIGHT AND WEIGHING <= 200 G PER M2	24,584,608	9,571,324
5209 .WOVEN FABRICS OF COTTON, CONTAINING >= 85 % COTTON BY WEIGHT AND WEIGHING > 200 G PER M2	15,834,770	4,519,667
5210 .WOVEN FABRICS OF COTTON, CONTAINING 50 % TO 85 % COTTON BY WEIGHT, MIXED PRINCIPALLY OR SOLELY WITH MAN-MADE FIBRES AND WEIGHING <= 200 G PER M2	7,798,519	928,307
5211 .WOVEN FABRICS OF COTTON, CONTAINING > 50 % TO < 85 % COTTON BY WEIGHT, MIXED PRINCIPALLY OR SOLELY WITH MAN-MADE FIBRES AND WEIGHING > 200 G PER M2	9,483,887	1,911,219
5212 .WOVEN FABRICS OF COTTON, CONTAINING > 50 % TO < 85 % COTTON BY WEIGHT, OTHER THAN THOSE MIXED PRINCIPALLY OR SOLELY WITH MAN-MADE FIBRES	1,110,804	588,110
5309 .WOVEN FABRICS OF FLAX	3,167,361	3,741,822
5310 .WOVEN FABRICS OF JUTE OR OF OTHER TEXTILE BAST FIBRES OF HEADING 5303	11,511,923	2,570,466
5311 .WOVEN FABRICS OF OTHER VEGETABLE TEXTILE FIBRES; WOVEN FABRICS OF PAPER YARN (EXCL. THOSE OF FLAX, JUTE, OTHER TEXTILE BAST FIBRES OF HEADING 5303 AND WOOL)	112,093	660,661
5407 .WOVEN FABRICS OF SYNTHETIC FILAMENT YARN, INCL. MONOFILAMENT OF >= 67 DECITEX AND WITH A MAXIMUM DIAMETER OF <= 1 MM	79,506,170	43,189,828
5408 .WOVEN FABRICS OF ARTIFICIAL FILAMENT YARN, INCL. MONOFILAMENT OF >= 67 DECITEX AND A MAXIMUM DIAMETER OF <= 1 MM	5,282,139	1,856,878
5512 .WOVEN FABRICS CONTAINING >= 85 % SYNTHETIC STAPLE FIBRES BY WEIGHT	4,306,006	1,912,380
5513 .WOVEN FABRICS CONTAINING > 50 % TO < 85 % SYNTHETIC STAPLE FIBRES BY WEIGHT, MIXED PRINCIPALLY OR SOLELY WITH COTTON AND WEIGHING <= 170 G PER M2	18,533,729	3,934,073
5514 .WOVEN FABRICS CONTAINING > 50 % TO < 85 % SYNTHETIC STAPLE FIBRES BY WEIGHT, MIXED PRINCIPALLY OR SOLELY WITH COTTON AND WEIGHING > 170 G PER M2	12,062,369	7,117,812
5515 .WOVEN FABRICS CONTAINING > 50 % TO < 85 % SYNTHETIC STAPLE FIBRES BY WEIGHT, OTHER THAN THOSE MIXED PRINCIPALLY OR SOLELY WITH COTTON	6,996,549	19,223,248
5516 .WOVEN FABRICS OF ARTIFICIAL STAPLE FIBRES	17,770,730	3,826,459
5801 .WOVEN PILE FABRICS AND CHENILLE FABRICS (EXCL. TERRY TOWELLING AND SIMILAR WOVEN TERRY FABRICS, TUFTED TEXTILE FABRICS AND NARROW WOVEN FABRICS OF HEADING 5806)	14,615,016	3,046,962
5802 .TERRY TOWELLING AND SIMILAR WOVEN TERRY FABRICS, TUFTED TEXTILE FABRICS (EXCL. NARROW WOVEN FABRICS OF HEADING 5806, CARPETS AND OTHER FLOOR COVERINGS)	557,443	65,235
5803 .GAUZE (EXCL. NARROW WOVEN FABRICS OF HEADING 5806)	141,811	48,640
5804 .TULLE, INCL. BOBBINET, AND OTHER KNOTTED NET FABRICS; LACE IN THE PIECE, IN STRIPS OR AS MOTIFS	722,091	345,586
5805 .HAND-WOVEN TAPESTRIES SUCH AS GOBELIN, FLANDERS, AUBUSSON, BEAUVAIS AND THE LIKE, AND NEEDLE-WORKED TAPESTRIES, E.G. PETIT POINT, CROSS-STITCH, WHETHER OR NOT MADE UP (EXCL. KELEM, SCHUMACKS, KARAMANIE AND THE LIKE, AND TAPES)	50,648	41,654
5806 .NARROW WOVEN FABRICS, INCL. NARROW FABRICS CONSISTING OF WARP WITHOUT WEFT, N.E.S.	7,791,521	7,005,885
5807 .LABELS, BADGES AND SIMILAR ARTICLES, OF TEXTILE MATERIALS, IN THE PIECE, IN STRIPS OR CUT TO SHAPE OR SIZE, NOT EMBROIDERED	1,531,663	2,727,519
5808 .BRAID OF TEXTILE MATERIALS, IN THE PIECE, ORNAMENTAL TRIMMINGS AND THE LIKE, OF TEXTILE MATERIALS, IN THE PIECE, NOT EMBROIDERED, OTHER THAN KNITTED OR CROCHETED; TASSELS, POMPONS AND SIMILAR ARTICLES OF TEXTILE MATERIALS	1,133,413	957,567
5809 .WOVEN FABRICS OF METAL THREAD AND WOVEN FABRICS OF METAL OR METALLIZED YARN OF HEADING 5605, OF A KIND USED FOR CLOTHING, INTERIOR DECORATION OR SIMILAR PURPOSES, N.E.S.	33,082	16,888
5810 .EMBROIDERY ON A TEXTILE FABRIC GROUND, IN THE PIECE, IN STRIPS OR AS MOTIFS	3,035,879	517,407
5811 .QUILTED TEXTILE PRODUCTS IN THE PIECE, COMPOSED OF ONE OR MORE LAYERS OF TEXTILE MATERIALS ASSEMBLED WITH PADDING BY STITCHING OR OTHERWISE (EXCL. EMBROIDERY OF HEADING NO 5810 AND QUILTED FABRICS FOR BEDDING AND FURNISHINGS)	1,879,455	159,983
5901 .TEXTILE FABRICS COATED WITH GUM OR AMYLACEOUS SUBSTANCES, OF A KIND USED FOR THE BINDING OF BOOKS, THE MANUFACTURE OF BOXES AND ARTICLES OF CARDBOARD OR FOR SIMILAR PURPOSES; TRACING CLOTH; PREPARED ARTIST'S CANVAS; BUCKRAM A	2,418,908	1,167,687
5902 .TYRE-CORD FABRIC OF HIGH-TENSILE YARN OF NYLON OR OTHER POLYAMIDES, POLYESTERS OR VISCOSE, WHETHER OR NOT DIPPED OR IMPREGNATED WITH RUBBER OR PLASTIC	8,721,136	1,399,860
5903 .TEXTILE FABRICS IMPREGNATED, COATED, COVERED OR LAMINATED WITH PLASTIC (EXCL. TYRE-CORD FABRIC OF HIGH-TENSILE YARN OF NYLON OR OTHER POLYAMIDES, POLYESTERS OR VISCOSE; WALL COVERINGS IMPREGNATED OR COVERED WITH TEXTILE MATER)	11,652,201	23,270,985
5904 .LINOLEUM, WHETHER OR NOT CUT TO SHAPE; FLOOR COVERINGS CONSISTING OF A TEXTILE BACKING AND A TOP LAYER OR COVERING, WHETHER OR NOT CUT TO SHAPE	3,505,367	9,234,391
5905 .WALL COVERINGS OF TEXTILE MATERIALS	128,554	99,886
5906 .RUBBERIZED TEXTILE FABRICS (EXCL. TYRE-CORD FABRIC OF HIGH-TENSILE YARN OF NYLON OR OTHER POLYAMIDES)	11,371,710	5,377,609
5907 .IMPREGNATED, COATED OR COVERED TEXTILE FABRICS; PAINTED CANVAS FOR USE AS THEATRICAL SCENERY, STUDIO BACKCLOTHS AND THE LIKE, N.E.S.	2,824,988	2,270,583
5908 .TEXTILE WICKS, WOVEN, PLATED OR KNITTED, FOR LAMPS, STOVES, LIGHTERS, CANDLES AND THE LIKE; INCANDESCENT GAS MANTLES AND TUBULAR KNITTED GAS MANTLE FABRICS FOR INCANDESCENT GAS MANTLES, WHETHER OR NOT IMPREGNATED (EXCL. WAX-IMPREGNATED)	93,459	50,571
5909 .TEXTILE HOSEPIPING AND SIMILAR TEXTILE TUBING, WHETHER OR NOT IMPREGNATED OR COATED, OR WITH FITTINGS OR ACCESSORIES OF OTHER MATERIALS	536,885	1,228,922
5910 .CONVEYOR OR TRANSMISSION BELTS OR BELTING, OF TEXTILE MATERIALS, WHETHER OR NOT REINFORCED WITH METAL OR OTHER MATERIALS (EXCL. THOSE WITH A THICKNESS OF <= 3 MM AND OF INDETERMINATE LENGTH OR CUT TO LENGTH ONLY, PLUS THOSE IM)	667,142	3,948,163
5911 .TEXTILE PRODUCTS AND ARTICLES FOR TECHNICAL USE, AS SPECIFIED IN NOTE 7 TO CHAPTER 59	3,256,105	6,277,416
6001 .PILE FABRICS, INCL. 'LONG PILE' FABRICS AND TERRY FABRICS, KNITTED OR CROCHETED	8,709,737	19,416,710
6002 .KNITTED OR CROCHETED FABRICS (EXCL. PILE FABRICS, INCL. 'LONG PILE', LOOPED PILE FABRICS, LABELS, BADGES AND SIMILAR ARTICLES, AND KNITTED OR CROCHETED FABRICS, IMPREGNATED, COATED, COVERED OR LAMINATED)	2,898,842	2,719,031
6003 .KNITTED OR CROCHETED FABRICS OF A WIDTH NOT EXCEEDING 30 CM, OTHER THAN THOSE OF HEADING 6001 OR 6002	1,094,083	374,489
6004 .KNITTED OR CROCHETED FABRICS OF A WIDTH EXCEEDING 30 CM, CONTAINING BY WEIGHT 5% OR MORE OF ELASTOMERIC YARN OR RUBBER THREAD, OTHER THAN THOSE OF HEADING 6001	3,415,510	2,814,585
6005 .WARP KNIT FABRICS (INCLUDING THOSE MADE ON GALLOON KNITTING MACHINES), OTHER THAN THOSE OF HEADINGS 6001 TO 6004	4,414,657	8,656,381
6006 .OTHER KNITTED OR CROCHETED FABRICS	4,473,717	2,720,710
Total fabrics	324,831,640	218,661,875
Sum 50-53 - Raw natural fabrics - specified	78,718,925	31,840,512
Sum 54-55 - Man-made fabrics - specified	144,437,692	80,860,678
Sum 55 - Man-made fibres adjusted (suppressed data for this chapter estimated to be 50% fibres and 50% fabrics (intermediate products) - see suppressed raw data below)	144,437,692	139,073,868
Sum 58-60: Unspecified fabrics	101,675,023	105,960,685
Total fabrics	324,831,640	276,875,065
55.SUPPRESSED FOR - .MAN-MADE STAPLE FIBRES	0	116,426,379
50 - Silk	943,096	610,907
51 - Wool (and other animal hair)	4,171,870	6,738,029
52 - Cotton	58,812,582	17,518,627
53 - Other natural	14,791,377	6,972,949
54-55 Man made fabrics	144,437,692	139,073,868
Total	223,156,617	170,914,380
Including unspecified	324,831,640	276,875,065

Import and export of intermediate products in 2004 by mass

Detailed HM Revenue & Customs 2004 trade data in the "Combined Nomenclature" classification system downloaded	Quantity kg	
	Total Imports	Total Exports
Total yarn (from previous table)	251,314,193	116,733,858
Total fabrics (from previous table)	324,831,640	276,875,065
5601 :WADDING OF TEXTILE MATERIALS AND ARTICLES THEREOF; TEXTILE FIBRES WITH A LENGTH OF ≤ 5 MM 'FLOCK', TEXTILE DUST AND MILL NEPS (EXCL. WADDING AND ARTICLES THEREOF IMPREGNATED OR COATED WITH PHARMACEUTICAL SUBSTANCES OR PUT UP	70,720,783	13,507,089
5602 :FELT, WHETHER OR NOT IMPREGNATED, COATED, COVERED OR LAMINATED, N.E.S.	14,087,081	15,040,037
5603 :NONWOVENS, WHETHER OR NOT IMPREGNATED, COATED, COVERED OR LAMINATED, N.E.S. - NB 2005 data has replaced 2004 data because 2004 import data was estimated to be incorrect (much too high)	165,031,525	31,811,910
5604 :TEXTILE-COVERED RUBBER THREAD AND CORD; TEXTILE YARN, STRIP AND THE LIKE OF HEADINGS 5404 AND 5405, IMPREGNATED, COATED, COVERED OR SHEATHED WITH RUBBER OR PLASTIC (EXCL. IMITATION CATGUT, THREAD AND CORD WITH FISH- HOOK ATTAC	1,593,801	909,109
5605 :METAL YARN AND METALLIZED YARN, WHETHER OR NOT GIMPED, CONSISTING OF STRIP OR THE LIKE OF HEADINGS 5404 OR 5405, OR OF TEXTILE YARN, COMBINED WITH METAL IN THE FORM OF THREAD, STRIP OR POWDER, OR COVERED WITH METAL (EXCL. YAR	406,936	171,059
5606 :GIMP, GIMPED STRIP AND THE LIKE OF HEADINGS 5404 OR 5405; CHENILLE YARN AND LOOP WALE-YARN (EXCL. METAL YARN AND METALLIZED YARN OF HEADING 5605; GIMPED HORSEHAIR YARN; TEXTILE-COVERED RUBBER THREAD; TWINE, CORD AND OTHER GIM	839,588	18,460
5607 :TWINE, CORDAGE, ROPE AND CABLE, WHETHER OR NOT PLAITED OR BRAIDED, WHETHER OR NOT IMPREGNATED, COATED, COVERED OR SHEATHED WITH RUBBER OR PLASTIC	18,024,609	4,897,412
5608 :KNOTTED NETTING OF TWINE, CORDAGE, ROPE OR CABLE, BY THE PIECE OR METRE; MADE-UP FISHING NETS AND OTHER MADE- UP NETS, OF TEXTILE MATERIALS (EXCL. HAIRNETS, NETS FOR SPORTING PURPOSES, INCL. LANDING NETS, BUTTERFLY NETS AND TH	5,257,583	1,177,779
5609 :ARTICLES OF YARN, STRIP OR THE LIKE, OF HEADINGS 5404 AND 5405, OR OF TWINE, CORDAGE, ROPE OR CABLE OF HEADING 5607, N.E.S.	771,213	545,719
Total intermediate products	852,878,952	461,687,497
56- Other intermediate product (than fibres, yarns and fabrics)	276,733,119	68,078,574

Import and export of products in 2004 by mass

Detailed HM Revenue & Customs 2004 trade data in the "Combined Nomenclature" classification system downloaded from www.uktradeinfo.com/	Quantity kg	
	Total Imports	Total Exports
5701 CARPETS OF TEXTILE MATERIALS, KNITTED, WHETHER OR NOT MADE UP	5,695,678	1,051,875
5702 CARPETS AND OTHER TEXTILE FLOOR COVERINGS, WOVEN, NOT TUFTED OR FLOCKED, WHETHER OR NOT MADE UP, INCL KELEM, SCHUMACKS, KARAMANIE AND SIMILAR HANDWOVEN RUGS	70,522,502	8,187,674
5703 CARPETS AND OTHER TEXTILE FLOOR COVERINGS, TUFTED NEEDLE PUNCHED, WHETHER OR NOT MADE UP	302,914,792	25,189,710
5704 CARPETS AND OTHER FLOOR COVERINGS, OF FELT, NOT TUFTED OR FLOCKED, WHETHER OR NOT MADE UP	23,453,938	5,130,726
5705 CARPETS AND OTHER TEXTILE FLOOR COVERINGS, WHETHER OR NOT MADE UP (EXCL. WOVEN OR TUFTED NEEDLE PUNCHED)	8,237,043	9,200,918
6101 MENS OR BOYS' OVERCOATS, CAR-COATS, CAPES, CLOAKS, ANORAKS, INCL. SKI-JACKETS, WIND-CHEATERS, WIND-JACKETS AND SIMILAR ARTICLES, KNITTED OR CROCHETED (EXCL. SUITS, ENSEMBLES, JACKETS, BLAZERS AND TROUSERS)	4,236,745	520,819
6102 WOMENS OR GIRLS' OVERCOATS, CAR-COATS, CAPES, CLOAKS, ANORAKS, INCL. SKI-JACKETS, WIND-CHEATERS, WIND-JACKETS AND SIMILAR ARTICLES, KNITTED OR CROCHETED (EXCL. SUITS, ENSEMBLES, JACKETS, BLAZERS, DRESSES, SKIRTS, DIVIDED SKI)	12,376,287	1,544,781
6103 MENS OR BOYS' SUITS, ENSEMBLES, JACKETS, BLAZERS, TROUSERS, BIB AND BRACE OVERALLS, BREECHES AND SHORTS (EXCL. WIND-JACKETS AND SIMILAR ARTICLES, SEPARATE WAISTCOATS, TRACK SUITS, SKI SUITS AND SWIMWEAR)	14,770,173	1,330,276
6104 WOMENS OR GIRLS' SUITS, ENSEMBLES, JACKETS, DRESSES, SKIRTS, DIVIDED SKIRTS, TROUSERS, BIB AND BRACE OVERALLS, BREECHES AND SHORTS, KNITTED OR CROCHETED (EXCL. WIND-JACKETS AND SIMILAR ARTICLES, SLIPS, PETTICOATS AND PANTIES)	31,790,825	3,407,808
6105 MENS OR BOYS' SHIRTS, KNITTED OR CROCHETED (EXCL. NIGHTSHIRTS, T-SHIRTS, SINGLETTS AND OTHER VESTS)	22,471,759	2,772,427
6106 WOMENS OR GIRLS' BLOUSES, SHIRTS AND SHIRT-BLOUSES, KNITTED OR CROCHETED (EXCL. T-SHIRTS AND VESTS)	12,123,380	5,481,588
6107 MENS OR BOYS' UNDERPANTS, BRIEFS, NIGHTSHIRTS, PYJAMAS, BATHROBES, DRESSING GOWNS AND SIMILAR ARTICLES, KNITTED OR CROCHETED (EXCL. VESTS AND SINGLETTS)	16,806,383	1,207,461
6108 WOMENS OR GIRLS' SLIPS, PETTICOATS, BRIEFS, PANTIES, NIGHTDRESSES, PYJAMAS, NEGLIGES, BATHROBES, DRESSING GOWNS, HOUSECOATS AND SIMILAR ARTICLES, KNITTED OR CROCHETED (EXCL. T-SHIRTS, VESTS, BRASSIERES, GIRDLES, CORSETS AND	36,015,388	1,896,711
6109 T-SHIRTS, SINGLETTS AND OTHER VESTS, KNITTED OR CROCHETED	137,576,277	21,727,321
6110 JERSEYS, PULLOVERS, CARDIGANS, WAISTCOATS AND SIMILAR ARTICLES, KNITTED OR CROCHETED (EXCL. WADDLED WAISTCOATS)	131,875,294	18,073,190
6111 BABIES' GARMENTS AND CLOTHING ACCESSORIES, KNITTED OR CROCHETED (EXCL. HATS)	22,178,193	2,981,198
6112 TRACK-SUITS, SKI-SUITS AND SWIMWEAR, KNITTED OR CROCHETED	8,475,951	1,046,938
6113 GARMENTS, KNITTED OR CROCHETED, RUBBERIZED OR IMPREGNATED, COATED OR COVERED WITH PLASTICS OR OTHER MATERIALS (EXCL. BABIES' GARMENTS AND CLOTHING ACCESSORIES)	1,062,262	152,203
6114 SPECIAL GARMENTS FOR PROFESSIONAL, SPORTING OR OTHER PURPOSES, N.E.S., KNITTED OR CROCHETED	5,480,395	806,419
6115 PANTY HOSE, TIGHTS, STOCKINGS, SOCKS AND OTHER HOSIERY, INCL. STOCKINGS FOR VARICOSE VEINS, KNITTED OR CROCHETED (EXCL. FOR BABIES)	36,973,404	3,440,535
6116 GLOVES, MITTENS AND MITTS, KNITTED OR CROCHETED (EXCL. FOR BABIES)	10,145,666	917,369
6117 MADE UP CLOTHING ACCESSORIES, KNITTED OR CROCHETED, KNITTED OR CROCHETED PARTS OF GARMENTS OR OF CLOTHING ACCESSORIES N.E.S.	5,496,031	3,976,880
6201 MENS OR BOYS' OVERCOATS, CAR-COATS, CAPES, CLOAKS, ANORAKS, INCL. SKI-JACKETS, WIND-CHEATERS, WIND-JACKETS AND SIMILAR ARTICLES, KNITTED OR CROCHETED (EXCL. SUITS, ENSEMBLES, JACKETS, BLAZERS AND TROUSERS)	19,527,362	66,380,574
6202 WOMENS OR GIRLS' OVERCOATS, CAR-COATS, CAPES, CLOAKS, ANORAKS, INCL. SKI-JACKETS, WIND-CHEATERS, WIND-JACKETS AND SIMILAR ARTICLES (EXCL. KNITTED OR CROCHETED, SUITS, ENSEMBLES, JACKETS, BLAZERS AND TROUSERS)	29,689,262	3,203,205
6203 MENS OR BOYS' SUITS, ENSEMBLES, JACKETS, BLAZERS, TROUSERS, BIB AND BRACE OVERALLS, BREECHES AND SHORTS (EXCL. KNITTED OR CROCHETED, WIND-JACKETS AND SIMILAR ARTICLES, SEPARATE WAISTCOATS, TRACK SUITS, SKI SUITS AND SWIMWEAR)	92,341,131	8,567,034
6204 WOMENS OR GIRLS' SUITS, ENSEMBLES, JACKETS, DRESSES, SKIRTS, DIVIDED SKIRTS, TROUSERS, BIB AND BRACE OVERALLS, BREECHES AND SHORTS (EXCL. KNITTED OR CROCHETED, WIND-JACKETS AND SIMILAR ARTICLES, SLIPS, PETTICOATS AND PANTIES)	175,695,110	17,227,902
6205 MENS OR BOYS' SHIRTS (EXCL. KNITTED OR CROCHETED, NIGHTSHIRTS, SINGLETTS AND OTHER VESTS)	35,433,436	3,805,041
6206 WOMENS OR GIRLS' BLOUSES, SHIRTS AND SHIRT-BLOUSES (EXCL. KNITTED OR CROCHETED AND VESTS)	41,353,766	4,829,793
6207 MENS OR BOYS' SINGLETTS AND OTHER VESTS, UNDERPANTS, BRIEFS, NIGHTSHIRTS, PYJAMAS, BATHROBES, DRESSING GOWNS AND SIMILAR ARTICLES (EXCL. KNITTED OR CROCHETED)	5,444,317	535,141
6208 WOMENS OR GIRLS' SLIPS, PETTICOATS, BRIEFS, PANTIES, NIGHTDRESSES, PYJAMAS, NEGLIGES, BATHROBES, DRESSING GOWNS, HOUSECOATS AND SIMILAR ARTICLES (EXCL. KNITTED OR CROCHETED, BRASSIERES, GIRDLES, CORSETS AND SIMILAR AR	13,816,809	1,271,260
6209 BABIES' GARMENTS AND CLOTHING ACCESSORIES OF ALL TYPES OF TEXTILE MATERIALS (EXCL. KNITTED OR CROCHETED AND HATS)	8,829,192	856,462
6210 GARMENTS MADE UP OF FELT OR NONWOVENS, WHETHER OR NOT IMPREGNATED, COATED, COVERED OR LAMINATED, GARMENTS OF TEXTILE FABRICS, RUBBERIZED OR IMPREGNATED, COATED, COVERED OR LAMINATED WITH PLASTICS OR OTHER SUBSTANCES (EXCL. KN	12,167,449	4,413,518
6211 TRACK-SUITS, SKI SUITS, SWIMWEAR AND OTHER GARMENTS N.E.S. (EXCL. KNITTED OR CROCHETED)	19,095,495	2,809,488
6212 BRASSIERES, GIRDLES, CORSETS, BRACES, SUSPENDERS, GARTERS AND SIMILAR ARTICLES AND PARTS THEREOF, OF ALL TYPES OF TEXTILE MATERIALS, WHETHER OR NOT ELASTICATED, INCL. KNITTED OR CROCHETED (EXCL. BELTS AND CORSELETS MADE ENTR	15,190,810	1,300,842
6213 HANDKERCHIEFS, OF WHICH NO SIDE EXCEEDS80 CM (EXCL. KNITTED OR CROCHETED)	565,374	30,454
6214 SHAWLS, SCARVES, MUFFLERS, MANTILLAS, VEILS AND SIMILAR ARTICLES (EXCL. KNITTED OR CROCHETED)	6,500,331	1,290,802
6215 TIES, BOW TIES AND CRAVATS OF TEXTILE MATERIALS (EXCL. KNITTED OR CROCHETED)	1,562,299	398,608
6216 GLOVES, MITTENS AND MITTS OF ALL TYPES OF TEXTILE MATERIALS (EXCL. KNITTED OR CROCHETED AND FOR BABIES)	2,104,772	217,413
6217 MADE UP CLOTHING ACCESSORIES AND PARTS OF GARMENTS OR CLOTHING ACCESSORIES, OF ALL TYPES OF TEXTILE MATERIALS N.E.S. (EXCL. KNITTED OR CROCHETED)	4,198,214	11,894,575
6301 BLANKETS AND TRAVELLING RUGS OF ALL TYPES OF TEXTILE MATERIALS (EXCL. TABLE COVERS, BEDSPREADS AND ARTICLES OF BEDDING AND SIMILAR FURNISHING OF HEADING 9404)	9,536,325	2,004,846
6302 BED-LINEN, TABLE LINEN, TOILET LINEN AND KITCHEN LINEN OF ALL TYPES OF TEXTILE MATERIALS (EXCL. FLOOR-CLOTHS, POLISHING-CLOTHS, DISH-CLOTHS AND OUSTERS)	118,073,875	10,572,739
6303 CURTAINS, INCL. DRAPES, AND INTERIOR BUNDS, CURTAIN OR BED VALANCES OF ALL TYPES OF TEXTILE MATERIALS (EXCL. AWNINGS AND SUNBLINDS)	36,840,373	2,190,319
6304 ARTICLES FOR INTERIOR FURNISHING, OF ALL TYPES OF TEXTILE MATERIALS (EXCL. BLANKETS AND TRAVELLING RUGS, BED-LINEN, TABLE LINEN, TOILET LINEN, KITCHEN LINEN, CURTAINS, INCL. DRAPES, INTERIOR BUNDS, CURTAIN OR BED VALANCES, L	21,901,533	1,027,991
6305 SACKS AND BAGS, OF A KIND USED FOR THE PACKING OF GOODS, OF ALL TYPES OF TEXTILE MATERIALS	30,835,397	2,548,133
6306 TARPULLINS, SAILS FOR BOATS, SAILBOARDS OR LANDCRAFT, AWNINGS, SUNBLINDS, TENTS AND CAMPING GOODS	39,123,541	1,810,050
6307 MADE UP ARTICLES OF TEXTILE MATERIALS, INCL. DRESS PATTERNS, N.E.S.	41,873,993	7,876,007
6308 SETS CONSISTING OF WOVEN FABRIC AND YARN, WHETHER OR NOT WITH ACCESSORIES, FOR MAKING UP INTO RUGS, TAPESTRIES, EMBROIDERED TABLE CLOTHS OR SERVIETTES, OR SIMILAR TEXTILE ARTICLES, PUT UP IN PACKINGS FOR RETAIL SALE (EXCL. SE	204,885	108,864
6309 WORN CLOTHING AND CLOTHING ACCESSORIES, BLANKETS AND TRAVELLING RUGS, HOUSEHOLD LINEN AND ARTICLES FOR INTERIOR FURNISHING, OF ALL TYPES OF TEXTILE MATERIALS, INCL. ALL TYPES OF FOOTWEAR AND HEADGEAR, SHOWING SIGNS OF APPRE	12,302,845	199,245,442
6310 USED OR NEW RAGS, SCRAP TWINE, CORDAGE, ROPE AND CABLES AND WORN OUT ARTICLES THEREOF, OF TEXTILE MATERIALS	21,105,915	12,213,263
Sum products	1,733,277,888	492,755,173
6309+6310 - Waste import and export	33,488,760	211,468,705
6309+6310 - Waste import and export (rounded and as estimated / confirmed by Garth Ward, Salvation Army, personal communication, 2006). In addition (Gart Ward), total end of life products collected in UK is estimated to 300,000,000 kg. Of this UK Recycling and reuse is estimated to 100,000,000, 60% for recycling and 40% for reuse.	30,000,000	200,000,000
Sum products excluding waste import and export 6309+6310	1,699,789,228	281,286,468
Clothing alone (61+62)	992,569,353	200,315,616
Carpets alone (57)	410,823,953	52,840,903

Consumption and emissions from the Clothing and Textile industry

Clothing and Textile (C&T) products

In the table below the 2004 the top 3 UK apparent consumption of C&T categories by value (million £) are shown.

UK Top 3 consumption of C&T in 2004 by value

	Apparent consumption	Import	Production	Export
Clothing				
Trousers (woven) etc.	1,880	1,894	308	322
T-Shirts etc.	1,248	1,518	66	336
Pullovers etc.	1,015	1,021	214	220
Total top 3 clothing	4,143	4,433	588	878
Total clothing	12,065	10,859	3,925	2,719
Textiles				
Carpets etc.	1,373	824	754	205
Man-made fibres	545	17	725	197
Bed linen	280	264	45	29
Total top 3 textiles	2,198	1,105	1,524	431
Total textiles	6,955	4,657	5,657	3,359

- Note that the apparent consumption by value is based on industry sales and not retail sales.
- Production data is based directly on British Apparel & Textile Confederation (BATC)^{MO}. Import and export is based directly on HM Revenue & Customs 2004 trade data^{MA}. Except for “Bed linen” that is based on BATC only and Export of “Man-made fibres” that has been estimated from (MA) using the same principle for suppressed data as mentioned in the table “Import and export of fibres in 2004 by mass”.

Note that fibres can be used to produce intermediate products (yarns and fabrics) and the fibres, yarns and fabrics can be used to produce various C&T products. For the calculations of the totals for apparent consumption for fibres (and yarns and fabrics) double counting is therefore most likely to occur. For import and export correct totals can be calculated in all cases because the numbers relate to actual physical flow entering or leaving UK.

In the table on the next page the 2004 UK apparent consumption of major C&T categories by mass (million kg) are shown.

2004 UK apparent consumption of major C&T categories by mass (million kg)

	Apparent consumption	Import	Production	Export	Notes
Clothing					
Trousers (woven) etc.	163	163	14	15	Import and export estimated based on the average £/kg for CN code 6203 and 6204 (11.60 and 21.72 respectively). Production estimated from export data -assumed similar.
T-Shirts etc.	140	160	5	24	Import and export estimated based on the average £/kg for CN code 6105 and 6109 (9.48 and 13.71 respectively). Production estimated from export data -assumed similar.
Pullovers etc.	112	112	11	11	Import and export estimated based on £/kg for CN code 6110 (9.09 and 19.97 respectively). Production estimated from export data -assumed similar.
Total top 3 clothing	415	436	30	50	
Total clothing	992	993	200	200	Import and export directly from the table "Import and export of products in 2004 by mass". Production estimated from BATC PRODCOM data.
Textiles					
Carpets etc.	532	411	174	53	Import and export directly from the table "Import and export of products in 2004 by mass". Production estimated from BATC PRODCOM data using the production in m2 (84.5 million m2) and using the average kg/m2 (2.06) for the import and export for the CN chapter 57.
Total textiles	1,150				Balance calculation from the figure on page 20-21 in the "Well dressed?" report. The total consumption is 2,156 thousand tons, clothing is about 1,000 thousand tons i.e. the rest about 1,150 thousand tons is various textiles.

Fibres, yarns, and fabrics

In the table below details about fibres, yarns, fabrics and other intermediate products by mass are shown.

UK consumption of fibres, yarns, and fabrics in 2004 by mass (thousand tonnes)

Fibres/ Yarns / Fabrics	Apparent consumption	Import	Production	Export
Fibres				
Raw natural fibres	145	137 ¹	70 ^{2,3,4}	62 ^{1,4}
Man-made fibres	312	224 ¹	242 ^{2,3,4}	154 ^{1,3,4}
Total fibres	458	361	312	215
Yarns				
Natural yarns	84	54 ¹	49 ^{2,3,4}	19 ^{1,4}
Man-made yarns	128	198 ¹	27 ^{2,3,4}	97 ^{1,3,4}
Total yarns	210	251	76	117
Fabrics⁵				
Natural fabrics – specified	65	79 ¹	18 ^{2,3,4}	32 ¹
Man-made fabrics – specified	58	144 ¹	53 ^{2,3,4}	139 ¹
Various fabrics unspecified	54	102 ¹	58 ^{2,3,4}	106 ¹
Total fabrics	177	325	129	277
Total yarns and fabric	387	576	205	394
Total, fibres, yarns and fabrics	845	937	517	609

1: HM Revenue & Customs 2004 trade data^{MA}

2: 2004 BATC data^{M0}

3 2004 data (or parts of it) are either not available or statistically "suppressed" for reasons of confidentiality.

4 Estimated from various sources.

5 Excluding "Household fabrics" that are considered to be end-products and not intermediate products.

Note that in terms of mass flow a large part of the apparent consumption of fibres and yarns occurs with the industry i.e. the fibres and yarns are used to produce intermediate products (primarily fabrics) or finished C&T products and will leave the industry as such.

Foreign supply of fibres, yarns and fabrics to the UK textile

In the table below more detailed break-down of the import by mass in table M8-b are shown.

UK supply of fibres, yarns and fabrics in 2004 by mass (thousand tonnes)

Fibres/ Yarns / Fabrics	Import
Fibres	
Silk	0.35
Wool (and other animal hair)	69
Cotton	44
Other natural fibres	23
Man-made fibres	224
Total fibres	361
Yarns	
Silk	0.25
Wool (and other animal hair)	17
Cotton	29
Other natural fibres	7
Man-made fibres	198
Total yarns	251
Specified fabrics	
Silk	1
Wool (and other animal hair)	4
Cotton	59
Other natural fibres	15
Man-made fibres	144
Total specified fabrics	223
Total fibres, yarns and fabrics	835
Total – Silk	1.6
Total - Wool (and other animal hair)	90
Total –Cotton	132
Total Other natural	45
Total Man-made	566

From the table it can be calculated that about two-thirds of the UK import of basic textile materials (fibres, yarns and fabrics) by mass to the industry is man-made, the rest is of natural origin (primarily cotton and wool – about 15% and 10% respectively).

Consumption and emissions from the UK C&T industry

In the table below estimates of the overall key consumption and emissions numbers for the UK textile industry can be seen.

Consumption and emissions for the UK C&T Industry

	Clothing and Textile Industry	Percentage of total UK consumption and emission
Primary energy consumption¹	0.989 million tonnes of oil equivalent	0.4%
Water consumption²	90 million tonnes	0.5%
Wastewater³	70 million tonnes	Not available
CO₂ emissions to air⁵	3.1 million tonnes	0.4%
Solid Waste⁵	1.5 million tonnes	0.5%

1: 2004 data^{MB}, 2: 1997/8 data^{MC}, 3: Estimated from 1997/8 data^{MC}, 4 CO₂ equivalents^{MD}, 5: 2002/2003 data^{MC}

Footnotes to the section “The United Kingdom Clothing and Textile mass balance”

MO

Data sets provided by the British Apparel & Textile Confederation (BATC), Adam Mansell. Stated to be based on data from Office for National Statistics, HM Revenue & Customs and BATC estimates.

MA

HM Revenue & Customs 2004 trade data downloaded from <http://www.uktradeinfo.com/>

MB

Calculated from DTI, 2006. UK energy sector indicators 2006, page 91. <http://www.dti.gov.uk/files/file29726.pdf>

MC

ONS, May 2006. Environmental Accounts – spring 2006. Office for National Statistics, page 23, 27, 35 and 39.

http://www.statistics.gov.uk/downloads/theme_environment/EAMay06.pdf#search=%22Environmental%20Accounts%20%E2%80%93%20spring%202006%22

MD

Calculated using the Gabi-EDIP software process for unspecified primary energy.

Scenario analysis

The scenarios were grouped into four key themes representing the major changes that might occur in the operation of the sector: changes in the structure of the supply chain – the location and means of production; changes in the design of clothing and textiles products and the materials used; changes in the behaviour of consumers; changes in the influence exerted on the sector by government. The scenarios were analysed through use of three representative products: a cotton T-shirt, a viscose blouse and a polyamide carpet. The current production and impacts of these products are described in some detail in the section entitled “Base case”. In each scenario the consequences of changing the way that one or more of these products is delivered is explored, and measured according to the “triple bottom line” of sustainability:

Environmental scenario analysis

Environmental impact is predicted through detailed life cycle analyses (LCA), based on the internationally recognized Danish methodology EDIP (Environmental Design of Industrial Products) and with results summarised by three key indicators: climate change (measured in thousand tonnes of CO₂ equivalent); waste volume (in thousand tonnes); an aggregate ‘environmental index’ representing the combined effect of ozone depletion, acidification (acid rain), nutrient enrichment (algae growth that can cause fish death), and photochemical ozone formation (smog). The aggregated environmental index is measured in “Person Equivalent Targeted” (PET) units i.e. the impacts are normalised to one person share and weighted according to political reduction targets. We could have chosen other LCA methodologies but selected the EDIP methodology because extensive textile related data sets were available using this method in the GaBi-EDIP software package. The GaBi-EDIP software package^A includes an input and output database on various unit processes in the life cycle of textile products and can calculate the environmental impact according to several internationally recognized life cycle assessment methodologies. Most of the textile related data in the software tool was developed during the Danish EDIPTEx project^B.

We could also have decided to include detailed life cycle analysis of the use of resources like oil, iron and aluminium etc. or included other indicators like land-use but decided to limit the analysis and presentation of results to only 3 indicators for reasons of simplicity. Climate change and waste were selected as key indicators because they have become common in the public domain in recent years. We also decided to create and use an aggregate ‘environmental index’ even though it is not directly recommended in the EDIP methodology. Because we are using the “Person Equivalent Targeted” (PET) unit for all the contributions to this indicator this is in principal mathematically correct and enable us to report major environmental changes in a more simple way.

^A GaBi-EDIP software package, Version 4.2. 03/2006. For more information about the GaBi-EDIP software database and tool visit the Danish LCA-center web-site: <http://www.dk-teknik.dk/cms/site.asp?p=2456>

^B Laursen, S.E., Hansen J., Knudsen, H.H., Wenzel, H., Larsen, H.F. and Kristensen, F.M., 2006. "EDIPTEx -Environmental assessment of textiles." Working Report no 3, 2006. Danish Environmental Protection Agency (in Danish). Is currently being translated to English by DEPA.

A widely known problem with LCA is that it is only feasible if boundaries are ‘drawn’ around the problem being investigated, in order to provide a tractable problem. Such boundaries generally attempt to include all direct inputs to a product but exclude indirect inputs such as capital equipment and infrastructure. Estimates of how much this leads to under-prediction of impacts varies, but can be as high as 50% in some cases. So, the absolute values predicted in the LCA will be only partially accurate, but their relative accuracy – between scenarios where the boundary conditions are constant – should be high.

Economic and social scenario analysis

In this report economic impact is measured by a simplified set of national accounts. For each base case product, a cost model has been developed, showing raw material prices and the build up of production costs and transfer prices to complete the product. Each scenario leads to some variation in production costs, which leads to adjustment of the transfer prices. The final consumer price is held constant – so that an increase in production costs is reflected in reduced retailer margin. The production costs are then converted to national accounts for each participating country, by calculating the total output and intermediate consumption of the businesses operating within each country. From these figures, a Gross National Income is derived for each country and, in addition for the UK, a Balance of Trade and Operating Surplus is calculated- the latter giving a broad indication of profitability of the sector.

Two issues arise in the very simple economic model used to predict macro-economic effects of the scenarios. Firstly, the analysis assumes that activity can be brought in and out of the UK independently of other activity there. In fact, most economists would describe the UK as having “Full employment” – so creation of clothing and textiles jobs in the UK would be possible only by replacing jobs in another sector. If this is the case, the analysis over predicts any positive changes to GNI – as the jobs are substitutes; not new jobs. However, we have assumed that the jobs created would typically be relatively low skilled, and that there is surplus labour in the UK for such tasks. Secondly, many economists would want to include a “multiplier effect” for predictions of GNI: someone who used to be unemployed but is now employed will spend their income, mainly within the country, which will in turn create new jobs and new national income. The difficulty of this type of analysis is to predict which multiplying factor to use. We have chosen here to ignore it.

Social impact is described qualitatively in two areas: the influence of changes on consumers in the UK; the influence of changes on the social conditions of those involved in production. Quantitatively, published figures on working hours and productivity are used to predict the total number of people employed in each country for each scenario.

Environmental, economic and social scenario analysis

On the following pages the overall results presented in the world maps in the “Well dressed?” report are shown with additional details.

Theme 1 Location of clothing and textiles

Global data:		Climate Change	Waste	Env impact				
(totals)	Base case	3.26E+06	3.81E+05	6.67E+05				
T-shirt)	Changing the location of existing operations	3.19E+06	3.81E+05	6.08E+05				
	Changed location with new production technology	3.04E+06	3.69E+05	5.75E+05				
	Changed location with new production technology and local recycling	2.97E+06	3.31E+05	4.74E+05				
USA data		Climate Change	Waste	Env impact	GNI	Employment		
(T-shirt)	Base case	9.69E+05	1.61E+05	3.13E+05	2.52E+02	1.02E+04		
	Changing the location of existing operations	9.54E+05	1.61E+05	3.07E+05	2.52E+02	1.02E+04		
	Changed location with new production technology	8.76E+05	1.48E+05	2.81E+05	2.31E+02	9.33E+03		
	Changed location with new production technology and local recycling	4.48E+05	7.55E+04	1.44E+05	4.60E+01	2.36E+03		
UK data		Climate Change	Waste	Env impact	GNI	Employment	Balance of trade	Operating surplus
(T-shirt)	Base case	1.92E+06	2.08E+05	2.66E+05	2.32E+03	2.62E+04	-9.02E+02	1.89E+03
	Changing the location of existing operations	2.24E+06	2.20E+05	3.01E+05	2.97E+03	1.73E+05	-2.52E+02	1.11E+02
	Changed location with new production technology	2.17E+06	2.22E+05	2.93E+05	2.99E+03	2.72E+04	-2.31E+02	2.54E+03
	Changed location with new production technology and local recycling	2.52E+06	2.55E+05	3.30E+05	3.17E+03	3.20E+04	-4.60E+01	2.65E+03
China data		Climate Change	Waste	Env impact	GNI	Employment		
(T-shirt)	Base case	3.74E+05	1.24E+04	8.82E+04	6.50E+02	1.08E+05		
UK data		Climate Change	Waste	Env impact	GNI	Employment	Balance of trade	Operating surplus
(blouse)	Base case	1.74E+04	1.79E+03	5.26E+03	6.11E+02	1.85E+03	-1.04E+02	5.80E+02
	Changing the location of existing operations	1.21E+05	1.78E+04	5.55E+04	7.15E+02	1.58E+04	0.00E+00	4.55E+02
India data		Climate Change	Waste	Env impact	GNI	Employment		
(blouse)	Base case	1.05E+05	7.15E+03	5.14E+04	1.04E+02	1.02E+04		
Global data:		Climate Change	Waste	Env impact				
(totals)	Base case	1.22E+05	8.94E+03	5.67E+04				
(blouse)	Changing the location of existing operations	1.21E+05	8.94E+03	5.55E+04				

Here are some relevant notes clarifying the above table:

Unit for climate change is tonnes CO₂ equivalents^c.

Unit for waste is tonnes.

Unit for environmental impact (environmental impact evaluation) is PET (Person Equivalent Targeted)^d.

Unit for GNI (Gross National Income) is million £.

Unit for EMP (Employment) is number of workers.

Unit for BOT (Balance Of Trade) is million £.

Unit for OS (Operating Surplus) is million £.

^c "EDIP, 1997, Global warming potential (GWP 100 years)"

^d "EDIP 1997, Env. imp. eval. (PET W, EU 2004)" and based on EDIP 1997 Environmental Impact Normalization - "EDIP 1997, Env. Imp. norm. (PE W, EU 1994)"

Theme 2 Changes in consumer behaviour

Global data:		Climate Change	Waste	Env impact			
(totals)	Base case	3.26E+06	3.81E+05	6.67E+05			
	Wash temperature reduced (60°C to 40°C)	3.01E+06	3.53E+05	6.42E+05			
(T-shirt)	Wash temperature reduced and T-shirt hang-dried	1.66E+06	2.05E+05	5.04E+05			

USA data		Climate Change	Waste	Env impact	GNI (€m)	Employment		
(T-shirt)	Base case	9.69E+05	1.61E+05	3.13E+05	2.52E+02	1.02E+04		

UK data		Climate Change	Waste	Env impact	GNI	Employment	Balance of trade	Operating surplus
(T-shirt)	Base case	1.92E+06	2.08E+05	2.66E+05	2.32E+03	2.62E+04	-9.02E+02	1.89E+03
	Wash temperature reduced (60°C to 40°C)	1.67E+06	1.80E+05	2.40E+05	2.32E+03	2.62E+04	-9.02E+02	1.89E+03
	Wash temperature reduced and T-shirt hang-dried	3.19E+05	3.17E+04	1.02E+05	2.32E+03	2.62E+04	-9.02E+02	1.89E+03

China data		Climate Change	Waste	Env impact	GNI	Employment		
(T-shirt)	Base case	3.74E+05	1.24E+04	8.82E+04	6.50E+02	1.08E+05		

UK data		Climate Change	Waste	Env impact	GNI	Employment	Balance of trade	Operating surplus
(blouse)	Base case	1.74E+04	1.79E+03	5.26E+03	6.11E+02	1.85E+03	-1.0E+02	5.80E+02
	Second hand clothing	1.82E+04	1.86E+03	4.81E+03	5.02E+02	1.85E+03	-8.3E+01	4.71E+02

India data		Climate Change	Waste	Env impact	GNI	Employment		
(blouse)	Base case	1.05E+05	7.15E+03	5.14E+04	1.04E+02	1.02E+04		
	Second hand clothing	8.37E+04	5.72E+03	4.12E+04	8.30E+01	8.16E+03		

Global data:		Climate Change	Waste	Env impact			
(totals)	Base case	1.22E+05	8.94E+03	5.67E+04			
(blouse)	Second hand clothing	1.02E+05	7.58E+03	4.60E+04			

Here are some relevant notes clarifying the above table:

Unit for climate change is tonnes CO₂ equivalents^E.

Unit for waste is tonnes.

Unit for environmental impact (environmental impact evaluation) is PET (Person Equivalent Targeted)^F.

Unit for GNI (Gross National Income) is million £.

Unit for EMP (Employment) is number of workers.

Unit for BOT (Balance Of Trade) is million £.

Unit for OS (Operating Surplus) is million £.

^E "EDIP, 1997, Global warming potential (GWP 100 years)"

^F "EDIP 1997, Env. imp. eval. (PET W, EU 2004)" and based on EDIP 1997 Environmental Impact Normalization - "EDIP 1997, Env. Imp. norm. (PE W, EU 1994)"

Theme 3 New products and material selection

Global data:		Climate Change	Waste	Env impact	Toxicity			
(totals)	Base case	3.26E+06	3.81E+05	6.67E+05	3.20E+07			
(T-shirt)	Organic cotton	3.07E+06	3.77E+05	6.26E+05	2.50E+06			
	Nanotechnology	2.30E+06	2.74E+05	5.69E+05	x			
USA data		Climate Change	Waste	Env impact	GNI (£m)	Employment		
(T-shirt)	Base case	9.69E+05	1.61E+05	3.13E+05	2.52E+02	1.02E+04		
	Organic cotton	7.78E+05	1.56E+05	2.72E+05	3.26E+02	1.02E+04		
	Nanotechnology	9.69E+05	1.61E+05	3.13E+05	2.52E+02	1.02E+04		
UK data		Climate Change	Waste	Env impact	GNI	Employment	Balance of trade	Operating surplus
(T-shirt)	Base case	1.92E+06	2.08E+05	2.66E+05	2.32E+03	2.62E+04	-9.02E+02	1.89E+03
	Organic cotton	1.92E+06	2.08E+05	2.66E+05	2.25E+03	2.62E+04	-9.74E+02	1.81E+03
	Nanotechnology	9.44E+05	1.00E+05	1.66E+05	1.92E+03	2.62E+04	-1.31E+03	1.48E+03
China data		Climate Change	Waste	Env impact	GNI	Employment		
(T-shirt)	Base case	3.74E+05	1.24E+04	8.82E+04	6.50E+02	1.08E+05		
	Organic cotton	3.74E+05	1.24E+04	8.82E+04	6.49E+02	1.08E+05		
	Nanotechnology	3.91E+05	1.27E+04	8.97E+04	1.05E+03	1.08E+05		
UK data		Climate Change	Waste	Env impact	GNI	Employment	Balance of trade	Operating surplus
(carpet)	Base case	6.86E+04	3.25E+04	8.22E+02	2.05E+02	6.70E+02	-5.10E+01	1.94E+02
	Alternative fibres: wool	2.57E+05	3.97E+04	1.48E+03	2.56E+02	1.64E+03	-6.80E-01	2.29E+02
	Nanotechnology	5.16E+04	1.81E+04	5.88E+02	7.70E+01	3.37E+02	-5.10E+01	7.20E+01
US data		Climate Change	Waste	Env impact	GNI	Employment		
(carpet)	Base case	1.76E+05	5.47E+03	3.94E+03	5.10E+01	5.00E+01		
	Alternative fibres: wool	4.42E+03	1.11E+02	1.32E+02	6.80E-01	7.00E+00		
	Nanotechnology	9.65E+04	3.00E+03	2.14E+03	5.10E+01	2.50E+01		
Global data:		Climate Change	Waste	Env impact				
(totals)	Base case	2.45E+05	3.80E+04	4.76E+03				
(carpet)	Alternative fibres: wool	2.62E+05	3.98E+04	1.61E+03				
	Nanotechnology	1.48E+05	2.11E+04	2.73E+03				

Here are some relevant notes clarifying the above table:

Unit for climate change is tonnes CO₂ equivalents^G.

Unit for waste is tonnes.

Unit for environmental impact (environmental impact evaluation) is PET (Person Equivalent Targeted)^H.

Unit for Toxicity (Toxicity evaluation) is PET (Person equivalent targeted)^I

Unit for GNI (Gross National Income) is million £.

Unit for EMP (Employment) is number of workers.

Unit for BOT (Balance Of Trade) is million £.

Unit for OS (Operating Surplus) is million £.

^G "EDIP, 1997, Global warming potential (GWP 100 years)"

^H "EDIP 1997, Env. imp. eval. (PET W, EU 2004)" and based on EDIP 1997 Environmental Impact Normalization - "EDIP 1997, Env. Imp. norm. (PE W, EU 1994)"

^I "EDIP 1997, Toxicity eval. (PET EU 2004)" and based on EDIP 1997 normalization "EDIP 1997, Toxicity norm. (PE EU 1994)"

Environmental scenario analysis

Some major methodology issues are discussed below:

- One major methodology issue was the selection of a suitable process for electricity generation. As we didn't want the results of the scenario analysis to be influenced by differences in electricity generation in different countries (in principal we could have selected other producing countries) we wanted to select one process and use the process for all calculations. In the GaBi-EDIP data-base 03/2006 version no electricity generation data was available for the UK. The most generic process is "Electricity, EU 1990. Aggregated EDIP". However this process is based on very old data (1990) i.e. less efficient technology and relies heavily on nuclear power (about 50%). In stead we selected the process "DK: Power grid mix by consumption, 2001 EDIP" which is based on the most recent data. This process relies heavily on coal which has been the trend worldwide in recent years (around 40%), 20% natural gas, 15% crude oil, 7% nuclear and 17% on renewable energy. The amount of renewable energy is unusually high for most other countries, but as we only report and analyse the sum of waste (and not radioactive waste alone) and as renewable in general and nuclear technology both have very low climate change impacts this is in our framework not far from the present situation in the UK - about 40% coal, 30% gas, 20% nuclear and about 5% renewable (DTI, June 2006, Energy trends <http://www.dti.gov.uk/files/file30881.pdf>).
- Another important decision has been the selection of the base-case products. We wanted to select a limited number of products but also wanted to work with a representative pool. The knitted cotton T-shirt represents standard products (like socks, briefs, etc.) and cotton is by far the most important natural fibre. The woven viscose blouse is a typical fashion garment and viscose is one of the most important man-made regenerated fibres. The carpet with a polyamide pile represents textiles. Carpets are by far the most important type of textiles and polyamide represents the synthetic fibres.
- As shown in the scenario analysis the life time of the products are very important for the environmental performance of the base case products. The 25 times washing and drying of the T-shirt, the 25 times washing of the blouse and the 10 year lifetime of the carpet are all assessed to be realistic. However 50% longer life time – especially for the T-shirt and carpet base cases would not have been unrealistic either. If we have selected these life times it wouldn't have changed the conclusions of the scenario analysis. The energy consumption in the use phase for the T-shirt would just have been more dominating. For the carpet the material phase would still by far have been the most important too. However to illustrate how important the life time issue can be several stakeholders have pointed out that a carpet with a polyamide theoretically can last longer than a wool carpet (the "New products and material selection" theme). In the scenario analysis we have assumed that the two carpets have the same life time (10 years which is the often the warranty for carpets). If we had run the scenario analysis at a theoretically life time level in stead it is not unlikely that the results would have indicated that the polyamide carpet would show the best environmental performance.
- Finally incineration with energy recovery was selected for the final waste disposal for the cotton T-shirt and the viscose blouse. Both products can be considered climate change neutral when incinerated. For the carpet landfill was selected.

According to the GaBi-EDIP license agreement “Users may not publish individual data sets. Only aggregated or calculated results produced using GaBi data may be published^J”

The numbers and calculations presented on the following pages were needed prior to the modelling of the base case products and scenarios in the Gabi-EDIP software tool.

^J GaBi, 2004. “Gabi 4 Manual”, Version February 2004.

Basic product data for the 3 base-case – at product level and at UK level

Product	Description / assumptions for the base case											
	Technical	Relevant trade and production codes	Key 2004 data (£, kg, other units) on import, export, UK production and apparent UK consumption:									
T-shirt - 100% cotton. - Knitted - Dyed with reactive dyestuffs - Washing 60°C. - Dried in a tumbler dryer. - Ironing - Lifetime 25 times washing and tumbler drying - Weight. It is assumed that the T-shirt weighs 250 g and 200g per m2	NB 2004 data for the CN and PRODCOM code (estimated production in kg in UK is based on UK production in £ divided by export price in £/kg)											
	Pounds Sterling				Quantity (kg)				Other Units (pieces)			
	Total Imports	Total Exports	UK Production	Apparent UK consumption	Total Imports	Total Exports	Estm. UK Production	Apparent UK consumption	Total Imports	Total Exports	UK Production	Apparent UK consumption
	1,047,171,251	209,110,322	35,202,000	873,262,929	114,854,928	18,486,434	3,112,039	99,480,533	498,685,755	60,412,107	9,630,317	448,103,965
	£ per piece: Import Export UK Production 2.10 3.46 3.66			£ per kg: Import Export UK Production 9.117 11.312 11.312			Kg per piece: Import Export UK Production 0.230 0.306 0.323					
- 2004 apparent consumption for the product is estimated to 100,000 tons or 450 mil. pieces - value (ex. Wholesale / retail margins) approx. 875 mil. £. - For this product the base case represents total imports i.e. 115,000 tons or 500 million pieces, value 1,050 million £. With a 250 g T-shirt i.e. 460 million pieces												
Blouse - Women's or girls' blouse made of 100% Viscose. - Woven - The viscose is dyed with reactive dyestuffs (like cotton) - Washing 40°C. - Hang-drying - Ironing not necessary - Lifetime 25 times washing - Weight. It is assumed that the blouse weighs 200g and 150 g per m2	NB 2004 data for the CN and PRODCOM code (estimated production in kg in UK is based on UK production in £ divided by export price in £/kg)											
	Pounds Sterling				Quantity (kg)				Other Units (pieces)			
	Total Imports	Total Exports	UK Production	Apparent UK consumption	Total Imports	Total Exports	Estm. UK Production	Apparent UK consumption	Total Imports	Total Exports	UK Production	Apparent UK consumption
	236,956,683	47,662,451	68,397,000	257,691,232	26,400,278	2,148,684	3,083,424	27,335,018	84,178,413	20,290,374	11,057,725	74,945,764
	£ per piece: Import Export UK Production 2.81 2.35 6.19			£ per kg: Import Export UK Production 8.98 22.18 22.18			Kg per piece: Import Export UK Production 0.31 0.11 0.28					
- 2004 apparent consumption for the product is estimated to 7,000 tons or 19 mil. pieces (roughly 25% of the CN / PRODCOM category) - value approx. 64 million £. - For this product the base case represents 25% of total imports i.e. 6,500 tons, 21 million pieces, value 59 million £. With a 200 g Blouse i.e. 32.5 million pieces.												
Carpet - The composition of the carpet: face-fibres 100% polyamide (nylon), primary backing is 100% polypropylene and the secondary backing is made of latex-foam - The carpet is a tufted carpet - Life-time is 10 year - The face fibres are dyed with acid dyestuffs - maintenance is assumed to be vacuum-cleaning - The carpet weighs 2633 g per m2 - the face fibres 1100 g per m2, the primary PP backing 133 gm2 and the secondary backing 1400 g/m2	NB 2004 data for the CN category. Production in UK in £ and m2 is based on 25% UK production in £ and m2 according to the PRODCOM data (because difference in categories). Estimated production in kg in UK is based on adjusted UK production in £ divided by export price in £/kg for the CN code data.											
	Pounds Sterling				Quantity (kg)				Other Units (m2)			
	Total Imports	Total Exports	UK Production	Apparent UK consumption	Total Imports	Total Exports	UK Production	Apparent UK consumption	Total Imports	Total Exports	Estm. UK Production	Apparent UK consumption
	89,756,741	16,190,997	100,226,000	173,791,744	42,662,427	3,650,289	22,596,130	61,608,268	23,661,430	1,822,659	14,157,042	35,995,813
	£ per m2: Import Export UK Production 3.79 8.88 7.08			£ per kg: Import Export UK Production 2.104 4.436 4.436			Kg per m2: Import Export UK Production 1.803 2.003 1.596					
- 2004 apparent consumption for the product is estimated to 60,000 tons or 35 million m2 - value approx. 175 million £. - For this product the base case represents 100% of total adjusted UK production i.e. 22,500 tons, 14 million m2, value 100 million £. With a 2633 g/m2 carpet i.e. 8.5 million m2.												

Material and waste flow in the life cycle of the 3 textile products - base cases

The data presented in this section is based on the following primary sources:

- Laursen, S.E., Hansen J., Knudsen, H.H., Wenzel, H., Larsen, H.F. and Kristensen, F.M., 2006. "EDIPTEx -Environmental assessment of textiles." Working Report no 3, 2006. Danish Environmental Protection Agency (in Danish). Is currently being translated to English by DEPA.
- BTTG, 1999. "Textile Processing Techniques". British Textile Technology Group (BTTG). Report no. 3, September 1999.
- Potting and Blok, 1995. "Life-cycle assessment of four types of floor covering".

The numbers have been entered into:

- GaBi-EDIP software package, Version 4.2. 03/2006. For more information about the GaBi-EDIP software database and tool visit the Danish LCA-center web-site: <http://www.dk-technik.dk/cms/site.asp?p=2456>

T-shirt - Base case

		T-shirt of 100% cotton, dyed				
		Details	Numbers pr T-shirt	Unit	UK demand	
					Amount	Unit/Notes
Product		Weight total 250g (cotton), 200 g/m2	250	g	460,000,000	Pieces
Disposal		Product 250 g to incineration	250	g	460,000,000	Pieces
Use		Life time 25 times 60 C washing with prewash (6.25 kg), drying (6.25 kg)	6.25	kg	11,500,000,000	Pieces washed /dried
		25 times ironing (1.25 hours)	1.25	h	11,500,000,000	Pieces ironed
End Product - packaging		10 g (polyethylene-PE)	10	g	4,600,000	kg PE
Total manufacturing textile waste	Sum of product, fabric and yarn manufacturing waste				35,880,000	kg dyed or greige cotton fabric or yarn or fibre
Total product - manufacturing textile waste	Sum of product manufacturing waste				11,500,000	kg dyed or greige cotton fabric
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste)			115,000,000	kg T-shirt
Product - manufacturing	Product (Making up) needed	g T-shirt needed	250	g	115,000,000	kg T-shirt
	Making up - waste (Laying up, cutting and sewing)	6% (of input) waste, i.e. 266 g (250/0.94) cotton fabric needed pr T-shirt, i.e. 16 g fabric waste	16	g	7,360,000	kg dyed and finished cotton fabric
	Finishing needed	From "Making up" i.e. 266 g finished fabric	266	g	122,360,000	kg dyed and finished cotton fabric
	Finishing needed - m2	With a weight of 200 g/m2 i.e. 266/200 = 1.33m2	1.33	m2	611,800	m2 dyed and finished cotton fabric
	Finishing waste 1 (Fabric inspec. + roll up on cardboard)	1.5% (of input) waste, i.e. 270 g (266/0.985) cotton fabric needed pr T-shirt (with a weight of 200g/m2 this is equivalent to 1.35 m2 (270/200)), i.e. 4 g fabric waste	4	g	1,840,000	kg dyed and finished cotton fabric
	Finishing waste 2 (Drying, final fixation & setting m2 weight)	1% (of input) waste, i.e. 273 g (270/0.99) cotton fabric needed pr T-shirt, i.e. 3 g fabric waste	3	g	1,380,000	kg dyed and finished cotton fabric
	Finishing - Softening needed	From "finishing waste 2" i.e. 273 g (272.7) dyed and softened fabric needed	273	g	125,580,000	kg dyed and softened cotton fabric
	Finishing - Softening waste	Negligible	0	g	0	kg dyed and softened cotton fabric
	Dyeing needed	From "Softening" i.e. 273 g (272.7) dyed fabric needed	273	g	125,580,000	kg dyed cotton fabric
	Dyeing waste	Negligible	0	g	0	kg dyed cotton fabric
	Pretreatment - Bleaching + washing needed	From "Dyeing" i.e. 273 g bleached and washed fabric	273	g	125,580,000	kg bleached and washed cotton fabric
	Pre-treatment - Bleaching + washing waste	1% (of input) waste, i.e. 275 g (273/0.99) cotton fabric needed pr T-shirt, i.e. 2 g fabric waste	2	g	920,000	kg bleached and washed cotton fabric
	Greige knitted fabric kg - needed	From "Bleaching" i.e. 275 g fabric	275	g	126,500,000	kg greige knitted cotton fabric
	Greige knitted fabric m2 -needed	200g/m2 i.e. 1.4 m2 fabric needed (275/200)	1.4	m2	644,000,000	kg greige knitted cotton fabric
Fabric - manufacturing (knitting)	Fabric - manufacturing (knitting) waste	1.5% (of input) waste (knitting) i.e. 279 g (275/0.985) yarn needed, i.e. 4 g yarn waste	4	g	1,840,000	kg cotton yarn
Yarn manufacturing (spinning)	Yarn - needed	From above i.e. 279 g yarn	279	g	128,340,000	kg cotton yarn
	Yarn - manufacturing waste	15% (of input) waste (spinning) i.e. 328 g (279/0.85) fibre needed i.e. 49 g fibre waste	49	g	22,540,000	kg raw cotton fibre
Raw fibre (and other materials)- needed		From "yarn manu" i.e. 328 g fibre needed	328	g	150,880,000	kg raw cotton fibre

Blouse- Base case

		Blouse of 100% viscose, woven, dyed				
		Details	Numbers pr Blouse	Unit	UK demand	
					Amount	Unit/Notes
Product		Weight 200g (150 g/m2 viscose)	200	6	32,500,000	Pieces
Disposal		Product 200 g to incineration	200	g	32,500,000	Pieces
Use		25 times 40 C, Normal without prewash (5 kg) + hang / lie / drip drying	5	kg	812,500,000	Pieces washed
End Product - packaging		10 g (polyethylene-PE)	10	g	325,000	kg PE
Total manufacturing waste	Sum of product, fabric and yarn manufacturing waste	In this case equal to product manufacturing waste because no yarn manufacturing waste			965,250	kg dyed or greige viscose fabric or yarn
Total Product - manufacturing waste	Sum of product manufacturing waste				965,250	kg dyed or greige viscose fabric
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste)			6,509,750	kg Blouse
Product - manufacturing	Product (Making up) needed	g Blouse needed	200	g	6,500,000	kg Blouse
	Making up - waste (Laying up, cutting and sewing)	10% (of input) waste i.e. 200 g (200/0.90) fabric needed, i.e. 222 g viscose, i.e. 22 g fabric waste	22	g	715,000	kg dyed and finished viscose fabric
	Finishing needed	From "Making up" i.e. 222 g finished fabric	222	g	7,215,000	kg dyed and finished viscose fabric
	Finishing needed - m2	With a weight of 150 g/m2 i.e. 222/150 = 1.48m2	1.48	m2	48,100,000	m2 dyed and finished viscose fabric
	Finishing waste 1 (Fabric inspec. + roll up on cardboard)	1.5% (of input) waste, i.e. 225.4 g (222/0.985) viscose fabric needed pr blouse (with a weight of 150g/m2 this is equivalent to 1.50 m2 (225.4/150), i.e. 4 g fabric waste	3.4	g	110,500	kg dyed and finished viscose fabric
	Finishing waste 2 (Drying, final fixation & setting m2 weight)	1% (of input) waste, i.e. 227.7 g (225.4/0.99) viscose fabric needed pr Blouse, i.e. 2.3 g fabric waste	2.3	g	74,750	kg dyed and finished viscose fabric
	Finishing -Softening needed	From "finishing waste 2" i.e. 228 g (227.7) dyed and softened fabric needed	228	g	7,410,000	kg dyed and softened viscose fabric
	Finishing - Softening waste	Negligible	0	g	0	kg dyed and softened viscose fabric
	Dyeing needed	From "finishing waste 2" i.e. 228 g (272.7) dyed fabric needed	228	g	7,410,000	kg dyed viscose fabric
	Dyeing waste	Negligible	0	g	0	kg dyed viscose fabric
	Pre-treatment-Desizing needed	From "Dyeing" i.e. 228 g desized fabric	228	g	7,410,000	kg desized viscose fabric
	Pre-treatment - Desizing waste	1% (of input) waste, i.e. 230 g (228/0.99) cotton fabric needed pr T-shirt, i.e. 2 g fabric waste	2	g	65,000	kg desized viscose fabric
	Greige woven fabric kg - needed	150 g/m2 i.e. 1.53 m2 fabric needed (230/150)	1.53	m2	49,725,000	kg greige woven viscose fabric
	Greige woven fabric m2 -needed	From "Fabric - m2" i.e. 230 g fabric	230	g	7,475,000	kg greige woven viscose fabric
Fabric - manufacturing (weaving)	Fabric - manufacturing waste	No waste. i.e. 230 g or 1.53 m2 needed	0	g	0	kg viscose filament yarn
Yarn + fibre manufacturing (directly from viscose company)	Yarn - needed	No waste as filament yarn comes directly from the viscose factory i.e. no separate spinning i.e. 230 g yarn needed, i.e. 0 g yarn waste	230	g	7,475,000	kg viscose filament yarn
	Yarn - manufacturing waste	No waste	0	g	0	kg viscose filament yarn

Carpet- Base case

		Carpet (tufted) of polyamide (PA) and polypropylene (PP) (per 1m2)					
		Details	Numbers pr carpet	Unit	UK demand		
					Amount	Unit/Notes	
Product		Weight total 2633g, pile (polyamide) 1100, primary backing (woven polypropylene) 133, secondary backing - Latex - 1400 (400 g styrene butadiene (SB) rubber and 1000 g limestone)	2633	g	22,500	tons carpet	
Disposal	Disposal - Total	Product 2633 g to Landfill	2633	g	8,545,385	m2 carpet	
	Disposal - PA		1100	g	9,399,924	kg carpet	
	Disposal - PP		133	g	1,136,536	kg carpet	
	Disposal (Latex)		1400	g	11,963,540	kg carpet	
Use		According to Frees, 2003 "Environmental assessment of vacuum cleaners", Working report no. 27 Danish Environmental Protection agency (in Danish). According to this a family spends 50 h a year cleaning 100 m2 i.e. 0.5 hours per year pr m2. Over the life time of 10 years i.e. 5 hours per m2	5	h	42,726,927	hours of carpet vacuum cleaning	
End Product - packaging		No data available - assumed zero	0	g	0	kg PE packaging	
Total manufacturing waste	Sum of product, fabric and yarn manufacturing waste	In this case equal to product manufacturing waste because no yarn manufacturing waste			5,063,995	kg dyed / finished / greige fabric or yarn	
Total Product - manufacturing waste	Sum of product manufacturing waste	in kg			5,063,995	kg dyed and finished carpet fabric	
		in m2			1,709,077	m2 dyed and finished carpet fabric	
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste)			22,500,000	kg Carpet	
	Product (Making up) needed	g carpet needed	2633	g	22,500,000	kg Carpet	
	Product (Making up) needed	m2 carpet needed	1	m2	8,545,385	m2 dyed and finished carpet fabric	
Product - manufacturing ("rolling, up, cutting and packing", "Application of finishing and backside", "Shearing", "Dyeing and drying of grey fabric", "Tufting of grey fabric" and "Polypropylene backing, grey fabric")	Making up - waste (Rolling up, cutting and packing)	0.2 m2 waste per 1m2 carpet (17%) i.e.. of PA,PP and Latexfoam					
		Waste-Total-m2	0.2	m2	1,709,077	m2 dyed and finished carpet fabric waste	
		Waste-Total-kg	526.6	g	4,500,000	kg dyed and finished carpet fabric waste	
		Waste-PA	220	g	1,879,985	kg dyed and finished PA fabric waste	
		Waste-PP	26.6	g	227,307	kg dyed and finished PP fabric waste	
		Waste-Latex (approx 70% limestone)	280	g	2,392,708	kg Latex fabric waste	
	Finishing (application of finishing and backside) needed	Application of Scotchgard and backside, 1.2 m2 needed	1.2	m2	10,254,463	m2 dyed and finished carpet fabric	
	Finishing waste	Negligible	0	g	0	m2 dyed and finished carpet fabric	
	"Shearing" needed		1.2	m2	10,254,463	m2 dyed carpet fabric	
	"Shearing" waste	Assumed to be about 5% of finished carpet, but only face fibre "Top shearing" i.e. PA waste (1.2*1.1)*0.05=66 g per m2 carpet product	66	g	563,995	kg dyed PA yarn waste	
	Dyeing and drying of grey fabric needed	1.2 m2	1.2	m2	10,254,463	m2 dyed carpet fabric	
	Dyeing and drying of grey fabric waste	Negligible	0	g	0	m2 dyed carpet fabric	
	Tufting of grey fabric needed	1.2 m2	1.2	m2	10,254,463	m2 tufted carpet fabric	
	Tufting of grey fabric waste	Negligible	0	g	0	m2 tufted carpet fabric	
	Fabric - manufacturing (PP backing)	Polypropylene backing, grey fabric needed	1.2 m2	1.2	m2	10,254,463	m2 PP backing carpet fabric
		Polypropylene backing, grey fabric waste	Negligible	0	g	0	m2 PP backing carpet fabric
Yarn + fibre + other materials manufacturing (yarn directly from PA and PP company)	Yarn - needed	No waste as filament yarn comes directly from the PP and PA factory i.e. no separate spinning i.e., i.e. 0 g yarn and fibre waste	1545.6	g	13,207,748	kg yarn	
		PA-yarn needed (end product mass+waste sources)	1386	g	11,843,904	kg PA yarn	
		PP-Yarn needed (end product mass+waste sources)	159.6	g	1,363,844	kg PP yarn	
	Other material	SB rubber - g (end product mass+waste sources)	484	g	4,135,967	kg SB-rubber	
	Ground limestone -g (end product mass+waste sources)	1196	g	10,220,281	kg limestone		

Textile material transportation needed in the life cycle of the 3 textile products - base cases

The world distance data presented in this section is based on the following primary sources:

- **SEA distances** <http://www.distances.com/index.php>
- **LAND distances** http://www.distances.com/distance_drive.php (US) and <http://www.indo.com/distance/>

The numbers have been entered into:

- GaBi-EDIP software package, Version 4.2. 03/2006. For more information about the GaBi-EDIP software database and tool visit the Danish LCA-center web-site: <http://www.dk-teknik.dk/cms/site.asp?p=2456>

As it can be seen on the following pages the environmental impact of boat transportation between countries have been allocated to the country that benefits economically from the trade i.e. the country that are selling the products. E.g. transportation by boat of T-shirts manufactured in China to United Kingdom has been allocated to China. Transportation within a country has been allocated to the country where the transportation occurs.

T-shirt - Base case

T-shirt of 100% cotton, dyed - 115,000 tons or 460 million pieces needed to meet UK demand

Life cycle phase	Transportation	Description / Notes	Amounts and distances for the T-Shirt				Amount to meet UK demand	
			Type of transport	Notes	Distance (km)	Amounts per piece (kg)		Distance (kgkm) per piece
Material	Transportation of raw cotton fibres	From US cotton farm to US ginning unit (1/3 is raw fibre 2/3 is seed) i.e., 3*0.328 (0.984 kg)	Truck		200	0.384	197	90,528,000,000
		From US ginning unit to US raw cotton market place	Truck		200	0.328	66	30,176,000,000
Production / retail	Transportation of raw cotton yarn	From US raw cotton marketplace to US spinning mill	Truck		200	0.328	66	30,176,000,000
		From US spinning mill to vertical textile company in China	Truck	Atlanta to Los Angeles	3128	0.279	873	401,447,520,000
Use	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation	Boat	Los Angeles to Shanghai	10571	0.279	2,949	1,356,682,140,000
			Truck	Shanghai to textile company	200	0.279	56	25,668,000,000
			Truck	Textile company to Shanghai	0	0.25	0	0
			Boat	Shanghai to UK-Southampton	200	0.25	50	23,000,000,000
			Truck	Shanghai to UK-Southampton	19074	0.25	4,769	2,193,510,000,000
			Truck	Southampton to dist. Centre	200	0.25	50	23,000,000,000
Use	Consumer transportation of T-Shirt	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline, i.e., 0.83 litres of gasoline is use (= 0.61 kg because gasoline weighs 0.73 kg per litre), i.e., (0.61*0.25/2.25) is allocated to the T-shirt, i.e., 0.07 kg gasoline per T-shirt or (10*0.25/2.25) = 1 kgkm	Car			0.28	1	460,000,000
							0.07	NB not kgkm but kg gasoline
Disposal		Discarded T-shirt to incineration plant	Truck		50	0.25	13	5,750,000,000
Total boat							7,718	3,550,192,140,000
Total truck							1,419	652,745,520,000
		Urban (assuming 1/3)					473	217,581,840,000
		Rural (assuming 1/3)					473	217,581,840,000
		Motorway (assuming 1/3)					473	217,581,840,000
Total Car							1	460,000,000
		kgkm						
		kg gasoline					0.07	32,200,000
Distance moon		382,500 km i.e. times 1 kg to the moon by boat:	9,281,548		by truck:	1,706,524	total:	10,989,275
Distance sun		150,000,000 km i.e. times 1 kg to the sun by boat:	23,668		by truck:	4,352	total:	28,023
Distance around the Earth		40,075 km i.e. times 1 kg around the earth by boat:	88,588,700		by truck:	16,288,098	total:	104,888,276
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to US (kgkm)	All in US+ transport to China	1,356,682,140,000	552,327,520,000	0	1,909,009,660,000			
Transportation allocated to China (kgkm)	All in China + transport to UK	2,193,510,000,000	48,668,000,000	0	2,242,178,000,000			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	51,750,000,000	460,000,000	52,210,000,000			
Total (check)		3,550,192,140,000	652,745,520,000	460,000,000	4,203,397,660,000			
Per piece	Per piece	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to China	2,949	1,201	0	4,150	400		
Transportation allocated to China (kgkm)	All in China + transport to UK	4,769	106	0	4,874	35		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	113	1	114	38		
Total (check)		7,718	1,419	1	9,138	473		

Blouse - Base case

Blouse of 100% Viscose, dyed - 6,500 tons or 32.5 million pieces needed to meet UK demand

Life cycle phase	Transportation	Amounts and distances for the Blouse					Amount to meet UK demand	
		Description / Notes	Type of transport	Notes	Distance (km)	Amounts per piece (kg)		Distance (kgkm) per piece
Material	Transportation of viscose yarn	From viscose yarn manufacturer in India to vertical viscose blouse manufacturer in India	Truck		500	0.23	118	3,737,500,000
	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation			0	0.23	0	0
Production / Retail	Transportation of Blouse	From India vertical company to UK distribution centre	Truck	Textile company to Bombay	500	0.2	100	3,250,000,000
			Boat	Bombay to UK-Southampton	7301	0.2	1,460	47,456,500,000
			Truck	Southampton to dist. Centre	200	0.2	40	1,300,000,000
			Truck	From UK distribution centre to UK retail	200	0.2	40	1,300,000,000
Use	Consumer transportation of Blouse	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline. i.e. 0.83 litres of gasoline is use (= 0.81 kg because gasoline weighs 0.73 kg per litre). i.e. (0.81*0.20/2.20) is allocated to the blouse, i.e. 0.05 kg gasoline per blouse or (10*0.20/2.20) = 1 kgkm)	Car			0.2	1	32,500,000
				0.05 kg gas per Blouse			0.05	NB not kgkm but kg gasoline
Disposal		Discarded Blouse to Incineration plant	Truck		50	0.2	10	325,000,000
Total boat								47,456,500,000
Total truck								9,912,500,000
		Urban (assuming 1/3)						3,304,166,667
		Rural (assuming 1/3)						3,304,166,667
		Motorway (assuming 1/3)						3,304,166,667
Total Car		kgkm						32,500,000
		kg gasoline						1,625,000
Distance moon	382,500 km i.e. times 1 kg to the moon by boat:		124,069	by truck:	25,915	total:	150,069	
Distance sun	150,000,000 km i.e. times 1 kg to the sun by boat:		316	by truck:	66	total:	383	
Distance around the Earth	40,075 km i.e. times 1 kg around the earth by boat:		1,184,192	by truck:	247,349	total:	1,432,352	
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to India (kgkm)	All in India+ transport to UK	47,456,500,000	6,987,500,000	0	54,444,000,000			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	2,925,000,000	32,500,000	2,957,500,000			
Total (check)		47,456,500,000	9,912,500,000	32,500,000	57,401,500,000			
Per piece	Principle	Boat	Truck	Car	Total		Truck allocated 1/3 to motorway, urban and rural transportation	
Transportation allocated to India (kgkm)	All in India+ transport to UK	1,460	215	0	1,675		72	
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	90	1	91		30	
Total (check)		1,460	305	1	1,766		102	

Carpet - Base case

Carpet of polyamide and polypropylene (1m²) - 22,500 tons or 8,545,385 m² needed to meet UK demand

Life cycle phase	Transportation	Description / Notes	Amounts and distances for the Carpet				Amount to meet UK demand	
			Type of transport	Notes	Distance (km)	Amounts per m2 (kg)		Distance (kgkm) per m2
Material	Transportation of yarn	From polyamide (PA) yarn and polypropylene (PP) yarn manufacturer in US to Carpet manufacturer in UK	Truck	Textile company to New York	500	1,5456	773	6,603,873,528
			Boat	New York City to Liverpool	11204	1,5456	17,456	149,168,295,250
			Truck	Liverpool to Carpet company	500	1,5456	773	6,603,873,528
Production / retail	Transportation of other materials	Limestone and Styrene Butadiene Rubber in UK to Carpet manufacturer	Truck	UK	500	1,68	840	7,178,123,400
			Truck	Negligible (vertical company) i.e. only company internal transportation	0	0	0	0
			Truck	From UK carpet company to UK distribution centre	500	2,633	1,317	11,249,999,353
Use	Consumer transportation of Carpet	From UK retail to consumer home - transport by truck / van.	Truck	From UK distribution centre to UK retail	200	2,633	527	4,499,999,741
			Truck		25	2,633	66	562,499,989
Disposal		Discarded carpet to landfill	Truck		50	2,633	132	1,124,999,935
Total boat							149,168,295,250	
Total truck							37,823,369,452	
Urban (assuming 1/3)							12,607,789,817	
Rural (assuming 1/3)							12,607,789,817	
Motorway (assuming 1/3)							12,607,789,817	
Distance moon	382,500 km i.e. times 1 kg to the moon by boat:		389,982	by truck:	98,885	total:	488,867	
Distance sun	150,000,000 km i.e. times 1 kg to the sun by boat:		994	by truck:	252	total:	1,247	
Distance around the Earth	40,075 km i.e. times 1 kg around the earth by boat:		3,722,228	by truck:	943,815	total:	4,666,043	
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to US (kgkm)	All in US+ transport to UK	149,168,295,250	6,603,873,528	0	155,772,168,778			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	31,219,495,924	0	31,219,495,924			
Total (check)		149,168,295,250	37,823,369,452	0	186,991,664,703			
Per m2	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to UK	17,456	773	0	18,229	258		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	3,653	0	3,653	1,218		
Total (check)		17,456	4,426	0	21,882	1,475		

Material and waste flow in the life cycle of the 3 textile products - scenarios

For the following scenarios there is no change in basic textile material and waste flows:

- Theme “Location of clothing and textiles production”, scenario 1 “Changing the location of existing operations”.
- Theme “Changes in consumer behaviour”, scenario 2 “Best practice in clothes cleaning”
- Theme “New products and material selection”, scenario 2 “Green manufacturing” – “Organic cotton in stead of conventional for the T-shirt” and scenario 3 “Smart functions” – “Nanotechnology - stain resistant coating of T-shirt”.

For theme “New products and material selection”, scenario 3 “Smart functions” “Nanotechnology – Extend life time of carpet” the basic flow will be reduced by 50% of the carpet base-case.

On the following pages in this section the basic flow for other scenarios are presented. The primary sources are the same as mentioned in the corresponding section for the base cases.

T-shirt - Theme “Location of clothing and textiles production”

Scenario 2 “Changed location with new production technology”

		T-shirt of 100% cotton, dyed			
		Details	Numbers pr T-shirt	Unit	UK demand
					Amount Unit/Notes
Product		Weight total 250g (cotton), 200 g/m2	250	g	460,000,000 Pieces
Disposal		Product 250 g to incineration	250	g	460,000,000 Pieces
Use		Life time 25 times 60 C washing with prewash (6.25 kg), drying (6.25 kg)	6.25	kg	11,500,000,000 Pieces washed /dried
		25 times ironing (1.25 hours)	1.25	h	11,500,000,000 Pieces ironed
End Product - packaging		10 g (polyethylene-PE)	10	g	4,600,000 kg PE
Total manufacturing waste	Sum of product, fabric and yarn manufacturing waste				23,460,000 kg dyed or greige cotton yarn or fibre
Total Product - manufacturing waste	Sum of product manufacturing waste				2,760,000 kg dyed or greige cotton fabric
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste)			115,000,000 kg T-shirt
Product - manufacturing	Product (Making up) needed	g T-shirt needed	250	g	115,000,000 kg T-shirt
	3-D-Making up (i.e. 3-D knitting) - waste	Assumed minimal waste 1% (of input) waste, i.e. 253 g (250/0.99) cotton yarn needed pr T-shirt, i.e. 3 g yarn waste.	3	g	1,380,000 kg dyed and finished cotton yarn
	Finishing needed	No finishing needed (softening was used for making up before)	0	g	0 kg dyed and finished cotton yarn
	Finishing waste 1 (Fabric inspec. + roll up on cardboard)	No finishing - No waste	0	g	0 Not relevant
	Finishing waste 2 (Drying, final fixation & setting m2 weight)	No finishing - no waste	0	g	0 Not relevant
	Finishing - Softening needed	No finishing - no waste	0	g	0 Not relevant
	Dyeing needed	From "Making up" i.e. 253 g dyed yarn	253	g	116,380,000 kg dyed cotton yarn
	Dyeing waste	Negligible	0	g	0 kg dyed cotton yarn
	Pretreatment - Bleaching + washing needed	From "Dyeing" i.e. 253 g bleached and washed fabric	253	g	116,380,000 kg bleached and washed cotton yarn
	Pre-treatment - Bleaching + washing waste	1% (of input) waste, i.e. 256 g (253/0.99) cotton yarn needed pr T-shirt, i.e. 3 g yarn waste	3	g	1,380,000 kg bleached and washed cotton yarn
	Greige yarn needed	From "Bleaching" i.e. 256 g yarn	256	g	117,760,000 kg greige cotton yarn
Yarn manufacturing (spinning)	Yarn - needed	"From - manu." i.e. 256 g yarn	256	g	117,760,000 kg cotton yarn
	Yarn - manufacturing waste	15% (of input) waste (spinning) i.e. 301 g (256/0.85) fibre needed i.e. 45 g fibre waste	45	g	20,700,000 kg raw cotton fibre
Raw fibre (and other materials)- needed		From "yarn manu" i.e. 328 g fibre needed	301	g	138,460,000 kg raw cotton fibre

T-shirt - Theme “Location of clothing and textiles production”

Scenario 3 “Changed location, new production technology and recycling”

		T-shirt of 100% cotton, dyed				
		Details	Numbers pr T-shirt	Unit	UK demand	
					Amount	Unit/Notes
Product		Weight total 250g (cotton), 200 g/m2	250	g	460,000,000	Pieces
Recycling company		50% of input can be used to produce new T-shirts	125	g	57,500,000	kg coloured recycled cotton yarn
Recycling waste			125	g	57,500,000	kg coloured cotton yarn waste
Use		Life time 25 times 60 C washing with prewash (6.25 kg), drying (6.25 kg)	6.25	kg	1,437,500,000	Pieces washed /dried
		25 times ironing (1.25 hours)	1.25	h	11,500,000,000	Pieces ironed
End Product - packaging		10 g (polyethylene-PE)	10	g	4,600,000	kg PE
Total manufacturing waste	Sum of product, fabric and yarn manufacturing waste				13,340,000	kg dyed or greige cotton yarn or fibre
Total Product - manufacturing waste	Sum of product manufacturing waste				2,760,000	kg dyed or greige cotton fabric
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste) + recycled fibres			115,000,000	kg T-shirt
Product - manufacturing	Product (Making up) needed	g T-shirt needed	250	g	115,000,000	kg T-shirt
	3-D-Making up (i.e. 3-D knitting) - waste	Assumed minimal waste 1% (of input) waste, i.e. 253 g (250/0.99) cotton yarn needed pr T-shirt, i.e. 3 g yarn waste .	3	g	1,380,000	kg dyed and finished cotton yarn
	Finishing needed	No finishing needed (softening was used for making up before)	0	g	0	kg dyed and finished cotton yarn
	Finishing waste 1 (Fabric inspec. + roll up on cardboard)	No finishing - No waste	0	g	0	Not relevant
	Finishing waste 2 (Drying, final fixation & setting m2 weight)	No finishing - no waste	0	g	0	Not relevant
	Finishing - Softening needed	No finishing - no waste	0	g	0	Not relevant
	Dyeing needed	From "3-D-Making up" i.e. 253 g dyed yarn needed - assumed dyeing both recycled and greige	253	g	116,380,000	kg virgin dyed cotton yarn
	Dyeing waste	Negligible	0	g		kg virgin dyed cotton yarn
	Pretreatment - Bleaching + washing needed	From "Dyeing" i.e. 253 g bleached and washed fabric	253	g	116,380,000	kg virgin bleached and washed cotton yarn
	Pre-treatment - Bleaching + washing waste	1% (of input) waste, i.e. 256 g (253/0.99) cotton yarn needed pr T-shirt, i.e. 3 g yarn waste	3	g	1,380,000	kg virgin bleached and washed cotton yarn
	Virgin Greige yarn needed	From "Bleaching" minus recycling 256-125 (i.e. 131 g yarn)	131	g	117,760,000	kg virgin greige cotton yarn
	Recycled yarns	From recycling company	125	g	57,500,000	kg coloured recycled cotton yarn
Virgin Yarn manufacturing (spinning)	Virgin Yarn - needed	"From - manu." i.e. 131 g yarn	131	g	60,260,000	kg virgin cotton yarn
	Virgin Yarn - manufacturing waste	15% (of input) waste (spinning) i.e. 154 g (131/0.85) fibre needed i.e. 23 g fibre waste	23	g	10,580,000	kg virgin raw cotton fibre
Virgin Raw fibre (and other materials)- needed		From "yam manu" i.e. 152 g fibre needed	154	g	70,840,000	kg virgin raw cotton fibre

Blouse- Theme “Changes in consumer behaviour”

Scenario 1 “Extending the life of clothing” – “Second-hand clothing”

		Blouse of 100% viscose, woven, dyed				
		Details	Numbers pr Blouse	Unit	UK demand	
					Amount	Unit/Notes
Product		Weight 200g (150 g/m2 viscose). For this scenario we assume that demand will drop 20% because people use 2nd hand clothing i.e. 0.8*32.5 mio pieces	200	6	26,000,000	Pieces
Waste sorting - waste to incineration					26,000,000	Pieces
Virging production		Product 200 g	200	g	26,000,000	Pieces
Use	Balance check				812,500,000	Pieces washed
	Use - 2nd hand	40 C, 6.5 mio pieces, Normal without prewash + hang / lie / drip drying	5	kg	162,500,000	Pieces washed
	Use - virgin	26.mio pieces. i.e. 25 times 40 C, Normal without prewash (5 kg) + hang / lie / drip drying	5	kg	650,000,000	Pieces washed
	Use - total	As base case with 32.5 mio pieces i.e. 25 times 40 C, Normal without prewash (5 kg) + hang / lie / drip drying	5	kg	812,500,000	Pieces washed
End Product - packaging		10 g (polyethylene-PE)	10	g	260,000	kg PE
Total manufacturing waste	Sum of product, fabric and yarn manufacturing waste	In this case equal to product manufacturing waste because no yarn manufacturing waste			772,200	kg dyed or greige viscose fabric or yarn
Total Product - manufacturing waste	Sum of product manufacturing waste				772,200	kg dyed or greige viscose fabric
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste)			5,207,800	kg Blouse
Product - manufacturing	Product (Making up) needed	g Blouse needed	200	g	5,200,000	kg Blouse
	Making up - waste (Laying up, cutting and sewing)	10% (of input) waste i.e. 200 g (200/0.90) fabric needed, i.e.. 222 g viscose, i.e. 22 g fabric waste	22	g	572,000	kg dyed and finished viscose fabric
	Finishing needed	From "Making up" i.e. 222 g finished fabric	222	g	5,772,000	kg dyed and finished viscose fabric
	Finishing needed - m2	With a weight of 150 g/m2 i.e. 222/150 = 1.48m2	1.48	m2	38,480,000	m2 dyed and finished viscose fabric
	Finishing waste 1 (Fabric inspec. + roll up on cardboard)	1.5% (of input) waste, i.e. 225.4 g (222/0.985) viscose fabric needed pr blouse (with a weight of 150g/m2 this is equivalent to 1.50 m2 (225.4/150), i.e. 4 g fabric waste	3.4	g	88,400	kg dyed and finished viscose fabric
	Finishing waste 2 (Drying, final fixation & setting m2 weight)	1% (of input) waste, i.e. 227.7 g (225.4/0.99) viscose fabric needed pr Blouse, i.e. 2.3 g fabric waste	2.3	g	59,800	kg dyed and finished viscose fabric
	Finishing -Softening needed	From "finishing waste 2" i.e. 228 g (227.7) dyed and softened fabric needed	228	g	5,928,000	kg dyed and softened viscose fabric
	Finishing - Softening waste	Negligible	0	g	0	kg dyed and softened viscose fabric
	Dyeing needed	From "finishing waste 2" i.e. 228 g (272.7) dyed fabric needed	228	g	5,928,000	kg dyed viscose fabric
	Dyeing waste	Negligible	0	g	0	kg dyed viscose fabric
	Pre-treatment-Desizing needed	From "Dyeing" i.e. 228 g desized fabric	228	g	5,928,000	kg desized viscose fabric
	Pre-treatment - Desizing waste	1% (of input) waste, i.e. 230 g (228/0.99) cotton fabric needed pr T-shirt, i.e. 2 g fabric waste	2	g	52,000	kg desized viscose fabric
	Greige woven fabric kg - needed	150 g/m2 i.e. 1.53 m2 fabric needed (230/150)	1.53	m2	39,780,000	kg greige woven viscose fabric
	Greige woven fabric m2 -needed	From "Fabric - m2" i.e. 230 g fabric	230	g	5,980,000	kg greige woven viscose fabric
Fabric - manufacturing (weaving)	Fabric - manufacturing waste	No waste i.e. 230 g or 1.53 m2 needed	0	g	0	kg viscose filament yarn
Yarn + fibre manufacturing (directly from viscose company)	Yarn - needed	No waste as filament yarn comes directly from the viscose factory i.e. no separate spinning i.e. 230 g yarn needed, i.e. 0 g yarn waste	230	g	5,980,000	kg viscose filament yarn
	Yarn - manufacturing waste	No waste	0	g	0	kg viscose filament yarn

Carpet - Theme “New products and material selection”

Scenario 1 “Alternative fibres” – “Wool face fibres in stead of polyamide for the carpet”

		Carpet (tufted) of polyamide (PA) and polypropylene (PP) (per 1m2)					
		Details	Numbers pr carpet	Unit	UK demand		
					Amount	Unit/Notes	
Product		Weight total 2600g, pile (wool) 950, primary backing (woven polypropylene) 120, secondary backing - Latex - 1430 (styrene butadiene (SB) rubber approx 460 and 1070 limestone)	2600	g	8,545,385	m2 carpet	
Disposal	Disposal - Total	Product 2600 g to landfill	2600	g	8,545,385	m2 carpet	
	Disposal - wool		950	g	8,118,116	kg carpet	
	Disposal - PP		120	g	1,025,446	kg carpet	
	Disposal (Latex)		1530	g	13,074,440	kg carpet	
Use		According to Frees, 2003 "Environmental assessment of vacuum cleaners", Working report no. 27 Danish Environmental Protection agency (in Danish). According to this a family spends 50 h a year cleaning 100 m2 i.e. 0.5 hours per year pr m2. Over the life time of 10 years i.e. 5 hours per m2	5	h	42,726,927	hours of carpet vacuum cleaning	
End Product - packaging		No data available - assumed zero	0	g	0	kg PE packaging	
Total manufacturing waste	Sum of product, fabric and yarn manufacturing waste				9,855,678	kg dyed / finished / greige fabric or yarn	
Total Product - manufacturing waste	Sum of product manufacturing waste	in kg			4,930,687	kg dyed and finished carpet fabric	
		in m2			1,709,077	m2 dyed and finished carpet fabric	
Product after manufacturing	Product (Making up) needed	Balance calculations fibre to end-product (initial fibre weight - manufacturing waste)			22,218,002	kg Carpet	
Product - manufacturing ("rolling, up, cutting and packing", "Application of finishing and backside", "Shearing", "Dyeing and drying of grey fabric", "Tufting of grey fabric" and "Polypropylene backing, grey fabric")	Product (Making up) needed	g carpet needed	2600	g	22,218,002	kg Carpet	
	Product (Making up) needed	m2 carpet needed	1	m2	8,545,385	m2 dyed and finished carpet fabric	
	Making up - waste (Rolling up, cutting and packing)	0.2 m2 waste per 1m2 carpet (17%) i.e. of wool,PP and Latex/foam					
		Waste-Total-m2	0.2	m2	1,709,077	m2 dyed and finished carpet fabric waste	
		Waste-Total-kg	520	g	4,443,600	kg dyed and finished carpet fabric waste	
		Waste-wool	190	g	1,623,623	kg dyed and finished PA fabric waste	
		Waste-PP	24	g	205,089	kg dyed and finished PP fabric waste	
		Waste-Latex (approx 70% limestone)	306	g	2,614,888	kg Latex fabric waste	
	Finishing (application of finishing and backside) needed	Application of Scotchgard and backside, 1.2 m2 needed	1.2	m2	10,254,463	m2 dyed and finished carpet fabric	
	Finishing waste	Negligible	0	g	0	kg dyed and finished carpet fabric	
	"Shearing" needed		1.2	m2	10,254,463	m2 dyed carpet fabric	
	"Shearing" waste	Assumed to be about 5% of finished carpet, but only face fibre "Top shearing" i.e. wool waste (1.2*0.95)*0.05=57 g per m2 carpet product	57	g	487,087	kg dyed PA yarn waste	
	Dyeing and drying of grey fabric needed	1.2 m2	1.2	m2	10,254,463	m2 dyed carpet fabric	
	Dyeing and drying of grey fabric waste	Negligible	0	g	0	g dyed carpet fabric	
Tufting of grey fabric needed	1.2 m2	1.2	m2	10,254,463	m2 tufted carpet fabric		
Tufting of grey fabric waste	Negligible	0	g	0	m2 tufted carpet fabric		
Fabric - manufacturing (PP backing)	Polypropylene backing, grey fabric needed	1.2 m2	1.2	m2	10,254,463	m2 PP backing carpet fabric	
	Polypropylene backing, grey fabric waste	Negligible	0	g	0	kg PP waste	
Yarn + fibre + other materials manufacturing (yarn directly from PA and PP company)	Yarn - needed	Wool-yarn needed from (end product mass+waste sources)	1,197	g	10,228,826	kg washed wool yarn	
		PP-Yarn needed (end product mass+waste sources)	144	g	1,230,536	kg PP yarn	
		No PP waste as filament yarn comes directly as filament yarn from PP factory - wool waste calculated from yarn needed above and washed wool needed below	133		1,136,536	kg washed wool fibre and yarn waste	
	Washed wool	Washed wool needed : Wool waste approx 10% in yarn manufacturing i.e. 1197/0.9= 1330 g washed wool needed	1330	g	11,365,363	kg washed wool	
		Wool waste calculated from washed wool above and raw wool needed below i.e	443	g	3,788,454	kg weight loss wool washing	
	Raw wool	Raw wool needed - washed wool waste (primarily dirt, suint and minor wool) - weight loss "wool washing" is 25% i.e.	1773	g	15,153,817	kg raw wool	
Other material	SB rubber - g (end product mass+waste sources)	521.8	g	4,468,982	kg SB-rubber		
	Ground limestone - g (end product mass+waste sources)	1314.2	g	11,230,346	kg limestone		

Textile material transportation needed in the life cycle of the 3 textile products – scenarios

For the following scenarios there is no change in textile material transportation:

- Theme “Changes in consumer behaviour”, scenario 2 “Best practice in clothes cleaning”
- Theme “New products and material selection”, scenario 2 “Green manufacturing” – “Organic cotton in stead of conventional for the T-shirt” and scenario 3 “Smart functions” – “Nanotechnology - stain resistant coating of T-shirt”.

For theme “New products and material selection”, scenario 3 “Smart functions” “Nanotechnology – Extend life time of carpet” the basic flow will be reduced by 50% of the carpet base-case.

On the following pages in this section the basic textile material transportation for other scenarios are presented. The primary sources are the same as mentioned in the corresponding section for the base cases.

Theme “Location of clothing and textiles production”, scenario 1 “Changing the location of existing operations”

T-shirt of 100% cotton, dyed - 115,000 tons or 460 million pieces still needed to meet UK demand

Life cycle phase	Transportation	Amounts and distances for the T-Shirt						Amount to meet UK demand
		Description / Notes	Type of transport	Notes	Distance (km)	Amounts per piece (kg)	Distance (kgkm) per piece	
Material	Transportation of raw cotton fibres	From US cotton farm to US ginning unit (1/3 is raw fibre 2/3 is seed) i.e. 3*0.328 (0.984 kg)	Truck		200	0.984	197	90,528,000,000
		From US ginning unit to US raw cotton market place	Truck		200	0.328	66	30,176,000,000
		From US raw cotton marketplace to US spinning mill	Truck		200	0.328	66	30,176,000,000
Production / retail	Transportation of raw cotton yarn	From US spinning mill to vertical textile company in UK	Truck	Atlanta to New York City	1204	0.273	338	154,521,360,000
			Boat	New York City to Liverpool	11204	0.273	3,151	1,449,471,960,000
			Truck	Liverpool to textile company	500	0.273	140	64,170,000,000
	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation			0	0.25	0	0
	Transportation of T-shirt	From UK textile company to UK distribution centre	Truck		500	0.25	128	57,500,000,000
	From UK distribution centre to UK retail	Truck		200	0.25	50	23,000,000,000	
Use	Consumer transportation of T-Shirt	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline. i.e. 0.83 litres of gasoline is use (= 0.81 kg because gasoline weighs 0.73 kg per litre). i.e. (0.81*0.25/2.25) is allocated to the T-shirt, i.e. 0.07 kg gasoline per T-shirt or (10*0.25/2.25) = 1 kgkm	Car			0.25	1	460,000,000
						0.07	NB not kgkm but kg gasoline	32,200,000
Disposal		Discarded T-shirt to incineration plant	Truck		50	0.25	13	5,750,000,000
Total boat								1,449,471,960,000
Total truck								455,821,360,000
		Urban (assuming 1/3)						151,940,453,333
		Rural (assuming 1/3)						151,940,453,333
		Motorway (assuming 1/3)						151,940,453,333
Total Car								460,000,000
		kgkm						
		kg gasoline						32,200,000
Distance moon	382,500 km i.e. times 1 kg to the moon by boat:		3,789,469		by truck:	1,191,690	total:	4,982,362
Distance sun	150,000,000 km i.e. times 1 kg to the sun by boat:		9,663		by truck:	3,039	total:	12,705
Distance around the Earth	40,075 km i.e. times 1 kg around the earth by boat:		36,168,982		by truck:	11,374,207	total:	47,554,668
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to US (kgkm)	All in US+ transport to UK	1,449,471,960,000	305,401,360,000	0	1,754,873,320,000			
Transportation allocated to China (kgkm)	All in China + transport to UK	0	0	0	0			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	150,420,000,000	460,000,000	150,880,000,000			
Total (check)		1,449,471,960,000	455,821,360,000	460,000,000	1,905,753,320,000			
Per piece	Principle	Boat	Truck	Car	Total		Truck allocated 1/3 to motorway, urban and rural transportation	
Transportation allocated to US (kgkm)	All in US+ transport to China	3,151	664	0	3,815			221
Transportation allocated to China (kgkm)	All in China + transport to UK	0	0	0	0			0
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	327	1	328			109
Total (check)		3,151	991	1	4,143			330

Theme “Location of clothing and textiles production”, scenario 1 “Changing the location of existing operations”

Blouse of 100% Viscose, dyed - 6,500 tons or 32.5 million pieces still needed to meet UK demand

Life cycle phase	Transportation	Description / Notes	Amounts and distances for the Blouse				Amount to meet UK demand	
			Type of transport	Notes	Distance (km)	Amounts per piece (kg)		Distance (kgkm) per piece
Material	Transportation of viscose yarn	From viscose yarn manufacturer in UK to vertical viscose blouse manufacturer in UK	Truck		500	0.23	115	3,737,500,000
Production / Retail	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation			0	0.23	0	0
	Transportation of Blouse	From UK vertical company to UK distribution centre	Truck	Textile company to UK distribution centre	500	0.2	100	3,250,000,000
		From UK distribution centre to UK retail	Truck		200	0.2	40	1,300,000,000
Use	Consumer transportation of Blouse	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline. I.e. 0.83 litres of gasoline is use (= 0.61 kg because gasoline weighs 0.73 kg per litre). I.e. (0.61*0.20/2.20) is allocated to the blouse, i.e. 0.05 kg gasoline per blouse or (10*0.20/2.20) = 1 kgkm	Car			0.2	1	32,500,000
							0.05 kg gas per Blouse	NB not kgkm but kg gasoline
Disposal		Discarded Blouse to Incineration plant	Truck		50	0.2	10	325,000,000
	Total boat							0
	Total truck							8,612,500,000
		Urban (assuming 1/3)						2,870,833,333
		Rural (assuming 1/3)						2,870,833,333
		Motorway (assuming 1/3)						2,870,833,333
	Total Car							32,500,000
		kgkm						1,625,000
		kg gasoline						
Distance moon		382,500 km i.e. times 1 kg to the moon by boat:	0	by truck:	22,516	total:		22,601
Distance sun		150,000,000 km i.e. times 1 kg to the sun by boat:	0	by truck:	57	total:		58
Distance around the Earth		40,075 km i.e. times 1 kg around the earth by boat:	0	by truck:	214,910	total:		215,721
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to India (kgkm)	All in India+ transport to UK	0	0	0	0			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	8,612,500,000	32,500,000	8,645,000,000			
Total (check)		0	8,612,500,000	32,500,000	8,645,000,000			
Per piece	Principle	Boat	Truck	Car	Total		Truck allocated 1/3 to motorway, urban and rural transportation	
Transportation allocated to India (kgkm)	All in India+ transport to UK	0	0	0	0			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	265	1	266			88
Total (check)		0	265	1	266			88

Theme “Location of clothing and textiles production”, scenario 2 “Changed location with new production technology”

T-shirt of 100% cotton, dyed - 115,000 tons or 460 million pieces still needed to meet UK demand

Life cycle phase	Transportation	Amounts and distances for the T-Shirt						Amount to meet UK demand
		Description / Notes	Type of transport	Notes	Distance (km)	Amounts per piece (kg)	Distance (kgkm) per piece	
Material	Transportation of raw cotton fibres	From US cotton farm to US ginning unit (1/3 is raw fibre 2/3 is seed) i.e. 3*0.301 (0.903 kg)	Truck		200	0.303	181	83,076,000,000
		From US ginning unit to US raw cotton market place	Truck		200	0.301	60	27,692,000,000
		From US raw cotton marketplace to US spinning mill	Truck		200	0.301	60	27,692,000,000
Production / retail	Transportation of raw cotton yarn	From US spinning mill to vertical textile company in UK	Truck	Atlanta to New York City	1204	0.256	308	141,783,040,000
			Boat	New York City to Liverpool	11294	0.256	2,891	1,329,981,440,000
	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation	Truck	Liverpool to textile company	500	0.256	128	58,880,000,000
	Transportation of T-shirt	From UK textile company to UK distribution centre	Truck		500	0.25	128	57,500,000,000
	From UK distribution centre to UK retail	Truck		200	0.25	50	23,000,000,000	
Use	Consumer transportation of T-Shirt	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline. i.e. 0.83 litres of gasoline is use (= 0.61 kg because gasoline weighs 0.73 kg per litre). i.e. (0.61*0.25/2.25) is allocated to the T-shirt, i.e. 0.07 kg gasoline per T-shirt or (10*0.25/2.25) = 1 kgkm	Car			0.25	1	460,000,000
				0.07 kg gas per T-shirt			0.07	NB not kgkm but kg gasoline
Disposal		Discarded T-shirt to incineration plant	Truck		50	0.25	13	5,750,000,000
Total boat								1,329,981,440,000
Total truck								425,373,040,000
		Urban (assuming 1/3)						141,791,013,333
		Rural (assuming 1/3)						141,791,013,333
Total Car		Motorway (assuming 1/3)						141,791,013,333
		kgkm						460,000,000
		kg gasoline						32,200,000
Distance moon		382,500 km i.e. times 1 kg to the moon by boat:	3,477,076		by truck:	1,112,086	total:	4,590,365
Distance sun		150,000,000 km i.e. times 1 kg to the sun by boat:	8,867		by truck:	2,836	total:	11,705
Distance around the Earth		40,075 km i.e. times 1 kg around the earth by boat:	33,187,310		by truck:	10,614,424	total:	43,813,212
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to US (kgkm)	All in US+ transport to UK	1,329,981,440,000	280,243,040,000	0	1,610,224,480,000			
Transportation allocated to China (kgkm)	All in China + transport to UK	0	0	0	0			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	145,130,000,000	460,000,000	145,590,000,000			
Total (check)		1,329,981,440,000	425,373,040,000	460,000,000	1,755,814,480,000			
Per piece	Principle	Boat	Truck	Car	Total		Truck allocated 1/3 to motorway, urban and rural transportation	
Transportation allocated to US (kgkm)	All in US+ transport to China	2,891	609	0	3,500		203	
Transportation allocated to China (kgkm)	All in China + transport to UK	0	0	0	0		0	
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	316	1	317		105	
Total (check)		2,891	925	1	3,817		308	

Theme “Location of clothing and textiles production”, scenario 3 “Changed location, new technology and recycling”

T-shirt of 100% cotton, dyed - 115,000 tons or 460 million pieces still needed to meet UK demand

Life cycle phase	Transportation	Amounts and distances for the T-Shirt						Amount to meet UK demand
		Description / Notes	Type of transport	Notes	Distance (km)	Amounts per piece (kg)	Distance (kgkm) per piece	
Material	Transportation of raw cotton fibres	From US cotton farm to US ginning unit (1/3 is raw fibre 2/3 is seed) i.e. 3'0.154 (0.462 kg)	Truck		200	0.462	92	42,504,000,000
		From US ginning unit to US raw cotton market place	Truck		200	0.154	31	14,168,000,000
		From US raw cotton marketplace to US spinning mill	Truck		200	0.131	158	72,553,040,000
Production / retail	Transportation of raw cotton yarn	From US spinning mill to vertical textile company in UK	Boat	Atlanta to New York City	1204	0.131	1,480	680,576,440,000
			Boat	New York City to Liverpool	11294	0.131	1,480	680,576,440,000
			Truck	Liverpool to textile company	500	0.131	66	30,130,000,000
	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation			0	0.25	0	0
	Transportation of T-shirt	From UK textile company to UK distribution centre	Truck		500	0.25	125	57,500,000,000
	From UK distribution centre to UK retail	Truck		200	0.25	50	23,000,000,000	
Use	Consumer transportation of T-Shirt	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline. i.e. 0.83 litres of gasoline is use (= 0.81 kg because gasoline weighs 0.73 kg per litre). i.e. (0.81*0.25/2.25) is allocated to the T-shirt, i.e. 0.07 kg gasoline per T-shirt or (10*0.25/2.25) = 1 kgkm	Car			0.25	1	460,000,000
						0.07	NB not kgkm but kg gasoline	32,200,000
		Transport Consumer to clothing bank - Negligible - by walking / doing other things			0	0.25		0
Disposal	Recycling + disposal operation	Transport clothing bank to sorting centre	Truck		100	0.25	25	11,500,000,000
		Transport sorting centre to recycling company	Truck		300	0.25	75	34,500,000,000
		Transport recycling centre to 3-D-knitting manufacturing	Truck		300	0.125	38	17,250,000,000
		Transport recycling company to waste incineration	Truck		50	0.125	6	2,875,000,000
	Total boat						680,576,440,000	
	Total truck						300,023,040,579	
	Urban (assuming 1/3)						100,007,680,193	
	Rural (assuming 1/3)						100,007,680,193	
	Motorway (assuming 1/3)						100,007,680,193	
	Total Car						460,000,000	
	kgkm						32,200,000	
	kg gasoline							
Distance moon	382,500 km i.e. times 1 kg to the moon by boat:		1,779,285	by truck:	784,374	total:	2,564,861	
Distance sun	150,000,000 km i.e. times 1 kg to the sun by boat:		4,537	by truck:	2,000	total:	6,540	
Distance around the Earth	40,075 km i.e. times 1 kg around the earth by boat:		16,982,569	by truck:	7,486,539	total:	24,480,586	
Absolute	Principle	Boat	Truck	Car	Total			
Transportation allocated to US (kgkm)	All in US+ transport to China	680,576,440,000	143,393,040,000	0	823,969,480,000			
Transportation allocated to China (kgkm)	All in China + transport to UK	0	0	0	0			
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	156,630,000,579	460,000,000	157,090,000,579			
Total (check)		680,576,440,000	300,023,040,579	460,000,000	981,059,480,579			
Per piece	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to China	1,480	312	0	1,791	104		
Transportation allocated to China (kgkm)	All in China + transport to UK	0	0	0	0	0		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	341	1	342	114		
Total (check)		1,480	652	1	2,133	217		

Theme “Changes in consumer behaviour”, scenario 1 “Extending the life of clothing” – “Second-hand clothing”

Blouse of 100% Viscose, dyed - 5,200 tons or 26.0 million pieces needed to meet UK demand

Life cycle phase	Transportation	Description / Notes	Amounts and distances for the Blouse				Amount to meet UK demand	
			Type of transport	Notes	Distance (km)	Amounts per piece (kg)		Distance (kgkm) per piece
Material	Transportation of viscose yarn	From viscose yarn manufacturer in India to vertical viscose blouse manufacturer in India	Truck		500	0.23	115	2,990,000,000
Production / Retail	Transportation of fabric	Negligible (vertical company) i.e. only company internal transportation			0	0.23	0	0
	Transportation of Blouse	From India vertical company to UK distribution centre	Truck	Textile company to Bombay	500	0.2	100	2,600,000,000
			Boat	Bombay to UK-Southampton	7301	1.460		37,965,200,000
			Truck	Southampton to dist. Centre	200	0.2	40	1,040,000,000
		From UK distribution centre to UK retail	Truck		200	0.2	40	1,040,000,000
Use	Consumer transportation of Blouse	From UK retail to consumer home - assuming the consumer buys 2 kg other goods, drives 10 km and the car drives 12 km per litre gasoline. i.e. 0.83 litres of gasoline is use (= 0.61 kg because gasoline weighs 0.73 kg per litre). i.e. (0.61*0.20/2.20) is allocated to the blouse, i.e. 0.05 kg gasoline per blouse or (10*0.20/2.20) = 1 kgkm	Car			0.2	1	26,000,000
				0.05 kg gas per Blouse		0.05	NB not kgkm but kg gasoline	1,300,000
2nd/hand recovery	Transport Consumer to clothing bank	By walking - environmental friendly	Walking					0
	Transport clothing bank to sorting centre	Calculated from "Environmental Resources Management: 2001. Clothing Recycling Life Cycle Assessment Study - Salvation Army Trading Company Limited." page 6-10 transport 10.5 million kWh extracted energy per 15576 tons reused. i.e. 0.68 kWh per kg reused - roughly 0.035 kWh / tkm bluk road freight i.e. 0.68/0.035 =19.3 kwh road freight per kg reused. With a total of 16 million pieces handled or 3,200,000 kg. transportation is 19,300 * 3,200,000 i.e. 6,176,000,000 kgkm.	Truck					6,176,000,000
	Transport sorting centre to 2nd hand shop	Included in the number above						
	Consumer transport 2nd hand to home	By walking - environmental friendly	Walking					0
Disposal	Transport sorting center to waste incineration	Included in the number above	Truck					0
Total boat								37,965,200,000
Total truck								13,846,000,000
		Urban (assuming 1/3)						4,615,333,333
		Rural (assuming 1/3)						4,615,333,333
		Motorway (assuming 1/3)						4,615,333,333
Total Car								26,000,000
		kgkm						1,300,000
		kg gasoline						
Distance moon		382,500 km i.e. times 1 kg to the moon by boat:	99,255	by truck:	36,199	total:	135,522	
Distance sun		150,000,000 km i.e. times 1 kg to the sun by boat:	253	by truck:	92	total:	346	
Distance around the Earth		40,075 km i.e. times 1 kg around the earth by boat:	947,354	by truck:	345,502	total:	1,293,505	
Absolute	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to India (kgkm)	All in India+ transport to UK	37,965,200,000	5,590,000,000	0	43,555,200,000	1,863,333,333		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	8,256,000,000	26,000,000	8,282,000,000	2,752,000,000		
Total (check)		37,965,200,000	13,846,000,000	26,000,000	51,837,200,000	4,615,333,333		

For this scenario we have assumed that UK demand will drop 20% because people buy more 2nd hand clothing.

Theme “New products and material selection”, scenario 1 “Alternative fibres” – “Wool face fibres instead of polyamide”

Carpet of wool and polypropylene (1m²) - 22,200 tons or 8,545,385 m² needed to meet UK demand

Life cycle phase	Transportation	Amounts and distances for the Blouse						Amount to meet UK demand
		Description / Notes	Type of transport	Notes	Distance (km)	Amounts per m2 (kg)	Distance (kgkm) per m2	
Material	Transportation of textile materials	From polypropylene (PP) yarn manufacturer in US to Carpet manufacturer in UK	Truck	Textile company to New York	500	0.144	72	615,267,720
			Boat	New York City to Liverpool	11294	0.144	1,626	13,897,667,259
		Transportation of UK raw wool to UK yarn manufacturer (raw wool washing and yarn manufacturing)	Truck	Liverpool to Carpet company	500	0.144	72	615,267,720
			Truck		500	1.773	887	7,575,483,803
			Truck		500	1.197	599	5,114,412,923
			Truck	UK	500	1.836	918	7,844,663,430
Production / retail	Transportation of other materials	Negligible (vertical company) i.e. only company internal transportation	Truck					
			Truck					
			Truck					
Use	Consumer transportation of Carpet	From UK carpet company to UK distribution centre	Truck		500	2.6	1,300	11,109,000,500
			Truck		200	2.6	520	4,443,600,200
Disposal	Discarded carpet to Incineration plant / landfill	From UK retail to consumer home - transport by truck / van.	Truck		25	2.6	65	555,490,025
			Truck		50	2.6	130	1,110,900,050
Total boat							13,897,667,259	
Total truck							38,984,046,370	
		Urban (assuming 1/3)					12,994,682,123	
		Rural (assuming 1/3)					12,994,682,123	
		Motorway (assuming 1/3)					12,994,682,123	
Distance moon		382,500 km i.e. times 1 kg to the moon by boat:	36,334	by truck:	101,919	total:	138,253	
Distance sun		150,000,000 km i.e. times 1 kg to the sun by boat:	93	by truck:	260	total:	353	
Distance around the Earth		40,075 km i.e. times 1 kg around the earth by boat:	346,791	by truck:	972,777	total:	1,319,569	
Absolute	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to UK	13,897,667,259	615,267,720	0	14,512,934,979	205,089,240		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	38,368,778,650	0	38,368,778,650	12,789,592,883		
Total (check)		13,897,667,259	38,984,046,370	0	52,881,713,629	12,994,682,123		
Per m2	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to UK	1,626	72	0	1,698	24		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	4,490	0	4,490	1,497		
Total (check)		1,626	4,562	0	6,188	52,881,713,629		

For this scenario we have assumed that wool is used instead of polyamide as pile (face fibre). UK demand is assumed to be the same i.e. 8,545,385 m².

Theme “New products and material selection”, scenario 3 “Smart functions” “Nanotechnology – Extend life time of carpet”

Carpet of polyamide and polypropylene (1m²) - 11,250 tons or 4,272,693 m² needed to meet UK demand

Life cycle phase	Transportation	Description / Notes	Amounts and distances for the Carpet				Amount to meet UK demand	
			Type of transport	Notes	Distance (km)	Amounts per m2 (kg)		Distance (kgkm) per m2
Material	Transportation of yarn	From polyamide (PA) yarn and polypropylene (PP) yarn manufacturer in US to Carpet manufacturer in UK	Truck	Textile company to New York	500	1.5456	773	3,301,936,764
			Boat	New York City to Liverpool	11294	1.5456	17,456	74,584,147,625
			Truck	Liverpool to Carpet company	500	1.5456	773	3,301,936,764
Production / retail	Transportation of other materials	Limestone and Styrene Butadiene Rubber in UK to Carpet manufacturer	Truck	UK	500	1.68	840	3,589,061,700
			Truck	Negligible (vertical company) i.e. only company internal transportation	500	2.633	1,317	5,624,999,676
			Truck	From UK carpet company to UK distribution centre	200	2.633	527	2,249,999,371
Use	Consumer transportation of Carpet	From UK distribution centre to UK retail	Truck		25	2.633	66	281,249,984
			Truck	From UK retail to consumer home - transport by truck / van.	50	2.633	132	562,499,968
Disposal	Discarded carpet to Incineration plant / landfill	Truck			50	2.633	132	562,499,968
			Total boat					74,584,147,625
			Total truck					18,911,684,726
			Urban (assuming 1/3)					6,303,894,909
Rural (assuming 1/3)					6,303,894,909			
Motorway (assuming 1/3)					6,303,894,909			
Distance moon	382,500 km i.e. times 1 kg to the moon by boat:	194,991	by truck:	49,442	total:	244,434		
Distance sun	150,000,000 km i.e. times 1 kg to the sun by boat:	497	by truck:	126	total:	623		
Distance around the Earth	40,075 km i.e. times 1 kg around the earth by boat:	1,861,114	by truck:	471,907	total:	2,333,021		
Absolute	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to UK	74,584,147,625	3,301,936,764	0	77,886,084,389	1,100,645,588		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	15,609,747,962	0	15,609,747,962	5,203,249,321		
Total (check)		74,584,147,625	18,911,684,726	0	93,495,832,351	6,303,894,909		
Per m2	Principle	Boat	Truck	Car	Total	Truck allocated 1/3 to motorway, urban and rural transportation		
Transportation allocated to US (kgkm)	All in US+ transport to UK	17,456	773	0	18,229	258		
Transportation allocated to UK (kgkm)	All in UK i.e. everything else	0	3,653	0	3,653	1,218		
Total (check)		17,456	4,426	0	21,882	1,475		

For this scenario we assume that people use nanotech carpet that will last for 20 years in stead of 10 i.e.UK demand will drop 50% i.e. 0.5*8,545,385 m² i.e.0.5*22,500 i.e.

Toxicity evaluation

The data presented in this section is based on the work done in connection with the Danish EDIPTEx project:

- Laursen, S.E., Hansen J., Knudsen, H.H., Wenzel, H., Larsen, H.F. and Kristensen, F.M., 2006. "EDIPTEx -Environmental assessment of textiles." Working Report no 3, 2006. Danish Environmental Protection Agency (in Danish). Is currently being translated to English by DEPA.

Many of the toxicity data developed during the EDIPTEx project has not been transferred to the GaBi-EDIP software, Version 03/2006. The data on the following page has therefore been extracted from the EDIPTEx work, entered in the GaBi-EDIP software for the T-shirt base case and used to calculate the toxicity impact for the T-shirt base case and the theme "New products and material selection", scenario 2 "Green manufacturing" – "Organic cotton instead of conventional for the T-shirt". In the EDIPTEx project report details about the methodology for calculating the toxicity fate factors can be found.

Economic and social analysis

On the following pages detailed information about the economic and social analysis can be found. The weights of the materials used in the environmental analysis of this report are taken as a reference for the numbers in the economic analysis.

Economic and social analysis - base cases

T-shirt- Base case

Country data	US	China	UK
Working day (hours/day)	8.00	8.00	8.00
Working week (days/week)	5	6	5
Working year (weeks/year)	44	50	44
Working year (hours/year)	1,760	2,400	1,760
Wage (£/hour)			9.38
Wage (£/year, paid 52 weeks, 40 hours)			16,500

Product data			
Number T-shirts sold in UK	4.6E+08		
	weight/ T-shirt (kg)	total weight ('000 tons)	
Weight of cotton crop	0.328	151	
Weight of cotton yarn	0.279	128	
Weight of cotton fabric	0.275	127	
Weight of finished T-shirt	0.250	115	

Product account	kg/man-year	pieces/man-year	£/kg	£/Tshirt	£million/UK demand	total workers	UK wages (£million)
Cotton crop production	30,000		0.84	0.28	127	5,031	
US Govt subsidy			0.18	0.06	27		
Selling price of cotton			0.66	0.22	100		
Cost of spinning	25,000		1.01	0.33	152	5,134	
Price of cotton yarn			1.96	0.55	252		
Cost of knitting	23,000		1.90	0.53	244	5,580	
Price of knitted fabric			3.92	1.08	496		
Cost of cutting and sewing		4,500	3.20	0.88	405	102,222	
Price of finished garment			7.84	1.96	902		
"Distribution"				0.69	317		
Wholesale price to retailer				2.65	1,219		
Cost + profit of retailer				4.35	2,001		
Price to consumer		17,582		7.00	3,220	26,163	432

National accounts	US	China	UK
Total Output	378	1,397	4,439
Intermediate consumption	100	747	2,121
Subsidies	27		
Gross National Income	252	650	2,318
Total employment	10,165	107,802	26,163
Total UK exports			0
Total UK imports			902
UK Balance of Trade			-902
UK wage bill			432
UK Operating surplus			1,887

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the table:

Wages

Source: The UK wages are based on a leading UK retailer's annual report data.

1,073 million £ spent on wages/ 65,000 workers = £ 16,500. This is £ 9.38 per hour based on 1,760 hours.

Assumed exchange rate 2004

Source: Quarterly Report of an internationally operating company, via Yahoo Finance. Exchange rate British pound (£)/ USD (\$) = £ 1 £/ \$ 1.822

Retail price

Source: The retail price for a white T-shirt is derived from the T-shirt retail price of a leading UK retailer. The retail price of £7 per T-shirt (and also the price of the blouse and the carpet) will stay fixed across scenarios so one can see reductions in the retailer margin if production costs go up.

Cotton crop production

Productivity

Source: United States Department of Agriculture; National Agricultural Statistics Service. Website: www.nass.usda.gov

There are 173,446 jobs on cotton farms in the USA (2005).

In 2005/06: 5,201 million kilograms of cotton harvested.

This is about 30,000 kilograms per worker per year.

Cotton price

Source: National Cotton Council of America. Website: www.cotton.org

Price in calendar year 2004: \$ 0.55 per Lb or \$ 1.21 per Kg

This is £ 0.66/ kilogram. This is assumed to exclude subsidies.

Cotton subsidies

Source: United States Department of Agriculture. National Agricultural Statistics Service, Crop values 2004 Summary (February 2005).

5.1 billion kilograms of cotton produced in 2004/ 2005

Other source: Environmental Working Group's Farm Subsidy Database. Website: www.ewg.org

Subsidies in 2004: \$ 1,649,366,720

Subsidies per kg: \$ 0.326 or £ 0.179

Cotton spinning

Productivity

Source: US Census Bureau. Website: www.census.gov

USA employment in fibre, yarn and thread mills, 2005: 54,000 employees

Spun cotton yarn production USA: 1.36 billion kilograms

Assuming all yarns produced are cotton yarns, production per employee is 25,000 kilograms.

Cotton yarn prices

Source: US Census Bureau, Yarn production: 2004, Issued May 2005

Export price of cotton yarn, estimate: \$ 3.15 / kilogram, so £ 1.96 / kilogram

Knitting fabric

Productivity

Source: Meenu Tewari (2005) Post-MFA adjustments in India's Textile and Apparel Industry: Emerging issues and trends. See table on page 27, which is based on: Khanna (1993): The challenge of Global Competition in the 1990s. ICRIER Memo.

For T-shirt production China is 1.53 times more productive than India. Namely, production per worker per day in China is 15.3 T-shirts as opposed to 10 T-shirts per worker per day in India.

India productivity: 15,000 kilograms of cloth per worker per year.

China productivity: 15,000 kilograms * 1.53 = 23,000 Kilograms per worker per year

Fabric prices

Source: Manufacturers' websites showing China imports. See <http://china.org.cn>; www.cotton.org

Other source: Leading UK retailer designer estimate; yarn price is 50% of fabric price.

Estimate price per kilogram: £ 3.92.

Cutting and sewing

Productivity

Source: Meenu Tewari (2005) Post-MFA adjustments in India's Textile and Apparel Industry: Emerging issues and trends. P. 27: Source: Khanna, 1993, The challenge of Global Competition in the 1990s. ICRIER Memo.

In 1994, productivity in T-shirt production was 13.96 pieces per worker per day. This is assumed to have grown 10% higher, which comes down to 15 per worker per day. Assumed: 50 work weeks of 6 days each a year. Productivity in cutting and sewing, China: $15 * 50 * 6 = 4,500$ pieces per worker per year.

Finished garment price

Source: Manufacturers' websites investigated. Website: www.emergingtextiles.com

Other source: Leading UK retailer's designer estimate (based on manufacturing cost in Egypt):

Fabric price is estimated to be 50% of finished garment price. Garment price is: £ 7.84 per kilogram, or £ 1.96 per T-shirt.

Wholesale

Wholesale price

Source: Several fabric prices compared. Website: www.emergingtextiles.com

Other source: Leading UK retailer's designer estimate

The wholesale price of a T-shirt is around 40% of the retail price. The finished garment price is around 70% of the wholesale price. Price estimate: Wholesale price is estimated to be £ 10.60 per kilogram or £ 2.65 per T-shirt.

Retail

Productivity and retail garment price

Source: Leading UK retailer company data.

Sales: £ 8 billion. Number of employees: 64,000. Our assumed price of a T-shirt: £ 7 per T-shirt.

$\text{£ 8 billion} / 64,000 \text{ employees} / \text{£ 7} = 17,582 \text{ pieces sold per worker per year.}$

Blouse - Base case

Country data		India	UK
Working day (hours/day)		8.00	8.00
Working week (days/week)		6	5
Working year (weeks/year)		50	44
Working year (hours/year)		2,400	1,760
Wage (£/hour)			9.38
Wage (£/year, paid 52 weeks, 40 hours)			16,500

Product data			
Number blouses sold in UK		3.3E+07	
	weight/ Blouse (kg)	total weight (*'000 tons)	
Weight of viscose yarn/ fibres	0.230	7	
Weight of viscose yarn	0.230	7	
Weight of viscose fabric	0.230	7	
Weight of finished blouse	0.200	7	

Product account		kg/man- year	pieces/man- year	£/kg	£/Blouse	£million/UK demand	total workers	UK wages (£million)
Viscose yarn production		18,000		3.04	0.70	23	415	
Selling price of viscose yarn				3.04	0.70	23		
Cost of weaving		15,000		3.70	0.85	28	498	
Price of woven fabric				6.74	1.55	50		
Cost of cutting and sewing			3,500	7.22	1.66	54	9,286	
Price of finished garment				13.96	3.21	104		
"Distribution"						3.79	123	
Wholesale price to retailer					7.00	228		
Cost + profit of retailer					15.00	488		
Price to consumer			17,582		22.00	715	1,848	30

National accounts		India	UK
Total Output		177	943
Intermediate consumption		73	332
Subsidies			
Gross National Income		104	611
Total employment		10,199	1,848
Total UK exports			0
Total UK imports			104
UK Balance of Trade			-104
UK wage bill			30
UK Operating surplus			580

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the above table:

Viscose yarn production

Productivity

Source: The National Textile Corporation Limited (NTC) Annual Report 2004/05 Chapter XII Public Sector Undertakings.

In this company 31,042 people are on payroll. 500 million kilograms of yarn, and 225 million meters of cloth assumed to weigh 45 million kilograms are produced. Ratio yarn to cloth production is 9:1. According to this ratio and based on 31,000 workers, 3,100 employees are assumed to work in cloth production, whereas 27,900 work in yarn production.

One worker produces about 500 million kilograms/ 27,900 workers= 18,000 kilograms of yarn per year.

Price of viscose yarn

Source: Wholesalers and prices of viscose investigated at www.fibre2fashion.com; www.emergingtextiles.com

Price for yarn estimated at £3.04 per kilogram or £ 0.70 per blouse.

Weaving

Productivity

Source: The National Textile Corporation Limited (NTC) Annual Report 2004/05 Chapter XII Public Sector Undertakings.

As before, 45 million kilograms of cloth are produced by 3,100 people, coming down to 45 million kilograms/ 3,100 workers = 15,000 kilograms of cloth produced per worker per year.

Cost of woven fabric

Source: Wholesaler websites like www.dharmatrading.com; www.manhattanfabrics.com

Other source: Assumptions cotton T-shirt. Yarn price is assumed to be 50% of the fabric price.

Price for fabric estimated at £ 6.74 per kilogram or £ 1.55 per blouse.

Cutting and sewing

Productivity

Source: Meenu Tewari (2005) Post-MFA adjustments in India's Textile and Apparel Industry: Emerging issues and trends. P. 27: Source: Khanna, 1993, The challenge of Global Competition in the 1990s ICRIER Memo.

In 1994, productivity was 10.15 blouses produced per worker per day. We assume that currently productivity has gone up by 10%, which is rounded to that one worker produces 11.5 blouses per day. Assumed: 50 work weeks of 6 days each a year. One worker in India produces:

$11.5 * 6 * 50 \approx 3,500$ blouses per year

Cost of cutting and sewing

Source: wholesaler websites. www.globalsourcing.com; www.birlaviscose.com;
www.whaleys-bradford.ltd.uk

Other source: T-shirt assumption, price of fabric is about 50% of the finished garment price.

Fabric is about £3.21 for one blouse, which is: $(1,000/230) * £3.21 = £ 13.96$ per kilogram.

Wholesale

Price

Source: estimate of a leading UK retailer.

The finished garment price is assumed to be 50 per cent of the wholesale price, and the wholesale price is assumed to be 30% of the retail price. Estimate for wholesale: £ 35 per kilogram or £7 per blouse.

Retail

Productivity and retail garment price

Productivity: same productivity assumed as in T-shirt case.

The profit margin for a blouse is assumed to be higher than for a plain white T-shirt since it is a fashionable item than can be 'up-sold' as opposed to a basic T-shirt. Estimate of a leading UK retailer's typical viscose blouse: £ 22.

Carpet - Base case

Country data	USA	UK
Working day (hours/day)	8.00	8.00
Working week (days/week)	5	5
Working year (weeks/year)	44	44
Working year (hours/year)	1,760	1,760
Wage (£/hour)		9.38
Wage (£/year, paid 52 weeks, 40 hours)		16,500

Product data	
Number of m2 sold in UK	8.5E+06

	weight/ carpet (kg)	total weight (‘000 tons)
Components		
Weight of polypropylene yarn/ fibres	0.160	1
Weight of polyamide yarn	1.386	12
Weight of ground limestone	1.196	10
Weight of styrene butadiene rubber	0.484	4
Backings and pile production of carpet		
Weight of secondary backing	1.400	12
Weight of primary backing	0.133	1
Weight of pile	1.100	9
Weight of finished carpet	2.633	22

Product account	kg/man- year	pieces (1 m2)/man- year	£/kg	£/Carpet	Emillion/UK demand	total workers	UK wages (Emillion)
Primary backing							
Polypropylene yarn production	170,000		0.55	0.09	0.750	8	
Cost of production primary backing-polypropylene yarn			0.44	0.06	0.500		
Price of primary backing - woven polypropylene		146,667	1.10	0.15	1.250	58	
Secondary Backing							
Ground Limestone production	1,500,000		0.01	0.02	0.143	3	
Styrene Butadiene Rubber production	60,000		0.82	0.40	3.391	7	
Cost of production secondary backing-SBR and limestone			0.30	0.41	3.535		
Price of secondary backing - SBR 400 and 1000 limestone		146,667	0.59	0.83	7.069	58	
Carpet Pile							
Polyamide yarn production	280,000		4.26	5.90	50.455	42	
Cost of production pile (tufting)		146,667	3.15	3.47	29.632	58	
Price of pile-polyamide			8.52	9.37	80.087		
Price of finished carpet			3.93	10.35	88.407		
"Distribution"			2.91	7.65	65.410		
Wholesale price to retailer			6.84	18.00	153.817		
Cost + profit of retailer			4.56	12.00	102.545		
Price to consumer		17,582	11.39	30.00	256.362	486	11.06

National accounts	USA	UK
Total Output	51	502
Intermediate consumption		297
Subsidies		
Gross National Income	51	205
Total employment	50	670
Total UK exports		0
Total UK imports		51
UK Balance of Trade		-51
UK wage bill		11
UK Operating surplus		194

(Units of national accounts are Emillion)

Here are some relevant supporting comments on the calculation in the table:

Materials

Polypropylene productivity

Source: US Department of Labor: Bureau of Labor Statistics. Chemical manufacturing, except pharmaceutical and medicine manufacturing. Website: www.bls.gov

Yearly propylene production: 15,345 metric tonnes.

Total propylene workers: 89,415 people.

Production per employee per year:

15,345 metric tonnes / 89,415 employees = 170,000 kilograms per employee per year.

Polypropylene price

Source: www.yarnsandfibres.com; British Plastic & Rubber On-line.

Website: www.polymer-age.co.uk

Yarn and fibre prices checked. Estimate; polypropylene yarn for the carpet: £ 0.55 per kilogram.

Styrene Butadiene Rubber productivity

Source: Synthetic Rubber Manufacturing: 2002, Economic Census 2000. Manufacturing, Industry Series, Issued January 2005. Website: www.census.gov

Styrene-Butadiene production in 2002: 403,750 tonnes.

Total workers: 6,395 people.

Production per employee per year:

403,750 tonnes/ 6,395 workers = 60,000 kilograms produced per employee per year rounded.

Styrene Butadiene Rubber price

Source: Crisil, Indian company in finance and advice. CRIS INFAC Analysis, July 08, 2004
Website: www.crisil.com

Source: K.G Kumar (December 23, 2004) Rubber Bands. In: The Hindu Business Line. Website: www.thehindubusinessline.com

Price estimate: £ 0.82 per kilogram.

Polyamide (nylon) productivity

Source: News article New York Times "Monsanto to cut nylon production". Reuters. Published 1981
Website: www.nytimes.com

Production cut: 56,700,000 kilograms of nylon.

Number of workers affected: 200 people.

Productivity per employee per year:

56.7 metric tonnes/ 200 people = 280,000 kilograms produced per employee per year (rounded).

Polyamide price

Source: www.yarnsandfibers.com; www.dailyexcelsior.com; www.polymer-age.co.uk

Price estimate: £ 4.686 per kilogram.

Limestone productivity

Source: National Statistics (www.statistics.gov.uk) Mineral Extraction in Great Britain. Business Monitor PA1007. 2003. London: TSO

Limestone extraction in GB: 7,807 metric tonnes.

Employment in limestone (GB, 2003): 5,508 people.

Productivity per employee per year:

$7,807 \text{ metric tonnes} / 5,508 \text{ people} = 1,500 \text{ tonnes per employee per year (rounded)}$.

Limestone price

Source: Department of Agriculture and Rural Development. Search for data on limestone production and prices. Website: www.dardni.gov.uk

Estimate for limestone price: £ 14 per tonne or £ 0.014 per kilogram.

Carpet tufting

Productivity

Source: International Labour Encyclopaedia. Carpets and Rugs. The Carpet and Rug Institute. Website: www.ilo.org

A carpet tufting machine can produce 1,000-2,000 m² per day (in 8 hours).

Per 24 hours that is 3,000-6,000 m². Machines are assumed to work 350 days per year.

This adds up to 1.05 million m² to 2.1 million m² of carpet per year.

A polyamide carpet is assumed to be tufted at high speed, 6,000m² per day, so 2.1 million m² per year.

For 8,545,385 m² we need:

$8.545 \text{ million m}^2 / 2.1 \text{ million m}^2 = 4.07 \text{ machines}$.

Total machine hours needed per year: $350 * 24 * 4.07 = 34,181.54 \text{ hours}$.

2 people are assumed to be needed for one machine. Ratio machine to worker: 1:2 or 0.33.

$34,181.54 / 1,760 / 0.33 = 58.26$ people are needed for carpet tufting yearly.

They produce on average:

$8.545 \text{ million m}^2 / 58.26 = 146,667 \text{ m}^2 \text{ per worker per year}$.

Price

The price of tufted polyamide pile for the carpet is assumed to be twice the price of polyamide.

So: $£ 4.26 * 2 = £ 8.52 \text{ per kilogram}$.

Primary backing

Productivity

Same productivity assumed as carpet tufting: 146,667 m² per worker per year.

Price

The price of woven polypropylene for the carpet is assumed to be twice the price of polypropylene.

So: £ 0.55*2 = £ 1.10 per kilogram.

Secondary backing

Productivity

Same productivity assumed as carpet tufting: 146,667 m² per worker per year.

Price

The price of latex for the carpet is assumed to be twice the price of SBR and limestone.

So: (£ 0.014+ £0.82) = £ 0.83 per carpet or £0.59 per kilogram.

Wholesale

Price

The wholesale price is assumed to be 60 per cent of the retail price (lower profit margin for the retailer than for garments assumed). So $30 \times 0.6 = £ 18$ per carpet or £6.84 per kilogram.

Retail

Productivity and retail price

Productivity: same productivity assumed as in T-shirt case.

Price

Source: Several retailers and wholesalers compared to make an estimate for the wholesale and retail price. Websites: www.carpetinfo.co.uk; www.georgiacarpet.com; www.globalsources.com; <http://www.cholleton.com>

Estimate: retail price is £30 per m² or £11.39 per kilogram.

Economic and social analysis - scenarios

T-shirt- Theme “Location of clothing and textiles production”

Scenario 1 “Changed location”

Product account:	kg/man-year	pieces/man-year	£/kg	£/T-shirt	Emillion/UK demand	total workers	UK wages (£million)
Cotton crop production	30,000		0.84	0.28	127	5,031	
US Govt subsidy			0.18	0.06	27		
Selling price of cotton			0.66	0.22	100		
Cost of spinning	25,000		1.01	0.33	152	5,134	
Price of cotton yarn			1.96	0.55	252		
Cost of knitting	16,867		1.9 + x	0.53 + x	244	7,609	
Price of knitted fabric			3.92	1.08	496		
Cost of cutting and sewing		3,300	3.2 + x	0.88 + x	405	139,394	
Price of finished garment			7.84	1.96	902		
"Distribution"				0.69	317		
Wholesale price to retailer				2.65	1,219		
Cost + profit of retailer		17,582		4.35	2,001	26,163	2,857
Price to consumer				7.00	3,220		

National accounts	US	China	UK
Total Output	378	0	5,837
Intermediate consumption	100	0	2,868
Subsidies	27	0	
Gross National Income	252	0	2,968
Total employment	10,165	0	173,166
Total UK exports			0
Total UK imports			252
UK Balance of Trade			-252
UK wage bill			2,857
UK Operating surplus			111

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the above table:

Cost of knitting, cutting, and sewing

When production shifts from China to the UK, production costs would go up, production in the UK being more expensive than in China. We do not know the exact cost add-up. Hence, the table shows a cost add-up of + x.

Productivity in knitting, cutting, and sewing

Working years in China consist of 2,400 hours whereas working weeks in the UK are 1,760 hours. Therefore productivity per year goes down to:

$23,000 * (1,760/2,400) = 16,867$ kilograms of fabric per worker per year.

$4,500 * (1,760/2,400) = 3,300$ kilograms of finished garment per worker per year.

Product account	kg/man- year	pieces/man- year	£/kg	£/Blouse	£million/UK demand	total workers	UK wages (£million)
Viscose yarn production	13,200		3.04 + x	0.7 + x	23	566	
Price of viscose yarn			3.04	0.70	23		
Cost of weaving	11,000		3.70 + x	0.85 + x	28	680	
Price of woven fabric			6.74	1.55	50		
Cost of cutting and sewing		2,567	7.22 + x	1.66 + x	54	12,662	
Price of finished garment			13.96	3.21	104		
"Distribution"					3.79		
Wholesale price to retailer				7.00	228		
Cost + profit of retailer				15.00	488		
Price to consumer		17,582		22.00	715	1,848	260

National accounts	India	UK
Total Output	0	1,120
Intermediate consumption	0	405
Subsidies		
Gross National Income	0	715
Total employment	0	15,757
Total UK exports		0
Total UK imports		0
UK Balance of Trade		0
UK wage bill		260
UK Operating surplus		455

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the above table:

Cost of yarn production, weaving, cutting, and sewing

When production shifts from India to the UK, production costs would go up, production in the UK being more expensive than in India. We do not know the exact cost add-up. Hence, the table shows a cost add-up of + x.

Productivity in yarn production, weaving, cutting, and sewing

Working years in India consist of 2,400 hours, whereas working weeks in the UK are 1,760 hours. Therefore productivity per year goes down to:

$$18,000 * (1,760/2,400) = 13,200 \text{ kilograms of yarn per worker per year}$$

$$15,000 * (1,760/2,400) = 11,000 \text{ kilograms of fabric per worker per year}$$

$$3,500 * (1,760/2,400) = 2,567 \text{ kilograms of finished garment per worker per year}$$

T-shirt Theme “Location of clothing and textiles production”

Scenario 2 “Changed location with new production technology”

Product data

Number T-shirts sold in UK	4.6E+08	
	weight/ T-shirt (kg)	total weight ('000 tons)
Weight of cotton crop	0.301	138
Weight of cotton yarn	0.256	118
Weight of cotton fabric	0.250	115
Weight of finished T-shirt	0.250	115

Product account

	kg/man-year	pieces/man-year	£/kg	£/T-shirt	Emillion/UK demand	total workers	UK wages (Emillion)
Cotton crop production	30,000		0.84	0.25	116	4,615	
US Govt subsidy			0.18	0.05	25		
Selling price of cotton			0.66	0.20	92		
Cost of spinning	25,000		1.01	0.30	139	4,710	
Price of cotton yarn			1.96	0.50	231		
Cost of 3D knitting		458,333	1.31	0.33	150	1,004	
Price of knitted fabric			x	x	x		
Cost of cutting and sewing			x	x	x		
Price of finished garment			7.84	0.83	381		
"Distribution"				0.69	317		
Wholesale price to retailer				1.52	699		
Cost + profit of retailer		17,582		5.48	2,521	26,163	448
Price to consumer				7.00	3,220		

National accounts

	US	China	UK
Total Output	347	0	4,300
Intermediate consumption	92	0	1,311
Subsidies	25	0	
Gross National Income	231	0	2,989
Total employment	9,326	0	27,166
Total UK exports			0
Total UK imports			231
UK Balance of Trade			-231
UK wage bill			448
UK Operating surplus			2,541

(Units of national accounts are Emillion)

Here are some relevant supporting comments on the calculation in the above table:

3D knitting

Productivity

3D knitting machine: 1,250 men's briefs produced per machine per day (Source: Santoni data)

Machines are assumed to produce 350 days a year (International Production Cost Comparison 2003, International Textile Manufacturers Federation; ITMF)

Assumed: 5 machines are controlled by 1 person at the same time.

$350 * 1,250 = 437,500$ T-shirts produced per machine per year.

$460 \text{ million} / 437,500 = 1,051.4$ machines needed per year.

1 machine makes $350 * 24 = 8,400$ hours per year.

All machines required make $8,400 * 1,051.41 = 8,832,000$ hours per year.

$8,832,000 / 1,760 / 5 = 1,004$ people are needed for T-shirt production in the UK.

Cost

Machines required: 1,051.

1 Machine is assumed to cost £ 100,000 a year. Cost of capital assumed 20%, so 20,000.

Cost of 1,051 machines required: $1,051 * £ 20,000 = £ 21,020,000$.

Cost of employee per year: £ 16,500.

Cost of 1,004 employees per year: $£ 16,500 * 1,004 = £ 16,560,000$.

Total capital and labour costs: £21.02 million + £ 1.56 million = £ 37.58 million.

Costs add up assumed: $37.58 * 2 = £ 75.16$ million.

Per T-shirt this is: $(75.16 \text{ million} / 460 \text{ million}) = 0.163$. Actual costs are estimated at: $0.163 * 2 = £ 0.33$ rounded.

T-shirt - Theme “Location of clothing and textiles production”

Scenario 3 “Changed location, new production technology and recycling”

Product data

Number T-shirts sold in UK	4.6E+08	
	weight/ T-shirt (kg)	total weight ('000 tons)
Weight of cotton crop	0.154	71
Weight of virgin fibres	0.131	60
Weight of recycled fibres	0.125	58
Weight of total yarn	0.253	116
Weight of cotton fabric	0.250	115
Weight of finished T-shirt	0.250	115

Product account

	kg/man-year	pieces/man-year	£/kg	£/T-shirt	£million/UK demand	total workers	UK wages (£million)
Cotton crop production	30,000		0.84	0.13	60	2,361	
US Govt subsidy			0.18	0.03	13		
Selling price of cotton			0.66	0.10	46		
Selling price of recycled fibres			0.55	0.07	32	215	
Cost of spinning 'Eco-yarn'	25,000		2.01	0.51	234	4,655	
Price of Eco-cotton yarn			2.68	0.68	312		
Cost of 3D knitting		458,333	1.31	0.33	150	1,004	
Price of knitted fabric			x	x	x		
Cost of cutting and sewing			x	x	x		
Price of finished garment			4.02	1.01	463		
"Distribution"				0.69	317		
Wholesale price to retailer				1.70	780		
Cost + profit of retailer		17,582		5.30	2,440	26,163	529
Price to consumer				7.00	3,220		

National accounts

	US	China	UK
Total Output	60	0	4,807
Intermediate consumption	0	0	1,633
Subsidies	13	0	0
Gross National Income	47	0	3,174
Total employment	2,361	0	32,036
Total UK exports			0
Total UK imports			46
UK Balance of Trade			-46
UK wage bill			529
UK Operating surplus			2,645

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the above table:

Cotton eco yarn spinning

Productivity

Total number of employees involved in the recycling business is derived from the number of people working in the 3D knitting business.

Calculation: $1,004 * £ 0.07 / £ 0.33 = 215$ employees.

Selling price of recycled fibres

Source: USA website for second hand clothing bales sales: www.abclosetouts.com

Prices are from about 1 USD per kilogram, which equals £ 0.55 per kilogram.

Cost of spinning eco-yarn

Spinning eco-yarn is assumed to be a more complicated and slower process than spinning regular cotton yarn; 50% of the yarn consists of recycled fibres, which are often shorter and vary more in quality than virgin fibres.

Spinning costs are assumed to be twice as high as regular spinning: $\pounds 1.006 \times 2 = \pounds 2.01$.

Blouse - Theme “Changes in consumer behaviour”

Scenario 1 “Extending the life of clothing” – “Second-hand clothing”

Product data								
Number Blouses sold in UK		2.6E+07						
Number of second hand blouses in UK		6.5E+06						
		weight/ Blouse (kg)	total weight ('000 tons)					
Weight of viscose yarn/ fibres		0.230	6					
Weight of viscose yarn		0.230	6					
Weight of viscose fabric		0.230	6					
Weight of finished blouse		0.200	5					
Weight of finished blouse - second hand		0.200	1					
Product account								
		kg/man- year	pieces/man- year	£/kg	£/Blouse	£million/UK demand	total workers	UK wages (£million)
Viscose yarn production		18,000		3.04	0.70	18	332	
Selling price of viscose yarn				3.04	0.70	18		
Cost of weaving		15,000		3.70	0.85	22	399	
Price of woven fabric				6.74	1.55	40		
Cost of cutting and sewing			3,500	7.22	1.66	43	7,429	
Price of finished garment				13.96	3.21	83		
"Distribution"					3.79	99		
Wholesale price to retailer					7.00	182		
Cost + profit of retailer					15.00	390		
Price to consumer			17,582		22.00	572	1,479	
Price to consumer- second hand sale			17,582		2.00	13	370	30
National accounts								
		India	UK					
Total Output		142	767					
Intermediate consumption		58	265					
Subsidies								
Gross National Income		83	502					
Total employment		8,159	1,848					
Total UK exports			0					
Total UK imports			83					
UK Balance of Trade			-83					
UK wage bill			30					
UK Operating surplus			471					

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the above table:

Number of (second hand) blouses sold in UK

In this scenario the assumption is that UK demand for blouses drops by 20% because people buy more second hand clothing. 26 million (80% of 32.5 million) regular blouses are sold, whereas 6.5 second hand blouses are sold (20% of 32.5 million). The weight of second hand blouses is 200 grams.

Second hand price and sale

Source: used-clothes-sale.vivastreet.co.uk; www.abclosetouts.com

Estimate made from sources: a second hand viscose blouse can be bought for about £2 per piece.

Productivity in second hand sale is set equal to retail productivity:

17,582 pieces sold per employee per year.

T-shirt - Theme “Changes in consumer behaviour”

Scenario 2 “Best practice in cleaning clothes”

The economic impact for this best practice scenario is equal to the base case. However, for consumers there are economic advantages on a micro scale. These are described in the text of the report, but there is no economic scenario analysis executed for this scenario.

T-shirt – Theme “New products and material selection”

Scenario 2 “Green manufacturing” “Organic cotton instead of conventional”

Product account	kg/man-year	pieces/man-year	£/kg	£/T-shirt	Emillion/UK demand	total workers	UK wages (Emillion)
Cotton crop production	30,000		1.33	0.44	201	5,031	
US Govt subsidy			0.18	0.06	27		
Selling price of cotton			1.15	0.38	174		
Cost of spinning	25,000		1.01	0.33	152	5,134	
Price of cotton yarn			2.54	0.71	326		
Cost of knitting	23,000		1.90	0.53	244	5,580	
Price of knitted fabric			3.92	1.24	570		
Cost of cutting and sewing		4,500	3.20	0.88	405	102,222	
Price of finished garment			7.84	2.12	974		
“Distribution”				0.69	317		
Wholesale price to retailer				2.81	1,292		
Cost + profit of retailer				4.19	1,928		
Price to consumer		17,582		7.00	3,220	26,163	432
National accounts	US	China	UK				
Total Output	527	1,544	4,512				
Intermediate consumption	174	895	2,266				
Subsidies	27						
Gross National Income	326	649	2,246				
Total employment	10,165	107,802	26,163				
Total UK exports			0				
Total UK imports			974				
UK Balance of Trade			-974				
UK wage bill			432				
UK Operating surplus			1,814				

(Units of national accounts are Emillion)

Here are some relevant supporting comments on the calculation in the above table:

Cotton crop production

Selling price of cotton

Source: Organic Trade Association: The 2005 cotton survey. Website: www.ota.com

Price of organic cotton is around 3.25 US dollars per kilogram, which is £1.33 per kilogram.

The spinning costs stay the same, but due to the increase in the fibre price, the cost of yarn and knitted fabric, and the finished garment and wholesale price go up.

Carpet - Theme “New products and material selection”

Scenario 1 “Alternative fibres” – “Wool face fibres in stead of polyamide for the carpet”

Product data									
Number of m2 sold in UK		8.5E+06							
		weight/ carpet (kg)	total weight ('000 tons)						
Components									
Weight of polypropylene yarn/ fibres		0.144	1						
Weight of washed wool		1.330	11						
Weight of woollen yarn		1.200	10						
Weight of ground limestone		1.315	11						
Weight of styrene butadiene rubber		0.520	4						
Backings and pile production of carpet									
Weight of secondary backing		1.530	13						
Weight of primary backing		0.120	1						
Weight of pile		0.950	8						
Weight of finished carpet		2.600	22						
Product account									
		kg/man- year m2)	pieces (1 /man-year	£/kg	£/Carpet	Emillion/UK demand	total workers	UK wages (Emillion)	
Primary backing									
Polypropylene yarn production		170,000		0.55	0.08	0.677	7		
Cost of production primary backing-polypropylene yarn				0.44	0.05	0.451			
Price of primary backing - woven polypropylene			73,333	1.10	0.13	1.128	117		
Secondary Backing									
Ground Limestone production		1,500,000		0.01	0.02	0.157	7		
Styrene Butadiene Rubber production		60,000		0.82	0.43	3.644	7		
Cost of production secondary backing-SBR and limestone				0.30	0.45	3.857			
Price of secondary backing - SBR 400 and 1000 limestone			73,333	0.59	0.90	7.658	117		
Carpet Pile									
Washed wool production		30,000		3.50	4.66	39.779	379		
Woollen yarn production		25,000		7.00	8.40	71.781	410		
Cost of production pile (tufting)			73,333	2.67	6.94	59.305	117		
Price of pile-wool				14.00	15.34	131.086			
Price of finished carpet				6.30	16.37	139.872			
"Distribution"				2.91	7.56				
Wholesale price to retailer				9.20	23.93	204.460			
Cost + profit of retailer				2.34	6.07				
Price to consumer			17,582	11.54	30.00	256.362	486	27	
National accounts									
Total Output		USA	UK						
Intermediate consumption		0.68	716						
Subsidies			460						
Gross National Income		0.68	256						
Total employment		7	1,640						
Total UK exports			0						
Total UK imports			0.68						
UK Balance of Trade			-0.68						
UK wage bill			27						
UK Operating surplus			229						

Here are some relevant supporting comments on the calculation in the above table:

Materials

Wool productivity

Same productivity assumed as cotton production:

30,000 kilograms per worker per year for washed wool production.

25,000 kilograms per worker per year for cotton yarn production.

Wool prices

Source: Reducing costs through waste management: The woollen sector. Environmental Technology Best Practice Program. GG79 Guide. 1997. Website: www.p2pays.org

Price assumption is £7 per kilogram for woollen yarn. Our estimate: £ 7 per kilogram.

The washed wool price is estimated to be half the woollen yarn price thus: £3.50 per kilogram.

Carpet pile

Productivity

See base case. However now we assume the slower production process, because woollen yarn breaks more easily. Production per machine is now 1.05 m² of carpet per year.

For 8,545,385 m² we need:

$8.545 \text{ million m}^2 / 1.05 \text{ million m}^2 = 8.14 \text{ machines.}$

Total machine hours needed per year: $350 * 24 * 8.14 = 68,363.08 \text{ hours}$

2 people are assumed to be needed for one machine. Ratio machine to worker: 1:2 or 0.33.

$68,363.08 / 1,760 / 0.33 = 116.53 \text{ people are needed for carpet tufting yearly.}$

Thus they produce on average:

$8.545 \text{ million m}^2 / 116.53 = 73,333 \text{ m}^2 \text{ per worker per year.}$

Price

The price of tufted woollen pile for the carpet is assumed to be twice the price of wool.

So: $£ 7.5 * 2 = £ 15 \text{ per kilogram.}$

Primary and secondary backing

Productivity

For the primary and secondary backing the same productivity is assumed as for tufting: 73,333 m² per worker per year.

Cost of production- pile

Source: Stakeholder feedback

Production of a woollen carpet is assumed to be more expensive than producing a polyamide

The cost of tufting woollen pile is assumed to be twice as high as tufting polyamide pile.

So: $£3.47 * 2 = £ 6.94 \text{ per carpet.}$

T-shirt - Theme “New products and material selection”

Scenario 3 “Smart functions” – “Nanotechnology - stain resistant coating”

Product account	kg/man-year	pieces/man-year	£/kg	£/T-shirt	Emillion/UK demand	total workers	UK wages (Emillion)
Cotton crop production	30,000		0.84	0.28	127	5,031	
US Govt subsidy			0.18	0.06	27		
Selling price of cotton			0.66	0.22	100		
Cost of spinning	25,000		1.01	0.33	152	5,134	
Price of cotton yarn			1.96	0.55	252		
Cost of knitting	23,000		1.90	0.53	244	5,580	
Price of knitted fabric			3.92	1.08	496		
Cost of cutting, sewing and nano-finish		4,500	6.40	1.76	810	102,222	
Price of finished garment			7.84	2.84	1,305		
"Distribution"				0.69	317		
Wholesale price to retailer				3.53	1,623		
Cost + profit of retailer				3.47	1,597		
Price to consumer		17,582		7.00	3,220	26,163	432
National accounts	US	China	UK				
Total Output	379	1,801	4,843				
Intermediate consumption	100	747	2,928				
Subsidies	27						
Gross National Income	252	1,053	1,915				
Total employment	10,165	107,802	26,163				
Total UK exports			0				
Total UK imports			1,305				
UK Balance of Trade			-1,305				
UK wage bill			432				
UK Operating surplus			1,483				

(Units of national accounts are Emillion)

Cost of cutting, sewing, and nano-finish

Nano-finish

In this case the T-shirt will be treated with a nano-coating. So after the fabric is cut and sewn into a T-shirt a nano-coating will be applied. This is assumed to double the original cost of cutting and sewing. $3.2 * 2 = £ 6.4$. The price of the finished garment and the wholesale price will go up as well.

Carpet- Theme “New products and material selection”

Scenario 3 “Smart functions” “Nanotechnology – Extend life time of carpet”

Product data		4.3E+06					
Number of m2 sold in UK							
	weight/ carpet (kg)	total weight (‘000 tons)					
Components							
Weight of polypropylene yarn/ fibres	0.160	1					
Weight of polyamide yarn	1.386	6					
Weight of ground limestone	1.196	5					
Weight of styrene butadiene rubber	0.484	2					
Backings and pile production of carpet							
Weight of secondary backing	1.400	6					
Weight of primary backing	0.133	1					
Weight of pile	1.100	5					
Weight of finished carpet	2.633	11					
Product account							
	kg/man-year	pieces (1 m2)/man- year	£/kg	£/Carpet	£million/UK demand	total workers	UK wages (£million)
Primary backing							
Polypropylene yarn production	170,000		0.55	0.09	0.375	4	
Cost of production primary backing- polypropylene yarn			0.44	0.06	0.250		
Price of primary backing - woven polypropylene		146,667	1.10	0.15	0.625	29	
Secondary Backing							
Ground Limestone production	1,500,000		0.01	0.02	0.072	3	
Styrene Butadiene Rubber production	60,000		0.82	0.40	1.696	3	
Cost of production secondary backing-SBR and limestone			0.30	0.41	1.767		
Price of secondary backing - SBR 400 and 1000 limestone		146,667	0.59	0.83	3.535	29	
Carpet Pile							
Polyamide yarn production- Add nano finish	280,000		8.52	11.81	50.455	21	
Cost of production pile (tufting)		146,667	3.15	3.47	14.805	29	
Price of pile-polyamide			17.04	15.27	65.260		
Price of finished carpet			6.17	16.25	69.420		
“Distribution”			2.91	7.65	32.704		
Wholesale price to retailer			9.08	23.90	102.123		
Cost + profit of retailer			2.32	6.10	26.059		
Price to consumer		17,582	11.39	30.00	128.182	243	5.56
National accounts							
	USA	UK					
Total Output	51	301					
Intermediate consumption		224					
Subsidies							
Gross National Income	51	77					
Total employment	25	337					
Total UK exports		0					
Total UK imports		51					
UK Balance of Trade		-51					
UK wage bill		6					
UK Operating surplus		72					

(Units of national accounts are £million)

Here are some relevant supporting comments on the calculation in the above table:

Number of m² sold in the UK

The demand for carpets drops by 50 per cent, because the nano-application increases the carpet lifetime from 10 years to 20 years.

Polyamide yarn production

The ‘nano-finish’ is applied at the polyamide yarn production stage. Cost for polyamide production therefore is assumed to double: £ 4.26*2= £ 8.52.

Price of pile

The price of pile for the carpet is assumed to be twice as high as the price of polyamide with nano-application. So: £ 8.52*2 = £ 17.04 per kilogram or £ 15.27 per carpet.