The development of Bath’s Green Box recycling system

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More people recycle when they have containers for kerbside collections from their homes. However, collection bank services are more common in the UK because of the lower costs involved. In Bath, a new approach to kerbside collections has been developed, with costs comparable to high-density bank schemes and without the expense of a materials reclamation facility for post-collection sorting. This Paper describes Bath’s Green Box system, and the series of trials which led to its development.*

Introduction
All waste collection authorities were required to prepare Recycling Plans by August 1992. Bath’s Recycling Plan identified kerbside collections as the only waste recovery option (for dry recyclables) with the potential for development in the city to achieve the Government’s 25% recycling target for household waste. Most other local authorities are continuing to develop collection bank schemes, some with the aim of establishing high-density networks of recycling centres. The higher the density of banks the greater the operating cost, to the extent that some bank schemes now have total net costs of more than £40/t.

2. Bath has a history of kerbside collections, and lacks sufficient suitable sites for a high density of collection banks. The city’s Recycling Plan noted that it is only kerbside collections which have proved to be capable of achieving the 25% recycling target within the UK.

3. Until 1980, when a local paper mill closed, Bath City Council collected paper in trailers towed behind refuse collection vehicles. In 1985, Avon Friends of the Earth (FoE) independently re-established monthly kerbside collections in Bath, which recovered mainly paper. Government job creation and training schemes provided an important source of funding. After this funding had been withdrawn, Avon FoE approached Bath City Council for support, and it was agreed in 1991 to jointly develop the service as a partnership.

Recycling in partnership
4. Avon FoE set up a non-profit making company, City of Bath Recycling, which entered into an agreement with the City Council to provide recycling collection services. This agreement is renewed annually, and allows for the operation of an agreed level of collection services. The City Council provides revenue funding, a depot and capital equipment.

5. The partnership arrangement has worked very well, and has led to considerable development of the services provided by City of Bath Recycling.

6. As well as kerbside collections which cover all 34 000 Bath households, City of Bath Recycling collects high-grade paper and drinks cans from schools and offices. A restricted service is offered to collect glass from commercial sources—such as public houses and hotels—which is due to be expanded during 1995. City of Bath Recycling also collects leftover clothing from jumble sales and provides two paper banks and a clothing bank.

7. Further recycling services are provided solely by Bath City Council. These include a low-density network of collection banks for paper (another seven sites), cardboard (one site), glass (eleven sites) and cans (seven sites), CFCs recovery and special offers on home composting bins and wormeries—over 1400 have been sold since May 1993.

Kerbside trials
8. In March 1993, a series of trials was launched to test improvements to City of Bath Recycling’s kerbside collections. Until that time, a monthly service had been operated for paper, food and drinks cans, clothing, foil, car batteries and sump oil without special containers being provided to householders. The trials tested different collection arrangements in nine areas, covering 4891 households, enabling the following to be compared

(a) weekly, twice-a-month and monthly collections
(b) adding glass to the materials accepted
(c) providing collection containers in the form of disposable green bags or reusable boxes.

9. The trial areas selected were largely similar self-contained middle income areas, without large numbers of flats. All areas received the same high level of promotional activities, with a leaflet delivered at the start of

* Bath City Council was chosen in November 1994 as the winner of the Local Authority Recycling Award, which was sponsored jointly by the Local Authority Recycling Advisory Committee (LARAC) and Local Authority Waste and Environment magazine.

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the trials and a newsletter reminder after ten weeks.

10. The trials were carefully monitored over six months, and the materials were weighed after each collection. The quantities collected in each trial area are summarized in Table 1. This shows the average quantities recovered over the trial period excluding the first collection, which tended to be well above average. The trial rounds varied in size between 469 and 603 households, thus the quantities of material recovered have been adjusted to equalize each round at 550 households. The recycling rates are calculated using average household waste generation levels in Bath.

Results of the trials

11. The results of the trials showed that the recycling rates achieved in each area through the kerbside collections only corresponded closely to the standard of the collection service. One important finding was that the provision of a collection container was a large factor in encouraging householders to recycle. A weekly service also encouraged more people to recycle, but twice-a-month collections seemed to make little difference compared to a monthly service. A survey carried out during the trials showed that overall recycling levels—including those through banks—were similar with both twice-a-month and monthly collections. One apparent anomaly was explained by the survey: less households used paper banks in the twice-a-month ‘no glass’ collection area where there were none nearby.

12. The survey showed that households who started to use the kerbside collection service during the trials switched both from throwing recyclable materials away and from using collection banks. In the areas with the highest participation levels, up to 34% of households switched from throwing away their paper and glass, and up to 49% switched from throwing away food cans.

13. Boxes were found to be safer than bags for collecting glass due to breakages from bottles migrating to the bottom of heavily-laden bags.

Green Box trials

14. Boxes were only provided on one round during the initial trials. A blue box was provided for paper and a green box for glass, cans and foil, with other materials being left separately alongside the boxes. It was felt to be unnecessary to provide a box for paper, as this could be easily left bundled or bagged on its own. Thus, a single Green Box system was used for a further set of trials to compare weekly and monthly collections.

15. In August 1993, green boxes were provided on three more trial rounds in addition to the weekly box round already established. The recycling rates over the following six months were 18% and 22% for the two monthly Green Box rounds, and 23% and 27% for the two weekly Green Box rounds. The round with a 18% recycling rate consisted partly of council housing, and had lower income households than the other trial areas.

16. During this second stage of the trials, green boxes were also provided to residents of flats, which form a high proportion (28%) of households in Bath. In some areas participation levels were lower than for the other trial
rounds, but overall the number of those recycling increased, and the Green Box service operated satisfactorily with only minor problems reported. However, more green boxes were returned from the flats, including by some residents who continued to recycle without a box. It was therefore decided that a smaller design of box with a foldaway carrying handle should be provided as the standard option to people living in flats. Large blocks of flats were not covered by the trials as it was felt that only the provision of a nearby mini recycling centre could offer a satisfactory service to these residents.

The provision of depot equipment

17. At the same time, plans were made to identify the depot equipment and vehicles necessary to operate a city-wide Green Box service. Three vans—two Ford Transits and a Renault Master—were being used to operate all the City of Bath Recycling collections thus far. The main items of depot equipment were a forklift with rotator, a can sorter and aluminium baler. This set-up had managed to cope with the trials, and was sufficient for monthly collections which mostly recovered paper. However, operating a city-wide Green Box service required the means to handle efficiently a far larger throughput of materials, particularly glass, which needs to be kept colour separated.

18. Operational arrangements at most of the UK’s other high recovery rate kerbside collection schemes were investigated, including those at Adur, Cardiff, Kensington and Chelsea, Leeds, Milton Keynes and Sheffield. Lessons were learnt from each, but none seemed to offer the right solution for Bath.

19. Due to the high proportion of flats and the city’s many steep driveways and narrow streets, wheeled bin systems had already been rejected in Bath. Boxes were preferred to bags, and out of necessity householders had already been encouraged to keep different materials separate. It seemed logical, therefore, that...
materials should be kept separate on the vehicle and not mixed for sorting back at the depot. Using boxes allows for easy kerbside separation and — of equal importance — the easy rejection of unwanted items.

20. The most suitable vehicle chassis available for the collections in terms of payload, size and cost was found to be the Iveco Ford Daily 59-12. A specially designed body with a low bed height was ordered along with purpose-built stillages to be mounted on the vehicle bed for each of the materials recovered. The stillages can be easily unloaded and tipped using the fork-lift at the depot. As a result of this, the only new depot equipment required was bulk storage containers for glass, a steel baler and a more powerful can sorter.

21. The proposed arrangements were costed and presented to the Council’s Environment Committee, who decided to phase in a weekly Green Box service, as well as the provision of mini recycling centres for large blocks of flats throughout Bath over a two-year period. The Committee also resolved to enter into a long-term agreement with Avon FoE to operate the service until the end of the Council’s next refuse collection contract — due to be in the year 2000.

22. Table 2 summarizes the budgeted costs of fully establishing the weekly Green Box service. The Bath Green Box service is very cost-effective compared to other high recovery rate collections, and has much lower capital costs than schemes requiring extensive post-collection sorting at a materials recovery facility. The net costs per tonne are also comparable to those of high-density collection bank networks established in the UK, none of which
have achieved the same rates of materials recovered.

**Conclusion**

23. The first of Bath’s new purpose-built Green Box collection vehicles started operating in April 1994. It has a materials payload of 2.25 t (sufficient for a half day’s collection), and carries two full-height stillages for paper (one on each side) along with two half-height stillages for glass (one of which is split for clear and brown) above which are two stillages for
Table 2: Budgeted costs of establishing the weekly Green Box service

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<tbody>
<tr>
<td>Waste recovered: t</td>
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<td></td>
<td></td>
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<tr>
<td>Domestic</td>
<td>1532</td>
<td>2700</td>
<td>4350</td>
<td>4800</td>
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<tr>
<td>Commercial</td>
<td>170</td>
<td>200</td>
<td>250</td>
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<tr>
<td>Staff: no.</td>
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<td>12</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Expenditure: £</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Capital</td>
<td>63 000</td>
<td>152 500</td>
<td>182 000</td>
<td>7 000</td>
</tr>
<tr>
<td>Staff and overheads</td>
<td>118 995</td>
<td>218 195</td>
<td>316 250</td>
<td>327 100</td>
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<tr>
<td>Income: £</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material sales</td>
<td>21 210</td>
<td>23 065</td>
<td>35 726</td>
<td>39 110</td>
</tr>
<tr>
<td>Recycling credits</td>
<td>12 490</td>
<td>68 250</td>
<td>108 750</td>
<td>120 000</td>
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<tr>
<td>Charges and other</td>
<td>20 420</td>
<td>1 380</td>
<td>3 000</td>
<td>5 000</td>
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<tr>
<td>Bath City Council</td>
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<tr>
<td>Annual costs: £</td>
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<td></td>
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<tr>
<td>Revenue payments</td>
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<td>125 500</td>
<td>169 000</td>
<td>163 000</td>
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<tr>
<td>Depot rent</td>
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<td>12 000</td>
<td>12 000</td>
<td>12 000</td>
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<tr>
<td>Loan charges</td>
<td>8 820</td>
<td>30 170</td>
<td>55 650</td>
<td>56 630</td>
</tr>
<tr>
<td>Cost/t: £</td>
<td>50 46</td>
<td>57 82</td>
<td>51 44</td>
<td>45 42</td>
</tr>
</tbody>
</table>

Including one set of stillages, is £23 500, which is less than a third of the cost of kerbside collection vehicles used in Adur and Milton Keynes. A further two Green Box collection vehicles were ordered for July, and the first phase of the programme to introduce the Green Box service throughout Bath was started. It has at present covered 14 000 households, with the rest of the city to be covered during June–July.

24. Plastic bottles could be added to the materials recovered on the Green Box collections, yet this requires a conveyor for sorting the different polymers, a plastics baler and the configuration of the stillages on the collection vehicle to be altered. As a result of the bulk and low weight of the plastics and the sorting required, they would cost more to recover than the other materials. It is estimated that they would add about £10/t to the net overall costs of the collections.

25. Bath's recycling rate for household waste has already risen from 9% in 1991–92 to 16% in 1993–94. As a result of introducing the new Green Box service— which is due to be provided throughout the city by August 1995—it is forecast that the city's recycling rate will be at least 21% in 1994–95, 26% in 1995–96 and 28% in 1996–97.

There are fixed containers for clothing, car batteries, sump oil and rubbish and space for stackable boxes. The cost of each vehicle, cans.