Public procurement of remanufactured products

An examination of the potential for increasing the use of remanufactured products by local authorities in the North East of England

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2 Background

2.1 North East Improvement and Efficiency Partnership

The North East Improvement and Efficiency Partnership (NEIEP) is comprised of twelve regional local authorities and four Fire and Rescue Services. It was established to assist its members to:

- secure cashable efficiency and improvement objectives
- deliver Local Area Agreement outcomes
- develop effective partnership working
- promote collaborative activity
- develop innovative approaches to service delivery.

Included within the NEIEP's broader programme are work streams relating to carbon management and sustainable procurement. This project cuts across these areas and forms part of a low carbon procurement workstream. It has been commissioned with a view to identifying opportunities for NEIEP partners to reduce the carbon impacts associated with their procurement, reduce resource use (and the associated impacts), engage in strategic 'market making' and reduce costs.

2.2 Remanufacturing

Remanufacturing is the act of returning an end of life product to an as-new condition with a warranty equivalent to new. In essence, a remanufactured product should perform in the same way as an equivalent new product. There are three distinct advantages of remanufacturing, in that:

- the cost is lower than an equivalent new product
- it is environmentally preferable to purchasing new or recycling
- it is usually conducted more locally than new manufacture, while creating higher-skilled jobs.

There are remanufacturers in almost every industrial sector, whether original equipment manufacturers, contractors or independents. They thrive in sectors which have embraced 'servicization'[1] when they share a motive to increase

[1] Servicization is the substitution of goods by services: rather than buying a product, a customer buys the service that the product offers. A classic example of this practice is photocopier service contracts which pay-per-sheet, the consumer buys each piece of printed paper rather than a photocopier, toner and paper. Under such conditions, the burden of maximising the value of the equipment resides with the supplier, who will use remanufacturing to minimise capital costs.

product life, improve durability and enhance performance. The practice has developed for purely economic reasons but its benefits – economic, environmental and social, which can be significant and are still largely undervalued. The economic benefits mean that procurers can purchase remanufactured products (where available) at a lower cost whilst achieving the same function.

In addition to these costs savings, remanufacturing offers additional benefits such as:[2]

- It creates high skill, high value added jobs compared to other waste management practices.
- Levels of occupational safety and hygiene are higher than in the recycling and waste management industry.
- It is estimated to employ 50,000 people in the UK (about the same as the recycling industry), has a sales value of approximately £2.4bn and saves around 10m tonnes of CO_2e per year through displacement of virgin product.
- It is a re-use option, sitting near the top of the 'waste hierarchy'.
- It shows high levels of resource efficiency.
- It uses fewer resources and could be important in reducing our reliance on scarce materials, or materials where the supply is not certain.

Remanufacturing is most common where units have very high value or technological content, and least common where customers buy on the basis of status, fashion or lifestyle choice. In a previous report by the CRR[3], remanufacturing was identified as happening or possible in 19 out of the 42 top product groups identified as priority sectors for waste. Market failures inhibiting remanufacture include:

- poorly recognised benefits of remanufacturing to business / consumers
- benefits of servicization not recognised by purchasers or sellers
- no common 'service standard'
- withholding of information by OEMs
- energy costs for primary manufacture not correctly priced (carbon impacts)
- lack of intermediaries/return channels
- availability of problem-solving skill set (training).

[2] Remanufacturing in the UK: A snapshot of the UK remanufacturing industry, the Centre for Remanufacturing and Reuse, 2009

[3] Remanufacturing in the UK: A snapshot of the UK remanufacturing industry, CRR, 2009

2.3 About the CRR

The Centre for Remanufacturing & Reuse (CRR) is operated by Oakdene Hollins Ltd, a research and consulting organisation in sustainable products and services. The CRR was established in 2007 under Defra's BREW programme to deliver resource efficiency assistance in these areas to business, and to capitalise on Oakdene Hollins longstanding (since 1997) interest and consulting work in remanufacturing. The CRR was created in the recognition that although substantial resources were being directed into materials recycling, little or no support was being given to reuse activities such as remanufacturing, which are higher up the waste hierarchy and had the potential, in many cases, for much greater levels of resource efficiency or carbon savings. Having received direct funding of nearly £2m for its work for almost four years, the CRR is now self- and industry-funded. The CRR maintains its own brand, and gives consultancy support to government and industry as well as making its reports, links, news, tools and other resources freely available through its website www.remanufacturing.org.uk. It has had an important role in raising the profile of the activity in environmental policy, in sustainable procurement and within business.

2.4 Aims and outcomes

This document is informed by spend data provided by Durham County Council, supplemented by generic regional data provided by NEIEP. The outcomes of this report are to:

- identify products where remanufactured alternatives exist
- calculate the financial and environmental benefit of substituting a product with a remanufactured alternative
- recommend appropriate actions to enable purchasers to procure remanufactured products within the public sector.

The document is intended to provide guidance to local authorities as to where they might consider the use of remanufactured products. It is intended to be used to inform regional procurement policy and practice, both by individual regional local authorities and the North East Purchasing Organisation.

3 Methodology

This section briefly describes the methodology used to determine areas where remanufactured products could be substituted for new. Key to its success is identifying re-manufacturable products that are high spend areas for Local Authorities. To achieve this, Durham County Council kindly provided access to their procurement database for the financial year 2009/10. The provided data were grouped by product categories and provided detail on individual item spend. This enabled rapid identification of candidate product groups and also allowed screening of the individual orders. Using a mixture of industry knowledge, publicly available reports on remanufacturing and conversations with experts, we were able to identify a range of products bought by the Council that could be substituted by remanufactured alternatives

From this initial long list of products, we performed a rough screening of the total spend for Durham per product, and targeted five products for a more in-depth analysis. A brief industry analysis of these products was then performed to identify the potential carbon benefit and the expected cost saving a remanufactured product would provide over an equivalent new item. Indicative savings were determined through interviews with leading suppliers of remanufactured products who supplied estimated costs. These were generally provided as a percentage range, from which the most conservative value was chosen to manage the expectations and risk of procurers.

We also undertook a brief assessment of the remanufacturing market's ability to respond to a sudden increased demand for its products from a large procurer; whilst the public sector may wish to drive the market for more sustainable products it is evidently important to understand the ability of the market to respond and to develop procurement policies which account for potential lags in the system...

A series of recommendations was then made to enable procurers to purchase remanufactured goods.

4 Results

4.1 Short list identification

Durham provided a list of 717 spend categories from which 17 different product groups were provisionally selected as possible candidates where remanufacturing activity was known. Through analysis of secondary literature, the CRR's database of case studies and other reports and conversations with companies involved within the remanufacturing sector, a crude ranking system was developed to identify likely candidates for procurement targets. This was based upon:

- **Total spend.** It is important to identify which products are likely to have the largest cost impact on the Council.
- **Market readiness**. Although remanufacturing occurs for all the identified products, it is important to make an estimate on the total market size and its ability to cope with a potentially large increase in orders through public procurement.
- **Acceptance and ease of substitution**. This criterion relates to the ease with which a remanufactured product can replace an incumbent new product. This depends on the complexity associated with procurement, potential reservations by procurers and users and any contractual issues which would make a remanufactured product difficult to use.

Table 1: A list of candidate products and the selection criteria for further investigation

Product	Spend	Market readiness	Acceptance/ease of substitution	Total
Printer Cartridges	3	3	3	9
Office furniture	3	3	2	8
Vehicle maintenance	3†	3	2	8
Laptops and desktops	3	2	2	7
Servers	2	2	2	6
Photocopiers	1*	3	2	6
Vending machines	1	3	2	6
Franking machines	1	2	3	6
Other furniture	2	2	1	5
Air conditioning	1	2	2	5
Hand dryers	1	2	2	5
Construction plant	1*	2	2	5
School furniture	1*	1	2	4
Lawn mowers	1	1	2	4
Stair lifts	1	1	2	4
Building materials	1	1	1	3

* Data unavailable.
† Data aggregated for the region
Key: 3 = high or good, 1 = low or poor

Based on the results presented in Table 1, 'Printer cartridges', 'Office furniture', 'Laptops/desktop computers' and 'Vehicle maintenance' are candidates for substitution. Of the next four, only 'Servers' has a reasonable spend associated with it and is included in the analysis. There are high quality remanufactured options available for procurers of 'Vending machines' and 'Franking machines'; however, the spend within Durham Council is very low and they are therefore not included in the analysis. For the remaining product area, 'Photocopiers', the spend data are unavailable. However, it seems reasonable to assume that there will be significant activity because photocopiers will be used throughout offices, and they will therefore be included in the analysis.

4.2 Product analysis

This section examines the market and savings associated with procuring remanufactured products from one of the identified categories from Section 4.1.

4.2.1 Office furniture

Product description and remanufacturing market

Office furniture includes tables, chairs, pedestals and bookcases, the data provided by Durham are broken down into these product categories enabling a detailed analysis of each product type. Approximately 165,000 tonnes of office furniture are thrown away annually from British businesses. Some of this will be the result of wear and tear, but the majority is in perfect working order and its disposal is largely due to changes in fashion, variations in staff levels, or whole office moves. It has been estimated that over half of the office furniture sent to landfill each year is re-useable. This figure is likely to increase with current spending cuts reducing the number of desks and offices required by both central and local government.

Within the furniture industry, the term 'remanufacture' is not widely used; in general, 'refurbish' and 'reupholster' are more common. However, the quality of the product delivered can easily be classified as remanufactured. There are several voluntary and commercial organisations dedicated to the refurbishment of office furniture. These include Green-Works, a nationally based charity, commercial organisations such as Amaryllis Environmental Services and, interestingly, HM Prison Service, which all offer refurbished furniture for sale. We are aware that NEIEP has an interest in identifying opportunities for SMEs and the third sector in re-manufacturing and that some initial discussions have been held which have been informed by this report.

Currently most firms offer refurbishment as a service rather than explicitly sell remanufactured items, largely because there has not been, until recently, a large market for these products. This is changing but we would suggest that there is a need for further engagement with the furniture industry with a view to ensure products are more suited to remanufacture.

There are certain innovative products that are designed with life extension and remanufacture in mind, but these are typically premium products. The furniture industry is realising that there are opportunities in reuse and remanufacture, and appear to be waiting for the right stimulus to engage with customers on this issue.

This could be a consideration when making procurement tenders, enabling the engagement of industry.

Potential savings

Based on conversations with remanufacturers, under current market conditions, savings of between 25% and 50% can be made on each item of furniture. For this analysis, we will use the conservative figure of a 25% cost reduction through purchasing remanufactured furniture.

There are two available carbon footprints on office furniture reuse: an office desk and an office chair.

Previous work has shown that the carbon footprint of a desk is 146 $kgCO_2e$ for a single lifetime.[4] The vast majority of this value (92%) is associated with the production of the raw materials and original manufacture of the desk. The large impacts associated with the manufacturing phase, rather than use phase, means that there are substantial benefits to be gained through reuse. If a desk is reused rather than sent to waste, with minimal refurbishment the carbon savings can be as high as 35% over the course of two life spans. If a part such as the work surface is replaced, the savings can be still be as much as 20% if the life of the desk is extended.

If a typical office chair is examined, the carbon footprint is estimated to be 82 $kgCO_2e$ per chair; again the majority is associated with materials and manufacture. Reuse of a chair can save up to 45% of the carbon footprint over the course of two life spans.

There are virtually no carbon emissions associated with the use phase of furniture and therefore there is a clear benefit from remanufacturing.

Unfortunately, carbon data on pedestals and shelving are not readily available. An estimate based on an approximate weight of a pedestal can be made. The materials and construction of a pedestal are similar to that of a table, therefore a proportional change in weight (and materials) will give a good approximation on the possible carbon emission savings. It is more difficult to provide a robust figure for savings with shelving. The spend category encompasses a wide range of products from single shelves to book cases and cupboards. Assigning a single carbon benefit to this category, under these circumstances, is likely to be subject to a large degree of error; we therefore propose not to estimate the benefit for shelving.

From the results presented in Table 2, we estimate that Durham County Council could save £47,000 and 59 tonnes of CO_2 per year (based on current spend) through the procurement of remanufactured furniture. It is unlikely that this could

[4] Carbon Impact of Office Furniture Reuse, Adrian Chapman, CRR, 2010

be achieved immediately due to an underdeveloped market, but could be achievable within the medium term.

Table 2: Analysis of the spend on furniture and potential savings by procuring remanufactured alternatives.

Product	Number of Items	Spend (£)	£ savings	CO_2 savings (kg)
Chairs	409	49,880	12,470	15,092
Desks	265	55,433	13,858	35,510
Pedestals	187	20,050	5,013	8,353
Shelving	625	62,366	15,591	N/A
TOTAL	**1,486**	**187,730**	**46,932**	**58,955**

Proposed purchasing specification/way forward

In our view there is a dormant market for remanufactured office furniture. Until now, the lack of demand has suppressed development in the industry. It is likely that a strong market demand would see more entrants into furniture remanufacturing. With this slight uncertainty surrounding the ability of the market to supply the entire region, it is recommended that some pilot studies are held to assess the market capacity through the procurement of refurbished furniture (for example by explicitly specifying refurbished furniture as part of the invitation to tender). Alternatively, additional award points could be included within tenders for suppliers that offer refurbished furniture.

All refurbished furniture should comply with the relevant new health and safety standards on ergonomics and fire retardancy, even if they were originally manufactured before the introduction of the standard. Although a possible stumbling block, there is evidence that high quality remanufacturers are meeting this requirement as a matter of course.

The term ‘refurbished’ is more appropriate than ‘remanufacture’ because, within this industry, the latter is associated with altering the shape or purpose of the furniture. The specification of refurbished furniture should include a warranty that is equivalent to new.

4.2.2 Printer cartridges

Product description and remanufacturing market

Printer cartridges provide the ink to enable printing on both ink-jet and laser printers. The cartridges for these products are incompatible but there is significant remanufacturing activity for both types. Most office-based printers are based on toner technology, and will be the focus of this section.

In general the remanufacture of toner cartridges is performed by third party remanufacturers and they are sold in strong competition with the sale of new cartridges. The market for remanufactured cartridges is very well developed with several national and multinational companies supplying the UK market. There are several supply chains for remanufactured cartridges. A major route is through ‘own label’ sale for retailers and office suppliers. In the majority of cases the purchaser is unaware that the cartridge is remanufactured and is usually

purchasing on price. Remanufacturers also offer value-added services such as collection of spent cartridges and print management services to ensure that they have a regular supply of spent cartridges for remanufacturing. Based on the age and the capacity of the market, the risk of failure of supply of remanufactured cartridges is very low.

The process of remanufacturing is complex: the cartridges can contain over 100 moving parts, they are disassembled, cleaned, tested, reassembled, refilled, tested again and then repackaged for sale with the same guarantees and assurances that accompany new cartridges.

Potential savings

The cost differential between new and remanufactured printer cartridges ranges from 20% to 50%. We will use the conservative figure of 20% price difference between new and remanufactured cartridges for calculating the benefits.

A lifecycle assessment of toner cartridges has calculated the carbon footprint to be 4.4 kgCO_2e.[5] By comparison, the impact of a remanufactured toner cartridge excluding prior uses is 2.4 kgCO_2e or 55% of the impact new. Therefore there are significant savings to be made by cartridge reuse, assuming like-for-like performance. This study also found that toner cartridges could be remanufactured 3.5 times on average, increasing the benefits of this activity further.

If the printer cartridge produces similar performance to new, the carbon footprint in use of the remanufactured printer cartridge should be identical to new because the power consumption of the printer should not be affected.

Table 3: Cost and carbon savings from procuring remanufactured printer cartridges

Product	Number of Items	Spend (£)	£ savings	CO_2 savings (kg)
Cartridges	7510	467,000	93,400	15,020

As can be seen from the analysis in Table 3, Durham County Council can save £93,000 and 15 tonnes of CO_2 by procuring remanufactured cartridges.

Proposed purchasing specification/way forward

Remanufactured toner cartridges are a 'like for like' replacement for new. The market is well developed with many different suppliers from very small companies to multinationals working in this area. As with most remanufacturing sectors, there is currently no established method of determining high quality product. However, the use of 'own label' cartridges procured through reputable suppliers and retailers will minimise risk.

[5] The carbon footprint of remanufactured versus new mono-toner printer cartridges, Best Foot Forward for The CRR, 2006

Additional potential benefits (non financial) may be gained from donating used cartridges to local charitable organisations. Remanufacturers will sponsor charitable work in order to obtain the spent cartridges for remanufacture. Such systems, where they exist, could add to the local benefit of buying remanufactured cartridges. It may also be possible to achieve this through a direct relationship with a supplier and could potentially be part of the award criteria. Based on evidence from the marketplace, a specification can readily be made to include remanufactured printer cartridges.

N.B. It is important to make the distinction between 'remanufactured' and 'compatible' cartridges. Remanufactured cartridges have been remanufactured from new whereas compatible cartridges are copies of original cartridges. There is some concern over the legality of compatible cartridges because of copyright infringement and purchase of these cannot be recommended for procurers.

4.2.3 Laptops/desktops

Although the pace of technological change means that older laptops are usually unsuited for use within a modern office environment, the return channels for unwanted and warranty-returned products mean that laptops which are only one or two months old are being resold as remanufactured with a full manufacturer's warranty. Most major Original Equipment Manufacturers (OEM's) and suppliers offer remanufactured and refurbished products, meaning that there is a large and active market for the sale of remanufactured and refurbished laptops. There are also smaller independent companies that remarket laptops, but these are generally older models. The quality of the range of products on offer can vary greatly. This is largely dictated by age, with older products being of lower quality. Remanufacturing is generally only undertaken with newer products, hence procuring remanufactured products will still ensure that high-quality products are being sourced. The industry recognises that there is customer confusion within this area and is developing a standard that defines remarketing terms. When available this could be used by procurers when buying remanufactured items.

There is a potential problem that very large volumes (above 100 units) of identical stock within a single order cannot usually be purchased (although a single order above 100 can be met by using similar equivalent products). Examining the current spend from Durham County Council, this should not present a major obstacle, as most orders require fewer than 50 items. Based on this discussion, a cautious view would be that remanufacturing can easily accommodate orders of up to 10 computers.

Savings

The price differential depends upon the age of equipment being offered, but nearly-new or current models will typically be in the range 65-75% of the cost of new; these will be sourced from overstock ex-factory, unopened returns, DOA & warranty repairs, to ex-fairs and events stock. These products are identical to those currently on offer as new, with the same performance and warranty, but at a

reduced price. For the purposes of this study the more conservative figure of 75% of the cost of new will be used.

The carbon footprint of a typical laptop is estimated[6] to be 539 kgCO_2e. Of this figure, around one third is associated with materials and manufacture, and two thirds with energy consumption through use (this assumes a four year lifetime, with 15-20% usage). Assuming similar power demands to a new product, through refurbishment, can save approximately 20% of the carbon emissions compared to the equivalent of using new.

Superficially, there could be a problem associated with procuring remanufactured laptops and desktops because of energy efficiency improvements of new products versus remanufactured. However, in most instances, remanufactured computers are recent models and the difference in power consumption between them and new models is marginal, such that that the overall energy consumption during use should be the same.

Table 4 Cost and carbon savings from procuring remanufactured laptops and desktop computers

Product	Number of Items	Spend (£)	£ savings	CO_2 savings (kg)
Computers (all)	747	332,520	83,130	80,526
Computers (selected)	195	127,994	31,986	21,021

From the analysis of Durham Council's spend, 747 computers were purchased in 2009/1: 443 computers were bought in batches of 50 or fewer, and 195 were bought in batches of less than 10. Using the more conservative recommendations, Table 4 shows that a saving of £31,986 could be made by purchasing remanufactured products leading to the abatement of 21 tonnes of carbon dioxide.

Procurement recommendations

Remanufactured computer equipment can act as a drop-in replacement for current new items and can therefore be specified in procurement with immediate effect.

Concern about volume sourcing suggest that, at present, the use of remanufactured equipment may be restricted to single orders of fewer than 10. It may however be possible to mitigate this by working with the remanufacturing industry should be undertaken to identify appropriate solutions and be able to find suitable buying methods to enable bulk orders of remanufactured computers and laptops. This could be examined through a pilot project.

[6] Unpublished internal data

The development of a new standard on ICT reuse, BS8887-211, could help develop the market for remanufactured products by helping procurers to set appropriate standards and procurement criteria.

4.2.4 Servers

Most office-based businesses, schools and other organisations have an internal IT infrastructure. This normally consists of workstation computers, typically desktops and laptops, which are supported by a server that operates over a network. The server is used to provide network services to users, for example network data storage, network routing, email hosting and file hosting. In many ways the equipment is similar to the more familiar desktop computers, using processors, memory and hard disks amongst other components. However, the role performed by server equipment means that it can be specialist in its nature, and its criticality means that high specification components are generally used which are less likely to fail.

The market structure for reusing and remarketing of servers is similar to that faced by laptop remanufacturers. Refurbished and remanufactured servers are sold through OEMs and specialist third party independent companies. There are four different markets that are served by remanufactured servers:

- replacement with like-for-like current infrastructure
- expansion of current infrastructure
- cost sensitive purchasers
- lower specification export.

A large portion of second-use server equipment is sourced from larger enterprises which are upgrading their systems. The equipment can be relatively new and can be readily installed into less demanding roles. Local Authorities could easily source equipment from this market because it is mature and capable of providing the equipment they need.

There is currently little regulation or standardisation in the quality of remanufactured or refurbished servers. The market is often open and dynamic, meaning that pricing is competitive:, conversely it can be difficult to identify high quality remanufacturers and products. This risk can reduced by using remanufacturers aligned with OEM brands. Also, cost is an indicator of quality: the higher the cost, the newer and better the specification of the server. Remanufactured servers are fully tested and generally brought up to current specifications.

Savings

Remanufacturing costs associated with server equipment are dependent on the equipment, its age and its specification as well as market demand for that product. A similar price range can be expected to that commanded by laptops. The

calculations described below will assume an average saving of approximately 25%.

A recent report produced by WRAP has examined the carbon benefits of server equipment reuse.[7] This report found that the overall impact of a typical piece of rack mounted server equipment was 3,814 kgCO_2e over three years. Of this figure, around 90% was associated with the use phase, mainly as a result of energy consumption. This study indicated that, depending on the number of components replaced, high quality reuse could save 7-12% of this impact, over a six-year time-frame. In a simple case, we will base the calculations in the table below on the more conservative figure of 7%.

The report also highlighted that other environmental considerations, such as resource depletion, demonstrate additional benefits for reuse of server equipment.

Table 5: Cost and carbon savings from procuring remanufactured servers

Product	Number of Items	Spend (£)	£ savings	CO_2 savings (kg)
Servers	20*	122,156	30,539	5,340

* 34 items were identified within the spend categories for server equipment. Several entries related to components that corresponded to a single server build. The figure included above estimates of the actual number of discrete servers procured by Durham Council and is used in the calculation of the environmental benefit.

However changes in energy efficiency between older remanufactured equipment and newer equipment can eliminate any carbon benefit saved through the remanufacturing process. This is an important point in relation to servers where the majority of the carbon impact is within the product's use phase. The saving quoted in the report assumes that the energy efficiency of a new and a remanufactured server is the same. If this is not the case, and if carbon is a priority factor careful examination of the energy efficiencies of the choices is needed. This is further complicated because, in general, newer computing equipment is more efficient per computing power, but the whole system can draw more power overall.

Based on this analysis, procuring remanufactured servers could save Durham Council £30,539 and approximately 5 tonnes of CO_2. Careful selection of product, and in particular its energy draw, is needed to ensure that any savings made through the remanufacturing process are not lost because a less efficient server is purchased.

Proposed purchasing specification/way forward

Servers are generally bespoke to organisations, built on a common number of building blocks: therefore there is generally no such thing as a 'standard' server. The consequence of this is that there may be the need for procurers to modify

[7] The Environmental Impacts of ICT Equipment Reuse, WRAP, 2011 (to be published)

their ordering practices to fully realise the benefit of acquiring remanufactured servers. The support and infrastructure are available to deliver remanufactured servers into Local Authorities, and so the focus should be on engagement with the market by procurers. The suggested action is therefore a pilot study between procurers and reputable remanufacturers of server equipment.

4.2.5 Vehicle maintenance

The automotive sector is traditionally an area in which remanufacturing has flourished. Over 50 different components are commonly remanufactured, these are typically high value and require a good level of technical expertise and knowledge to manufacture and remanufacture. Products include: engine and engine components, drive train, rotating electrics, turbo chargers, air conditioning and electronics. In addition to the remanufacturing activities there is also a market in reusing 'non-critical' components (for example vehicle body parts and interior trim) both through private customers and a nascent opportunity through insurance.

Most vehicle manufacturers and vehicle manufacturers' suppliers undertake remanufacturing, using it as a method for supplying warranty replacement parts. The term is commonly used, and remanufacturing is performed by a range of different organisations including original equipment manufacturers and independent organisations. The use of remanufactured parts covers cars and commercial vehicles equally and is a readily available option for fleet managers to reduce costs.

With automotive components, a full equivalent to new warranty should be provided as standard with any remanufactured parts. This is reinforced in certain companies who sell remanufactured parts alongside new.

Potential savings

Unfortunately accurate procurement data on their vehicle maintenance spend were not available from Durham Council, so a quantitative analysis of the benefit of remanufacturing could not be performed. In any event, with the widespread availability of remanufactured vehicle parts, any analysis may miss the use of remanufactured product that already occurs. Further research into the practices by fleet managers will be needed before targeted recommendations can be made but, if remanufactured parts are not being used, there will be significant opportunities to reduce cost across the entire fleet management contract.

Interrogation of a different database, the NEIEP DataCube, provided regional spend data on vehicle maintenance. Bearing in mind the caveats outlined above, an estimate of the regional savings can be made. Table 6 describes the total regional spend for categories relating to vehicles. Due to the wide variety of different products that can be remanufactured within this sector, an accurate saving cannot be determined; however, conversations with a range of remanufacturers suggested that typical savings of 5-25% the cost of an equivalent new product could readily be achieved. If a 5% saving is realised, a regional saving of just over £1m could be available.

Table 6: Regional spend on vehicles (supplied by NEIEP)

Category	2009/10 spend	Indicative savings
Heavy Construction Equipment	£765,566	£38,278
Industrial	£2,359,251	£117,962
Maintenance	£14,504,025	£725,201
Parts	£3,358,478	£167,923
Total	**£20,987,320**	**£1,049,364**

As stated reuse and remanufacturing are undertaken for a large variety of vehicle components, and these practices are well established in this market. The carbon impacts of the reuse of two commonly remanufactured products are described below.

Tyres: A study assessing the benefits of tyre reuse through retreading shows that the carbon impact of a retreaded tyre for a light commercial vehicle is 60.5 $kgCO_2e$ compared to 89.2 $kgCO_2e$ for a new tyre.[8] This is as a result of material and processing energy savings.

Gear boxes: The carbon impact of remanufacturing an existing gearbox has been calculated as 285 $kgCO_2e$, compared to 433 $kgCO_2e$ for manufacture of an equivalent new product.[9] This saving of around one third arises mainly from the materials savings, particularly of aluminium alloys which have a high embodied energy. The remaining savings are made through reduction of manufacturing activities.

An accurate assessment of the savings achievable within the sector cannot be made. However, the savings described above are indicative of those achievable. The comparison between new and remanufactured parts should result in identical performance and there should not be any difference in energy consumption between the two products.

Procurement recommendations

Given the ready availability of remanufactured options for use in vehicle maintenance it is recommended that procurers look to identify the extent to which such products are already in use. Once this has been established opportunities for introducing further items, and the potential savings which might be made, can be more readily assessed. Any such study should also look to identify any potential barriers/concerns which fleet managers might have in relation to the use of such products.

[8] The Carbon Footprint of Retreaded Versus New Light Commercial Vehicle Tyres, CRR

[9] The Carbon Impact of Remanufactured Products -6 Speed Gear Box, CRR, 2009

4.2.6 Photocopiers and other opportunities

Printers and photocopiers

There is a strong market in remanufactured photocopiers and printers. Due to the decreasing costs associated with lower volume models, the remanufacturing process is limited to higher value enterprise models. The process is performed by both independent remanufacturers and also a variety of original equipment manufacturers, the most widely quoted being Xerox, but others such as Océ and Lexmark offer similar services. Indeed, remanufacturing is an important business tool used by these organisations to reduce capital costs on many of their service contracts which involve the sale of a service (printed paper) rather a printer.

Several service based contracts appear to be in place within Durham County Council, suggesting that rather than procuring larger printers and photocopiers, most are leased or are part of a service agreement. Therefore, we were unable to obtain accurate spend data from Durham on photocopiers and large printers. Direct contact with suppliers of the photocopiers is needed to identify current practice. Even without understanding the current practice within the current contracts, the market for remanufacturing is well developed meaning that specifying remanufactured photocopiers could be readily inserted into future procurement tenders and should be used as best practice.

As is mentioned above, remanufacturing is common practice on larger printers and photocopiers, whereas, due to costs associated with the remanufacturing process, smaller cheaper products are rarely remanufactured. It is difficult to specify the threshold under which remanufactured products are unlikely to be available, but generally printers and photocopiers costing less than £500 will not be remanufactured. As a general rule the cost savings for higher value remanufactured photocopiers will be greater.

School furniture

Through stakeholder engagement, it was highlighted that any potential benefit relevant to schools should be highlighted. Although slightly outside the scope of the report, in that the spend data for schools is different to that held for council procurement, the total spend on furniture for schools is likely to be significant, therefore any benefits associated with the procurement of remanufactured products would also be large. At present the market for remanufactured and refurbished school furniture appears to be less well developed than the corresponding office furniture. Further research into this area would be needed to provide a robust recommendation for procuring remanufactured school furniture.

A recommended course of action is to engage with refurbishers of office furniture and begin a dialogue to develop a market for school furniture. Further engagement will also be needed with procurers from within schools to identify the appropriate project to implement any procurement in refurbished school furniture. As is mentioned above, there is also the possibility of using remanufactured ICT equipment within a school environment.

4.3 Regional Savings

The savings identified within section 4.2 are those estimated as being available for Durham County Council. Resource constraints prevent a similar analysis from being performed for all Councils within the NEIEP. We have however assumed that the opportunities for using remanufactured equipment will be similar across the region owing to the known similarity in activity and spend profiles.

For the purposes of giving some idea of the potential for regional cost/carbon savings we have scaled the gross spend data for Durham to the region. The data used within section 4.2 provided by Durham was not available to us so instead, the aggregate council spend was used to approximate the savings that could be made for the region. Data supplied by the Communities and Local Government on the ONS[10] was used to identify and determine the proportional difference between Durham and the NEIEP. Based on this data, Durham spent £937m in 2011; as a region, £5,764m was spent, meaning that the identified savings from the analysis presented above will need to be scaled by 6.2 to approximate the regional savings. The difference between these two spends was then used to estimate the savings for the region for the identified products. (This will lead to some variation in the calculation of these figures, but is still a good approximation of the savings that can be achieved throughout the region.) Table 7 outlines this calculation.

Table 7: Calculated savings for the North East through procurement of remanufactured products

Product	£ savings (000)		CO_2 savings (kg)	
	Durham	NE	Durham	NE
Chairs	12	74.4	15,092	93,570
Desks	14	86.8	35,510	220,162
Pedestals	5	31	8,353	51,788
Shelving	16	99.2	-	-
Cartridges	93	576.6	15,020	93,124
Servers	31	192.2	5,340	33,108
Computers	32	198.4	21,021	132,432
Vehicles	-	1,049	-	-
Total	203	2,307	100,336	624,184

From Table 7, a total of £2,307,000 could be saved if the five identified remanufactured product groups were procured. This saving could lead to 624 tonnes of CO_2 being abated.

[10] Revenue account budget, Department for Communities and Local Government, 2011

5 Recommendations

5.1 General methods for implementing procurement change

This section provides some general discussion on the methods for enacting change to encourage the purchasing of remanufactured products within the NEIEP.

5.1.1 Barriers

To explore the options for promoting remanufactured products we first need to understand the barriers that prevent buyers and suppliers from seeking such products.

There can be many barriers to the uptake of remanufactured products. Most barriers are directly related to lack of, or insufficient, information to make a balanced procurement decision. To understand/appreciate the barriers, it is useful to break them down by stakeholder group.

Internal Users	Buyers	Suppliers
1. Lack of knowledge about alternative products	1. Lack of knowledge about alternative products	1. Unclear about demand
2. Concerns about safety / suitability (perception of risk)	2. Concerns about safety / suitability (perception of risk)	2. Unclear about tendering opportunities and evaluation mechanisms
3. Concerns about “look and feel” of working environment	3. Concerns about cost implications	3. Unclear about government-set product standards
	4. Lack of tools to evaluate alternative products	4. Unaware of opportunities to engage
	5. Reluctance to explore alternative business models	5. Insufficient capital to bring solutions to market
	6. Confused priorities	

The fundamental barrier on the demand side (public sector procurement) is driven by lack of awareness and understanding of the various remanufactured market solutions. On the other hand, the supply side tends to be discouraged by mixed or confused messages regarding the level of desire and ability to source such goods. The key point for both sides tends to be lack of understanding of what is available and the level of commitment from the other side. This is a consequence of insufficient communication.

5.1.2 Internal Users

Procurement teams play diverse roles within organisations, from a position of total control of budgets and operational responsibility to having an advisory capacity in areas where budgetary control is devolved within organisations. In local authorities, it is often the internal user who acts as the procurement team's client and specifier and it is this group who may most need to be persuaded of the merits of remanufactured product options.

5.1.3 Buyers

The aim of this report is primarily to draw the attention of local authority procurers to the opportunities that remanufactured goods can provide to make both financial and carbon savings. Remanufacturing as an approach is likely to but this can be accelerated through public procurers creating a greater demand 'pull'. Some tools and guidance exist and the Defra Gvt Buying Standards now include remanufactured specifications for certain products. In addition to these measures, procurers should look to create additional market pull through strategic early market engagement and collaborative procurement.

5.1.4 Suppliers

Suppliers are often aware of remanufacturing, particularly in the sectors referred to in this report, in some cases they have been supplying remanufactured options for some time but have not seen fit to publicise this because of fears that the product might be perceived as inferior. Until this issue is addressed and demand for remanufactured products grows the availability of such products is likely to remain restricted. As and when,procurers priorities change, suppliers will need to be informed in advance so that they can adjust their businesses to meet any potential growth in demand. Often suppliers will be interested to pilot their remanufactured products within public sector organisations so as to build on, or begin to develop, a portfolio of clients; in such instances there may be scope for negotiating price reductions.

5.1.5 General recommendations

Table 8 describes a series of short/medium/long term actions regional procurers might take to encourage remanufacturing.

Table 8: Outline of possible options for increasing the general uptake of remanufactured products

Short Term	Medium Term	Long Term
Communicate existing remanufactured product specifications and suppliers e.g. prepare short briefing note with weblinks and product specification wording	Provide training for category and sourcing managers on product impacts and remanufacturing e.g. as part of normal procurement training or as ad hoc whole life costing awareness sessions	Identify good practice champions e.g. organisations who are keen to promote remanufactured products amongst their peers and task them with knowledge sharing
Identify possible future pilots through sourcing plans e.g. engage with existing contacts to explore when specific contracts are due to expire	Commence pilot work with the aim to develop the blueprint for market engagement e.g. select one product group and develop approach	Support procurers in developing category or sourcing strategies which include optional pre-procurement market research and engagement e.g.
Establish training/awareness needs for procurement community e.g. develop short questionnaire or targeted interviews with procurement community	Develop awareness campaign aimed at internal users e.g. agree messages and engage with environmental or CSR managers in each organisation to communicate to internal users	Continue to seek new remanufactured markets e.g. through desk research, engagement with other regions and participation in appropriate conferences and events
Organise remanufactured “market day” e.g. seek companies that provide remanufactured products and run an awareness event for public sector buyers	Set up a market engagement programme consisting of Remanufacturing Meet the Buyer events	Publicise successful procurements of remanufactured products e.g. through letters to CEOs, engagement with purchasing consortia, presentations at conferences and entering awards
Identify public sector influence groups for future participation e.g. engage with Defra to learn more about the product standard setting process and collaborative procurement	Build database of companies that offer remanufactured products e.g. through direct engagement with suppliers, expert organisations, trade bodies	Report benefits from remanufactured activities e.g. calculate CO2 emissions saved together with economic savings
Stress link between remanufactured products and sustainability benefits e.g. through revision and strengthening of sustainability policies	Determine sector-specific engagement approach based on prioritisation of spend and suppliers	Set up sector specific funds and grants for new remanufactured products
Communicate interest for remanufactured products on internet for suppliers’ benefit and awareness		

5.2 Specific procurement actions

5.2.1 Industry engagement and market development

The framework described above in Section 5.1.5 should be used to engage with industries where remanufacturing is already occurring but where the activity will not support a sudden increase in demand. Industry engagement can also be used to encourage the redesign of products to make them easier to remanufacture. As part of this, using pilot studies or programmes can be used to good effect to minimise the risk of a full scale roll-out by trialling new suppliers of remanufactured products.

Engagement with industry can also include local engagement, particularly with charitable organisations. The reuse of furniture is partly driven by the Third Sector and as such could be seen as a means to encourage this activity. Remanufacturing printer cartridges will also have indirect benefits for charitable causes.

5.2.2 Standards

Remanufacturing has existed in several forms for many years, however, only recently has the industry attempted to develop standards that enable procurers to identify high quality remanufacturers. The British Standard BS8887-220:2010 is a new standard that sets out the necessary procedures for remanufacturers to perform. Due to its recent launch, the standard is not yet widely adopted. There is an opportunity within the procurement frameworks in the NEIEP to outline the specifications within this standard. This will encourage the uptake of this standard and lead to further and easier procurement of remanufactured products. The British Standard BS8887-211 is still in development but specifically covers remanufacturing and reuse of computing hardware, such as laptops, computers, servers and printers. This complements BS8887-220:2010, and could be used as an alternative when specifying remanufactured computer hardware.

The national public procurement standards, Government Buying Standards, which are mandatory for all central government departments incorporate European Union defined Green Product Procurement and other criteria. There is active development of these standards with the expectation that the number of different product groups covered will increase in the coming years. These standards were originally devised in 2003 under ‘QuickWins’, but were rebranded to their current name in 2010.

There are currently over 30 products covered under Government Buying Standards. Within these specifications there are requirements to use products that minimise the use or release of hazardous materials, for example using low volatile organic compounds within paints and low-ozone depleting refrigerants. Within the furniture criteria, there is a specification for 5% reuse but other relevant criteria do not specify remanufacturing. When specifying procurement, criteria on remanufacturing can be included in addition to that specified within the GBS. This will enable procurers to purchase environmentally sustainable products whilst also enabling the procurement of remanufactured products.

5.2.3 Sector recommendations

Table 9 summarises the findings from the analyses in this study. The results suggest that the approach to procurement is different depending on the product to be procured. All the identified product groups are in practice 'drop-in' replacements for new product; however, the level of development of the market and the acceptability of the product to procurers and users differs, meaning that the approaches must be tailored to the product where:

- the barriers to acceptance are low (e.g. cartridges); it is recommended that the regional procurers specify remanufacturing within their current procurement tenders.
- there are possible issues with large scale supply but there is a solid remanufacturing market (e.g. laptops and furniture); a gradual introduction into the purchasing specifications would limit the risk to the procurer.
- there are contractual or institutional barriers (e.g. photocopiers and school furniture); work with both suppliers and the procurers is necessary to overcome these hurdles.
- there are quality perception issues (e.g. vehicle maintenance); work with the end user will be needed to gain acceptance.
- there are potential issues with the environment (e.g. servers); engagement with industry is needed to ensure that the specifications mitigate this risk.

Table 9: A summary of the overall savings that can be achieved through procurement of remanufactured products and the actions necessary to enable procurement

Product	Action	Savings	
		kg CO_2	£'000
Office Furniture	Pilot scheme: invitation to tender to furnish an office with refurbished furniture. Slowly increase its inclusion into tenders (possibly via additional award criteria)	365,000	291
Printer cartridges	Specify directly into tender. There are direct replacements available and the market is mature	93,000	576
Computers	Specify directly into a tender where less than 10 products are needed.	132,000	198
Servers	Industry engagement and specify directly into the tender. The market exists but there will need to be a shift in procurement practices	33,000	192
Vehicles	Engage with fleet managers and identify champions who want to use remanufactured products	-	1,049
School Furniture	Research and market development within schools to identify potential savings.	-	-
Printers/ Photocopiers	Engage with current suppliers and service providers of photocopying services and develop a new framework for using remanufactured products.	-	-
Total		**623,000**	**2,306**