TAKE-BACK MECHANISMS IN THE CHARITY SECTOR: A CASE STUDY ON OXFAM

Tom Cherrett, Sarah Maynard, Adrian Hickford, Andrew Crossland
School of Civil Engineering and the Environment, University of Southampton

Introduction

Work undertaken by the Transportation Research Group as part of the Green Logistics project looking at freight impacts in urban centres, identified that charity shops can receive significantly more weekly vehicle activity compared to other retail stores. A study of businesses on Winchester High Street suggested that the typical charity shop received 6.3 waste collections per week due to the nature of the core goods sold (donated second hand items), as opposed to 2.4 collections per week for the average business. Charity shops receive deliveries of potential stock from a variety of sources, the saleability of which cannot be gauged until the items are inspected by staff. This process inevitably leads to waste generation as items donated with good intention are deemed un-sellable due to their particular characteristics. As a result, a variety of waste contractors, jobbers and other companies can be involved in the collection of the residual waste and recyclate generated. An opportunity arose with Oxfam to study these take-back routes in detail and better understand how take-back works in this sector.

Aims

The main aim of this research has been to:

- Investigate the 4 key transport layers (Wastesaver, recycling contractor 1, 'man-with-a-van' and shop adopted bank collections) used to service Oxfam shops and banks within Southampton area W16 (Figure 1). (The two main transport layers, 'Wastesaver' and 'man-with-a-van' are discussed in this paper.)
- Focus in detail on the 'man-with-a-van' activities to:

  i) Quantify the current daily and weekly activity undertaken
  ii) Identify ways in which operational savings could be made using routing and scheduling optimisation

- Develop ideas for further in-depth research, to be undertaken as part of the Oxfam supported PhD over the period June 2010 to June 2013, following on from the Green Logistics project.

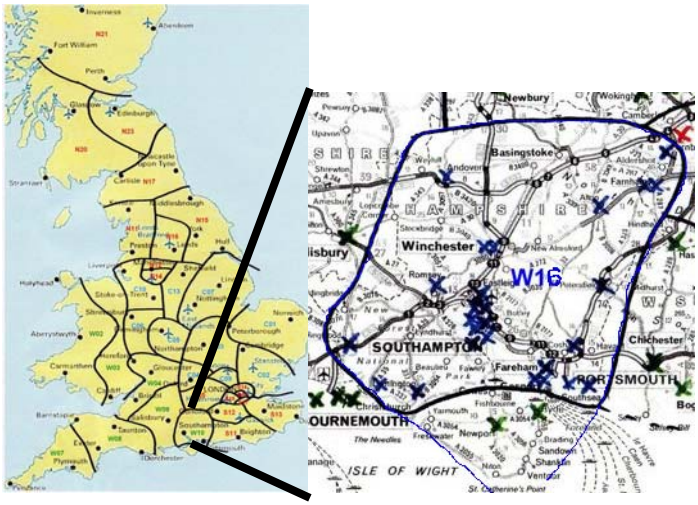

Figure 1: Map highlighting the W16 area relative to the 33 Oxfam regions.

Background

Oxfam is a registered charity in England and Scotland, originally formed in 1942 to help Greek civilian victims of World War II. To fund its activities, the charity opened its first shop in Oxford in 1948, collecting used clothing, books and bric-a-brac for resale. Over the last fifty years, Oxfam has expanded into a global charity, working on emergency response, development work and campaigning. Finance for Oxfam's work comes through fundraising and trading income. Trading income is earned through a network of over 650 shops and 1300 donation banks across 33 defined operating areas in the United Kingdom (Oxfam 2010).

Across Oxfam's UK network there are 6 different logistical platforms servicing its stores, banks and sorting facilities.

1. **Regional stock collections** and movements are managed 'independently' within the 33 local areas by area managers (Figure 1). The area manager has the responsibility for organising stock movements which include the cascading of stock between stores (if stock is not sold within approximately 2 weeks it is rotated to other stores), ad-hoc collections e.g. house clearances, and collections from shop-adopted banks which are typically conducted by a **'**man-with-a-van**'**, employed by Oxfam. There is currently limited liaison and integration between the regional logistics operations overseen by the area managers and the transportation of materials to Wastesaver in Huddersfield. Local area managers are restricted in how they can dispose of low-grade stock according to Oxfam's ethical policy.

   Regional differences in total spend on transport have been identified, due largely to differences in the individual managers approaches. Regional inefficiencies have been identified which relate to the duplication of rounds e.g. separate textile and book collection rounds servicing the same stores, and the high transportation costs/per tonne of material collected from remote locations e.g. West Wales, Gateshead and Scotland. Some of the most efficient areas keep transport costs down by using shop volunteers, the area manager or subcontractors rather than employing a full time 'man-with-a-van' driver. High cost areas typically employ one or more full time drivers and additional subcontractors where required.

2. **Collection and transportation of stock from UK stores/banks to Oxfam's sortation facility in Huddersfield** is organised centrally by Wastesaver. Black bag collections are conducted by Wastesaver (red area in Figure 3) and 8 regional subcontractors (blue areas in Figure 3). All stock is consolidated at a central point within the region (e.g. sub-contractors trailer park) where it is loaded onto trailers and trunked to Huddersfield. More than 1 trailer may be available at the consolidation point enabling stock to be separated into different grades of material (e.g. bank or ex-shop stock). Although the operation of Wastesaver generates significant profit, the collection and transportation of stock accounts for 52% of the total logistics expenditure. Low grade textiles sorted at Huddersfield are sold to the local textile recycling market to be turned into rags which are supplied to a wide range of industries. The facility is manned by 45 paid staff and is operational 36 hours/5 days per week.

   The review of operations has highlighted that donated stock can undergo up to 3 stages of sorting. Stock is initially sorted by volunteers in store where sellable items are separated; the remaining low-grade stock is re-bagged and sent to Wastesaver to be re-sorted for onward recycling. As a result, lower grade textiles are being transported through the system when it could be more cost effective to remove them from the chain at the shop level. The high cost of transporting and repeatedly sorting lower grade recyclate is a drain on Oxfam's profitability.

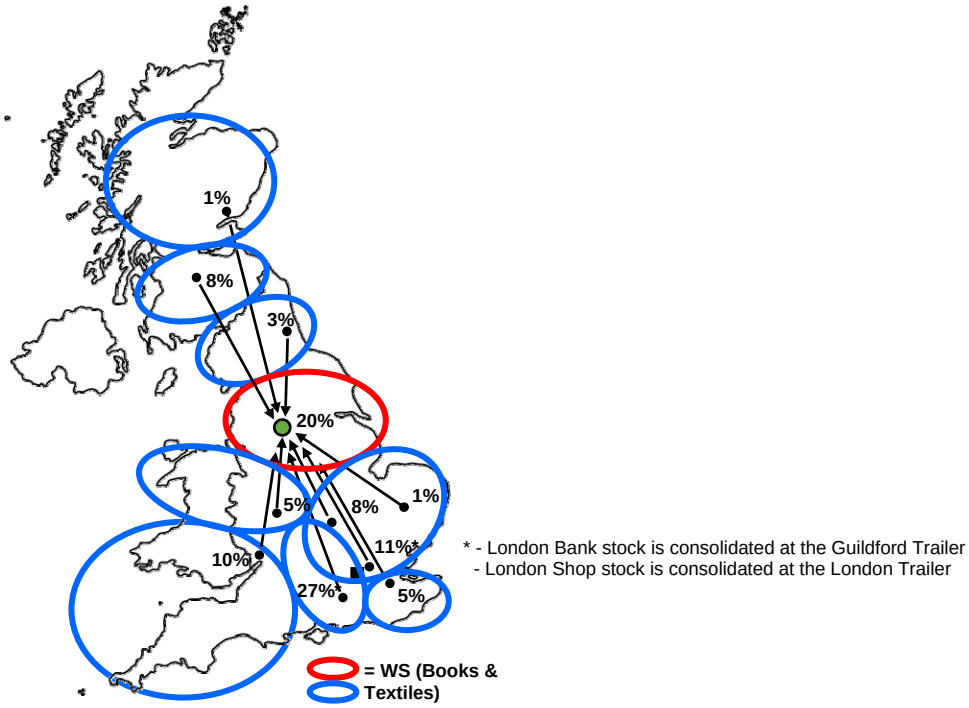

Figure 3. Wastesaver trunking operation (Stock generation (%) share by area). (Source:- Accenture 2009)

3. **Supply of new products and shop supplies to all UK stores from Oxfam's distribution centre in Bicester** (organised centrally). 3PLs are used to deliver stock to stores, accounting for 17% of logistics expenditure.
4. **Third party deliveries and collections including regular/scheduled recycling collections** from Recycling Contractor 1 (collections of paper, plastic, electrical and electronic waste and books) and Recycling Contractor 2 (textiles). Other regular collections and deliveries include residual waste collections, marketing deliveries and Royal Mail online sales collections.
5. **Online retail hubs** located at Portishead and Welwyn Garden City source stock through locally organised collections and Wastesaver deliveries on-route to Huddersfield.
6. **Bookbarn** located in Huddersfield which is a sorting facility where books are graded to be i) sold on-line, ii) stored for new shop openings and iii) recycled if resale value is low. Collections are currently limited to Northern England where a combination of contractors and internal Wastesaver drivers are used. Collections of books are kept separate to textile collections and as all book banks are adopted by shops, no collections are required.

The logistic costs associated with serving Oxfam's stores equates to approximately 8.4% of total revenue with donated stock collections accounting for 83% of the total logistics spend (Figure 4).

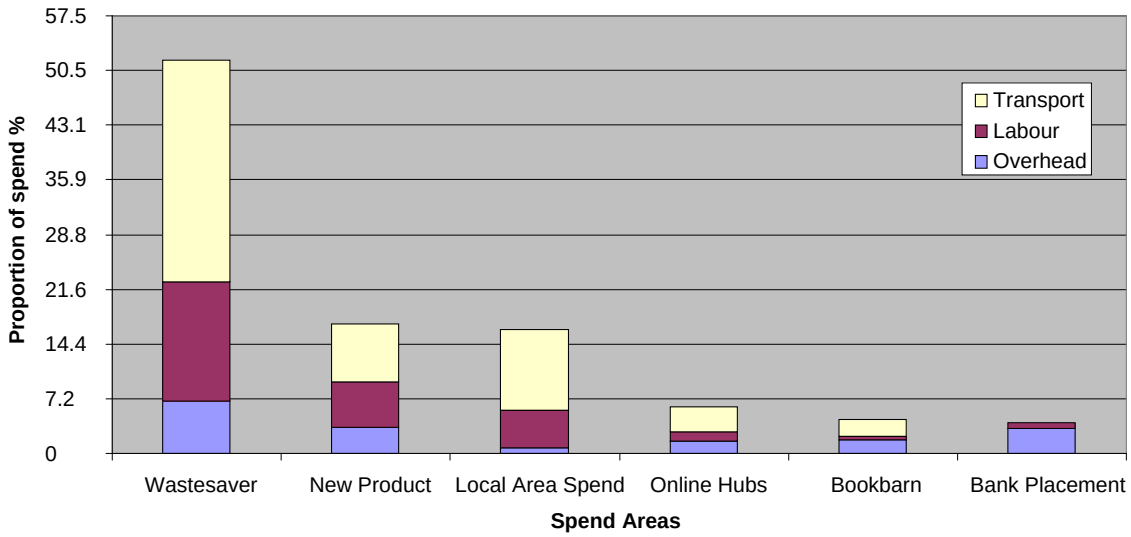

Figure 4. Oxfam's % spend on Logistics (Source:- Accenture 2009)

Shop and bank infrastructure and operations in area W16

As of Christmas 2009, Oxfam's donation infrastructure in area W16 consisted of 71 material specific banks, collecting either textiles or books, and 26 shops. The shops can be sub-divided into 5 different categories based on the types of products sold, which include books (5), books and music (5), furniture (1), music (1), and general shops (14) stocking a wide range of products. The flow of stock to shops essentially comes from 4 main sources which include:

i) Public donations made directly to the shop,
ii) Donations collected from textile/book banks which are delivered to shops either by an Oxfam employed 'man-with-a-van' or by shop volunteers,
iii) Stock donated by a leading high street retailer and collected by a 'man-with-a-van',
iv) Un-sold stock cascaded from other shops within the area by a 'man-with-a-van'.

All stock delivered to shops (irrespective of its origin) is sorted and graded in accordance with its quality and perceived saleability, both of which impact on whether the stock remains in the store or whether it is eventually cascaded elsewhere. There are 4 different flows of materials from shops, which include stock sold to customers, donated textiles destined for Wastesaver in Huddersfield which are deemed too poor in terms of quality to offer for sale and are collected by Subcontractor 1, books/textiles which are cascaded to other shops by 'man-with-a-van' if not sold within a certain time period (typically 3 weeks), or low quality books that cannot be sold and recyclate which are collected by Recycling Contractor 1 for recycling (Figure ??)

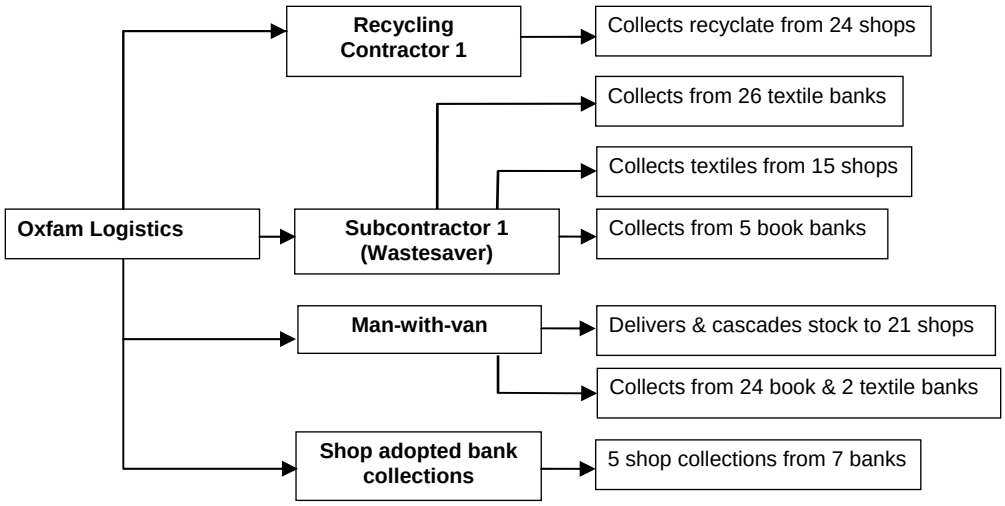

Figure 4: Summary of Oxfam's logistics operations serving area W16

Stock collection data supplied by Oxfam suggested that between February 2008 and January 2009, Subcontractor 1 made a total of 1062 collections from 15 Oxfam shops in area W16, collecting 31,173 bags of textiles and shoes. Assuming the average weight per bag is 7.5kg, this equates to 232.5 tonnes per year. A one-way analysis of variance test showed that there were significant differences between the shops in terms of the mean number of black textile sacks produced over the 12 month period ($F_{(13,153)} = 128.8$, $P<0.001$, $Ms_e = 2085$), with a Scheffe multiple range test suggesting that store F4226 consistently generated significantly more textiles (659 bags per month) than all the other shops, with store F4007 producing the least (67 bags per month). The results also highlighted that certain stores (notably F4101, F4032, F4106 and F4045) received over 100 collections per year but generated under 23 tonnes of textiles and shoes, suggesting that the vehicle activity could be reduced relative to the volumes moved (Figure 3).

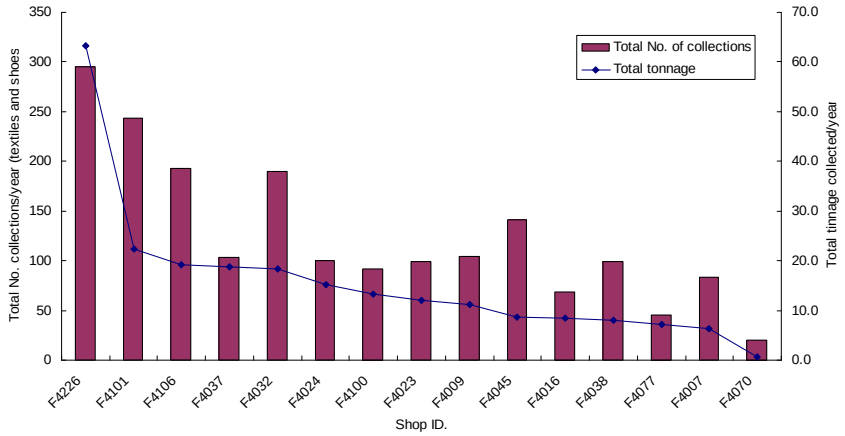

Figure 3: Total annual Subcontractor 1 collections (textiles and shoes) from Oxfam shops in area W16, and the tonnage generated.

At the time of the research, there were 71 donation banks located within area W16, although for operational reasons, 9 banks (4 book banks and 5 textile banks) had been adopted and were subsequently serviced by neighbouring area W14. Of the 62 banks managed by area W16, 55% were located in recycling centres (e.g. car parks and designated community recycling areas) and 39% in supermarket car parks (e.g. Sainsburys, Tesco, Asda, Morrisons and Waitrose). The flow of stock to the 62 banks (35 book banks and 27 textile banks) is solely reliant on direct public donations. Over the February 2008 to January 2009 period, 1220 Subcontractor 1 collections (average of 53 collections per bank) were made from 23 textile banks collecting a total of 31,250 bags of textiles. *(It should be noted that data were only available for 23 of the 27 banks).* Assuming an average weight per bag of 7.5kg (value derived by Accenture), this equates to approximately 234 tonnes per annum. On average, 25.6 bags of textiles (ranging from 10.1 to 54.3 bags) were collected per bank per collection. Considerable variability was also observed between banks in terms of the number of collections made per year relative to the weight of textiles recorded (Figure ???). Of interest for further research is the quality of the material collected and whether the most profitable banks in terms of sellable product can be identified and targeted for 'priority' logistics (Alexander et al., 2008). Subcontractor 1 travelled approximately 1264 kilometres each week (an average of 253 km per day) collecting textiles from 38 different Oxfam facilities. These journeys resulted in CO_2 emissions averaging approximately 60kg per day (303kg per week in total), at an operating cost of around £910 per week. This equated to transportation costs of just over 70p per bag (and 235g CO_2 emissions per bag) to take this stock to Guildford. *(N.B. These operating costs were based on an overall operating cost (fixed and variable costs) of 72p per km).*

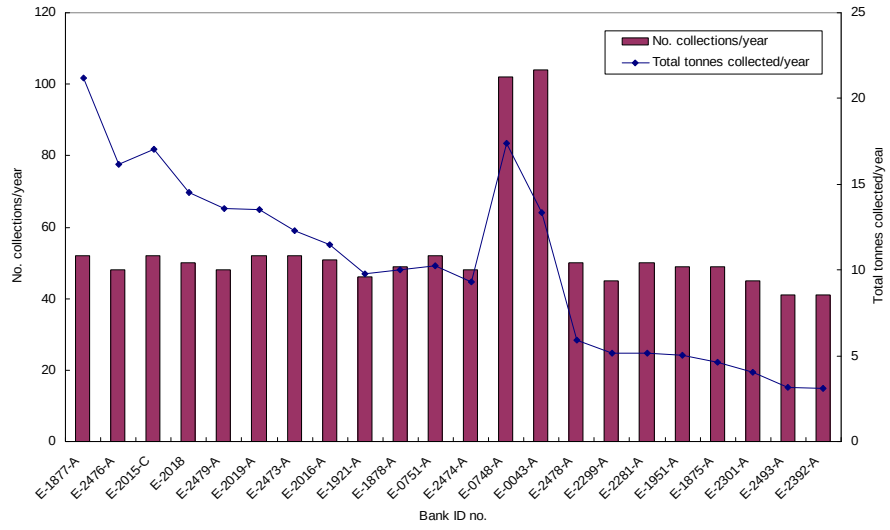

Figure 12. Subcontractor 1 collections from W16 textile banks (February 2008 to January 2009)

'Man-with-a-van' activity in W16

Discussions between the local area manager and the man-with-a-van driver produced the 'typical' scheduled and ad-hoc (un-scheduled) transactions that would be undertaken each week (Table 6).

Responsibility	Transaction
Fixed scheduled transactions	Collect stock from book banks and a smaller number of textile banks
	Deliver bank stock to Oxfam shops
	Transfer stock between stores (cascading)
Ad-hoc transactions	Collections of stock from a high street retailer (delivered to shops)
	Collections of stock from Portsmouth University (end of term)
	Collection of stock/fittings from shops for Lymington
	Deliveries of books to the Ryde shop (Isle of Wight)
	Deliveries of stock to Petersfield
	Occasional house clearances
	Special requests for stock/ fittings/ collections from shops

Table 6: Summary of 'man-with-a-van' scheduled and ad-hoc transactions

Scheduled transactions include all the collections and deliveries that are fixed on a regular weekly basis and include collections from banks, deliveries to shops and 'cascading' (transfer of stock between shops). Ad-hoc transactions are fairly infrequent and can involve collections of stock from a leading high street retailer (and subsequent transfer to shops), deliveries of stock to those shops experiencing poor donations, additional shop collections (during peak periods), clearances from houses and University accommodation. Since specific details of these ad-hoc transactions were not available, the associated trips were not included in the analyses. Future research would benefit from a detailed 'journey/activity diary' approach where the daily van activity could be recorded along with the levels of stock moved. All 'man-with-a-van' collections are conducted, Monday to Friday as part of a contracted 36 hour week.

Current collection/delivery schedule

The data suggested that 58 stops are scheduled each week to service banks (primarily book banks) and shops, with an average of 11.6 stops being made each day. All 26 banks (24 book banks and 2 textile banks) are emptied weekly unless they are overflowing with donations in which case additional collections will be scheduled. For the purpose of this analysis, it was assumed that each book bank would yield the equivalent of 10 bags of books (75kg), and each textile bank, 25 bags (188 kg) each collection. The 'man-with-a-van' services 22 of the shops within area W16, the majority of which receive weekly visits except for 3 shops located in Southampton (F4101/F4111/F4110) receiving between 4 and 5 deliveries per week. The number of bags collected or delivered to each shop was determined from a survey of shop managers.

Using the driver's schedule, the distances travelled each day to service shops and banks were calculated using Microsoft MapPoint. Estimates of CO_2 emissions and fuel costs associated with these trips were also estimated. Within these calculations, the following basic assumptions have been made:-

- The round always starts and finishes in Netley (SO31 5FX) where the vehicle is stored overnight;
- The daily schedules are fixed (therefore the same places are always visited on a given day);
- The driver uses the quickest route option, suggested by the route planner within MapPoint;
- The vehicle used is a diesel LGV, and has a fuel consumption of 24mpg in urban areas, and 39 mpg on motorways, with a load capacity of 6400 litres (6.4m^3) and a maximum payload of 1000kg (Ford 2010; Yahoo.com 2010);
- CO_2 emissions are given as 278.3g/km on urban roads, 245.4g/km on rural roads and 326.5g/km on motorways (National Atmospheric Emissions Inventory [NAEI] 2010); for the purposes of these calculations, an average value of 265g/km is used for non-motorway roads;

- Vehicle operating costs (not including driver salary) are 28.5 pence per kilometre (Freight Transport Association 2010);
- Vehicle operating costs (including driver salary of £21,000 per annum) are 72 pence per kilometre (3.5 tonne diesel van travelling an average 30,000 miles per annum), Freight Transport Association (2010);
- The distances calculated represent the minimum distance travelled as the driver will often be required to include additional ad-hoc collections/deliveries to his existing schedule at short notice;
- Stock is present on the vehicle when it starts/finishes its rounds.

The total weekly distance for the man-with-a-van round was estimated to be 918 km, an average daily distance of 184 km (of which 121 km was on urban or suburban roads, and 62 km on the motorway network). This equates to a total of 14 hours and 45 minute of travel time per week (an average of 3 hours per day), resulting in 262kg of CO_2 emissions. Using the FTA 2010 operating costs, the route schedule would cost £660.60 per week. The results suggested that each week, the 'man-with-a-van' would collect around 110 bags of goods (825kg) which had failed to sell within a certain time period, or which would be more suitable for sale in other shops, and subsequently cascaded. A similar number of bags would be delivered into shops. Given operating costs of £660 per week, this equates to around £6.00 per bag which is transferred between shops (2.4kg of CO_2 per bag). According to the schedule described by the area manager, the 'man-with-a-van' was due to collect further goods from book and textile banks, which are not accounted for in these delivery figures. Assuming each book bank yields 10 bags, and each textile bank 25 bags, this would result in a further 290 bags (2175kg) being collected by the 'man-with-a-van' which do not then get transferred to shops. If these extra bags are included in the transfer of stock, the cost is reduced to £1.65 per bag (650g CO_2 per bag).

Alternative collection/delivery schedules

DPS International's LogiX optimisation software was used to derive a more optimal route for each of the current daily delivery and collection schedules, assuming the same shops and banks have to be visited on each day. An optimised schedule was also created for the whole working week. The within-day optimisation represents an overall distance saving of 12% (109km for the week, or an average of 22 km per day). This equates to 12% less time on the road (a saving of 109 minutes per week), as well as 12% reduction in operating costs and CO_2 emissions (down from 262kg per week to 230kg). In the optimised weekly schedule, the shops in Southampton are visited in the morning, as previously, with only 10 out of the scheduled 30 shop visits being on different days. In terms of distance, the alternative route is 35% shorter than the original schedule, a saving of 64km per day on average (119km compared with 184km), with 65% less distance travelling on motorways (47 minutes saved per day). The reduction in route distance leads to theoretical operating cost and emissions savings with over £230 per week (£11,960 annually) saved in operating costs alone and emissions (CO_2) reduced by 37% (from 262kg/week to 165kg/week), Table ??.

Schedule	Total route distance (km)	Distance on motorway (km)	Travel time (mins)	CO_2 emissions (kg)	Operating costs (£)
Original	917.5	183.5	885	262.3	660.60
LogiX daily optimised	808.8	161.8	776	230.5	582.31
LogiX weekly optimised	595.5	110.2	649	164.6	428.77

Percentage savings compared with original schedule

LogiX daily optimised	11.8%	15.5%	12.3%	12.1%	11.9%
LogiX weekly optimised	35.1%	64.7%	26.7%	37.2%	35.1%

Table ??: Comparison of current, optimised daily, and optimised weekly 'man-with-a-van' collection and delivery schedules

These figures indicate that the current schedule used by the 'man-with-a-van' could be significantly improved, particularly if there is flexibility in the order that shops and banks are visited. However, if there are restrictions that particular shops must be visited at certain times and in a particular sequence (to allow cascading of stock from certain banks to certain shops, for example, or to ensure that the capacity of the van is not exceeded during a particular round), there would be an obvious impact on these distance and time savings.

Conclusions and further work

The current work has provided some understanding of Oxfam operations and the associated 'take-back' logistics at a local area level. A PhD studentship has been agreed to expand the research and look at three distinct areas of 'sustainable take-back', following on from the work in Work Module 10 of the Green Logistics project (www.greenlogistics.org.uk):

- Collaborating with other charity organisations (e.g. British Heart Foundation, Cancer Research UK) on stock cascading between stores and take-back logistics to shared disposal/treatment centres;

- Changing the operating structure in terms of the logistics methods and providers used, relative to the treatment and disposal outlets. This would consider the potential of local treatment/disposal options which could be used to reduce Oxfam's overall UK transport footprint;

- Utilising the logistics networks of high street retailers for back-loading material to treatment facilities.

The PhD research would have the opportunity to use existing, and develop new optimisation techniques to model the transport and environmental benefits that could be realised through the various new collaborative operating scenarios proposed.

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