

A Draft Report compiled November 2005
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Project funded by Environment Wales and Glasu

A brief project outline

The objectives as stated in the funding bid to Glasu

- Map flows of waste materials in the Dyfi Valley
- Identify materials that may be processed & or marketed locally
- Identify problems with present waste management / recycling
- Raise awareness of present recycling opportunities
- Raise awareness of free professional waste minimisation advice for businesses
- Establish a local waste database for possible exchange
- Establish a methodology that can be transferred to other areas

Our primary aim was to establish a clear picture of local waste and recycling issues and use the audit as a basis from which ecodyfi can effectively develop its waste minimisation and recycling work within the Valley community. Since there are a number of recycling schemes already available for householders, our emphasis for the study has been on business waste. We have then compared this to available household waste data. We had originally planned to cover all businesses, but due to time limitations we have not covered building trades. The environment agency is presently carrying out a building waste survey which should be used in future within our data. We have also not covered Manufacturing as there are less than 10 local manufacturers with specific wastes that may have distorted overall statistical analysis. These businesses should be considered individually at some point in the future.

Secondarily, the methodology may be of use to other business groups in similar analyses.

What is ecodyfi?

Ecodyfi is the local regeneration organisation for the Dyfi Valley, in Mid Wales. Their vision is for the Dyfi valley to be a thriving bilingual community with a reputation for sustainability.

The Dyfi Valley is made up of dispersed rural villages and farms based around the market town of Machynlleth. There are approximately 5000 households and over 600 businesses.

For more information see www.ecodyfi.org.uk

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1 Project methodology

1.1 Compiling our business directory for the study

A business directory was built for the project primarily using www.yell.com. Once having identified a total of 631 businesses, these businesses were divided into smaller sectors for the duration of this study. These are as follow;

Table 1 - Sectors

<i>Sector</i>	<i>Audit code</i>	<i>Standard Industrial Classification (SIC) codes in sector</i>
farmers	f	01.21 & 01.22
health related businesses	hrb	52.31, 85.12, 85.20, 93.02, 93.04
specific business retailers	sbr	50.10/1, 52.48/2, 52.48/9, 52.50/1, 74.81/4
	hsr	36.11, 52.11/1, 52.11/2, 52.11/3, 52.44, 52.42/2, 52.42/3, 52.42/4, 52.43/1, 52.43/2, 52.44, 52.45, 52.46, 52.47, 52.48/4, 52.48/5, 52.48/6, 52.48/9, 64.11, 71.40/5, 93.02, 71.40/5
high street retailers		
other	o	74.20/1, 92.61/9
public service / government	psg	85.12, 92.51, 90.01, 75.11, 80.10, 80.21, 75.14, 74.50
pubs / restaurants / cafes	prc	55.30/1, 55.30/2, 55.30/3, 55.30/4
	s	60.24/9, 63.12/9, 65.12/1, 65.12/2, 71.21/9, 74.11/3, 80.49/2, 85.32/2, 92.34/9
services	t	55.10/1, 55.10/3, 55.23/1, 55.23/2, 55.23/9, 63.30/9, 63.30/10, 71.21/1, 74.20/5, 74.20/6, 92.52/1
tourism		
vehicle related businesses	vrb	50.10/2, 60.23/1
manufacturing	m	20.51
building trades	bt	29.52/2, 45.21/1, 45.21/2, 45.21/3

Standard Industrial Classifications have also been used so that other studies may be able to relate to this work.

1.2 Defining the analysis sectors

In order to analyse the data we amalgamated some of the smaller sectors into the following '*analysis sectors*' so that we had sufficient numbers for statistical study.

Table 2 - analysis sectors

analysis sector	sector
farmers	farmers
health & education	health related businesses
health & education	public service / government
retailers	specific business retailers
retailers	high street retailers
services	pubs / restaurants / cafes
services	services
tourism	tourism
vehicles & other	other
vehicles & other	vehicle related businesses

Table 3 - The total numbers analysed by analysis sector

analysis sector	total in sector	no. interviewed	% interviewed
farmers	174	7	4
health & education	45	5	11
retailers	95	17	18
services	63	9	14
tourism	123	12	10
vehicles & other	59	8	14
Total	559	Total 58	Average 10

1.3 Designing the questionnaire

BRASS research centre at Cardiff University provided us with a questionnaire that they had used in a similar project. We simply adapted this questionnaire to suit our needs. We adapted the questionnaire with each trial to the point that it no longer resembled the original example from Cardiff.

(See appendix 1 - Final questionnaire sheet format and Appendix 2 - Questions to accompany Dyfi valley waste audit questionnaire sheet - Attitudes & practices).

1.4 How we carried out the interviews?

This was a drawn out process in which we trialled a number of questionnaire methods before settling on the final one.

Initially we tried a postal questionnaire which turned out to be a dead duck, as we had to call everyone back to clarify what they had filled in. We then tried to simplify the questions and sent it out again. It became

apparent that a postal questionnaire wouldn't work as the information we required was fairly in depth.

We then tried door to door questionnaires which were very effective but far too time consuming given that often the person required was not in or if they were took it as a chance to raise a great number of points on their waste disposal problems.

Finally we tried telephone interviews which were quick and effective.

While on the phone we ran through a questions sheet and copied as much information as possible onto a rough questionnaire form. (See appendix 1)

After the phone call, all of this information was transferred to a spreadsheet for calculation. (See spreadsheet 'waste audit analysis,' worksheet 'overall figures').

Ideally we would have used a database, but this had the disadvantage of not being so useful for easy data analysis. (Also, we did not have the experience to set a sufficiently advanced database up).

1.5 Make up of the spreadsheets

There are two spreadsheets to accompany the final report;

'Sector by sector analysis'
'Waste audit analysis'

1.5.1 Sector by sector analysis

This sheet contains calculations for each of the six analysis sectors, a 'cross sector graphs' sheet and a 'household assumptions' sheet.

Household assumptions are described in section 1.6.2.

The spreadsheet is divided into five sections which are colour coded and can basically be explained as follows;

Blue	Basic business information including audit code; county business based in; interview date; SIC code; whether the interview was by phone, personal or a trial; equivalent number of full time employees; what the business does.
Brown	Type of waste container. Quantity filled per year. Conversion to cubic metres (m3).
Green	Type of waste material. Conversion factor converting material annual m3 to tonnes. Material recycled, landfilled or other. Waste contractor. Miles material transported. Tonne miles per material.
Red	Total annual; tonnage, costs, landfill, recycle, other, tonne miles.
Purple	General attitudes.

1.5.2 Waste audit analysis

This document contains the following sheets;

Caravan park waste conversions. (For explanation see section 1.6.3).

Incongruous samples - samples removed from calculations.

Coding explanations - explanations to all colour coding and abbreviations.

Interview numbers

1.6 How we made calculations and assumptions

1.6.1 Annual mileage of waste materials delivered to their initial destination

Each waste material is collected by a different contractor and then taken either to landfill, a sorting station, reprocessor or re-user. (We have not accounted for further movement beyond the initial point of delivery, which would for example be the case in terms recycle delivered to Cae Post for sorting).

Mileages have been estimated using the AA route planner.

http://www.theaa.com/travelwatch/planner_main.jsp

Mileages are then multiplied against tonnage of material to give annual tonne miles of material moved.

Example

1.35 tonnes paper collected annually from a single business by Powys County Council.

Collection made in a recycling bag.

Delivered to Cae Post 40 miles away.

1.35 x 40 = 54 tonne miles

1.6.2 Annual household waste produced in the Dyfi Valley

Since the only figures available from the councils are municipal waste we are making some rough assumptions as follows.

We assume Powys County Council doorstep collection recycling rates (averaging out across county at 48%).

('Powys County Council Waste Management Strategy 2003/04'.

http://waste.powys.gov.uk/english/policydocs_strategy.htm)

There is obviously a certain amount of recyclate collected from car park bins and bulky goods etc, but we have ignored these. Given the lack of facilities in other areas of the valley, the 48% rate should more than cover household participation in recycling. (The Dyfi Valley is also renowned for its high awareness of and participation in recycling).

For each of the materials recycled (see table 4), we have also estimated quantities of each material that would be of a grade suitable for recycling. For each material we have considered availability of recycling collections or village collection points. We have also considered how much of each material would realistically be passed on to a reprocessor. Poor quality materials or materials with no market will be transferred from a recyclate sorting plant to landfill.

1.6.3 Calculating caravan park waste

As all caravan parks we spoke to said their waste would be much the same as household waste, we devised a system for splitting each parks total tonnage into the average percentage for each material in a n average household waste bag. We assumed WRAP 2002 household waste figures which are as follow;

Table 4 - WRAP 2002 household waste figures

	(wrap 2002) overall %
paper	15
card	4
textiles	3
glass	7
organics	21
cans tins	3
other metal	5
wood	4
plastic film	2
other plastic	5
nappies	2
garden waste	20
other	9

To see an example, look at spreadsheet 'waste audit analysis' worksheet 'caravan park waste conversions.'

1.7 Statistical analysis of business sectors

(See spreadsheets 'sector by sector analysis' and 'waste audit analysis.')

Table 5 - Analysis sectors

farmers
health & education
retailers
services
tourism
vehicles & other

Each of the analysis sectors has been analysed for the following;

Table 6 - Analysis areas

Individual waste materials annual tonnage	Overall annual tonnage	Overall annual cost	annual landfill tonnage	annual recycle tonnage	annual other tonnage	annual waste tonne miles

For each of these areas, we have taken;

- Average
- Standard Deviation
- Confidence Interval
- Total
- Minimum
- Maximum

We are then able to multiply each analysis sector up to the total number of Dyfi Valley businesses in this sector.

It is possible to identify key waste materials produced by each sector and their initial delivery destination after collection from the business. The same information also provides us with general distances each waste material is transported.

Referring to the final part of the questionnaire, concerning personal opinions, we can correlate differences in general attitudes and practices against what materials are collected or waste services provided to each business.

We can also see clearly whether there are any key issues coming out of the opinions on services and suggestions for improvement within each sector.

Note on statistical analysis

We only need the Standard Deviation to be able to calculate the confidence intervals so its of no further use. The confidence intervals are an indication of how accurate your mean is. If it is relatively large (as was often the case) this could indicate several things:

1) Because the sample size is small there is some inaccuracy, this will occur in all surveys...the mean would only be precise if you surveyed every business.

2) There is a lot of variation between the businesses relative to the sample size. The manufacturing business we took out of the data is an example of this effect. This is not inaccuracy it simply means that there's lots of variation in the sample (this is actually what SD measures). It can be useful to ask why there is this huge variation. Or why are some people

recycling and others are not? Alternatively the variation may, at least in part, be due to point 3.

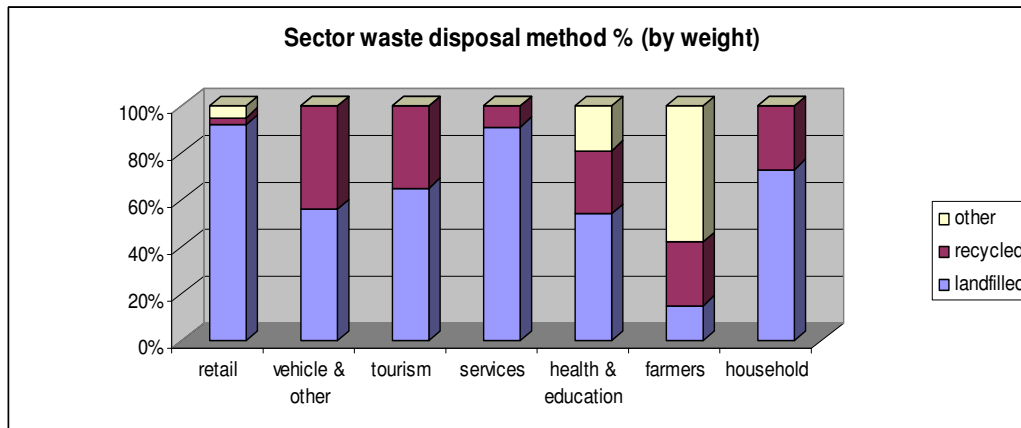
3) We are not comparing like for like. For two companies both recycling the same proportion of their waste the bigger company will naturally have a larger tonnage. This is why we did the 'proportion recycled' analysis, it neutralises the tonnage and so allows direct comparison of businesses, you should notice some reduction in the sd and ci if the variation was due to not comparing like for like. What it does allow is comparison across sectors/businesses and such like. For example it will indicate whether retail is recycling a greater proportion of their waste compared to other sectors. Obviously with a calculated 'mean tonnage of waste' and a 'proportion of waste recycled' is a simple matter to calculate the tonnage recycled, if total waste is 650 tonnes and 50% is recycled then 325 tonnes are recycled.

2 Analysis Results

2.1 Materials and Tonnage analysis

2.1.1 Sector waste disposal method

Graph 1



Across all sectors (except farming) the general trend is for a majority of waste to landfill, followed by a small proportion recycled and finally a smaller proportion disposed of otherwise.

The largest 'landfillers' by percentage weight in order of highest first are;

1. Retail
2. Services
3. Household
4. Tourism
5. Vehicle & other
6. Health & education
7. Farmers

High landfillers are likely to have little time, interest, money or easy access to recycling services.

Whilst most sectors have similar recycling rates of around 20% - 50%, services and retail have lower rates of 5% - 10%. Retail and services are largely made up of high street shops, caf  s, restaurants and bars.

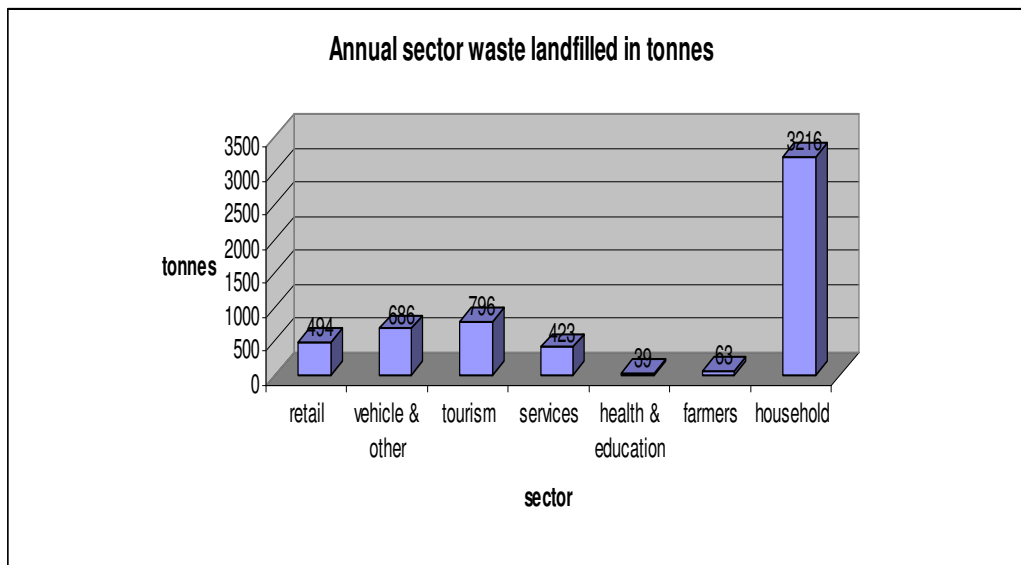
Within the Powys area where a majority of these businesses are based, there are recycling schemes available to deal with all of this waste with the exception of food waste. However, it appears that services are not being accessed for some reason.

The proportion of 'other' disposed of materials is accounted for by re-use of cardboard boxes for packaging etc. In the case of farmers where this figure is misleadingly high, this can be accounted for by dead livestock which are taken from the farm by specialist services. In effect this could be included as recycling, giving farmers the highest recycling rate by far across the sectors.

In the case of the health and education sectors, this is accounted for by medical waste, which is removed by specialist services and incinerated. Whilst this is not landfill, it is likely to be producing pollutants. Given more samples we believe that this proportion of the graph would actually be somewhat reduced.

2.1.2 Annual tonnage for all sectors

Graph2



Within the business sectors, tourism has the highest landfill tonnages. This can be accounted for by a large influx of holiday makers particularly to caravan parks for up to 9 months of the year. This waste will be as household waste, but with little opportunities for recycling as the

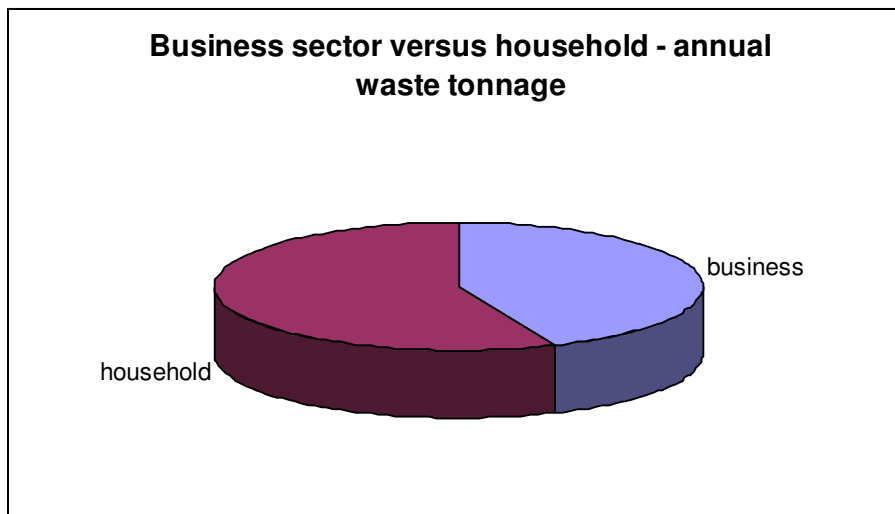
infrastructure is not established for this temporary population. Within certain areas of the Dyfi Valley, such as Borth and Ynyslas, populations swell enormously over the summer period and so too does the waste produced. This is not collected as household waste. The caravan parks pay the council or contractors for collections.

Vehicle and other tonnages are high due to the disposal of tyres, oil and broken engine parts.

Retail and services are fairly similar. Although they are regular waste producers, in contrast to the tourism sector, they produce less waste annually. It's make up is not as complicated as tourism waste, largely consisting of cardboard, paper, plastic and food waste.

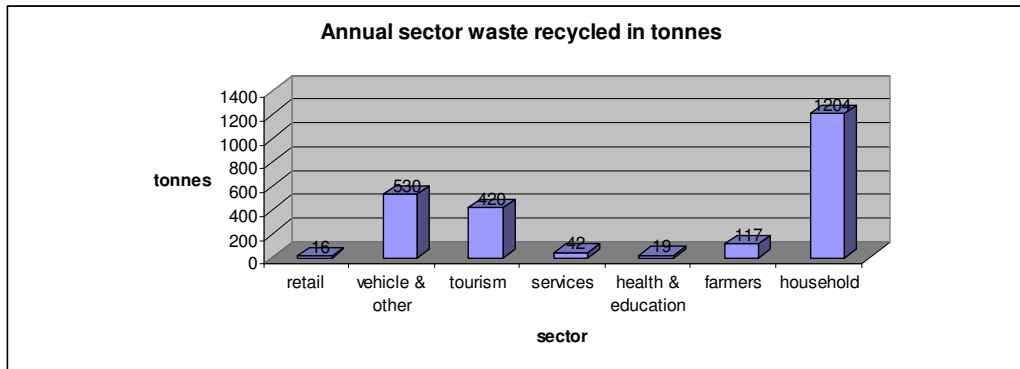
Health and education along with the farming sector both have very low annual tonnage.

Graph 3



Looking at graph 3, household waste is still the greatest overall tonnage contributor. Although considering there are 5000 households and only 600 businesses, as expected the businesses are higher individual waste producers. In this sense, it may be more effective to target a small number of very high waste producers (businesses) than a large number of lesser waste producers (households), in order to reduce our overall waste production. In practice we actually need to confront all producers.

Graph 4



High recycling rates in the vehicle and other sector are due to recycling of tyres, batteries and waste metals which is now compulsory.

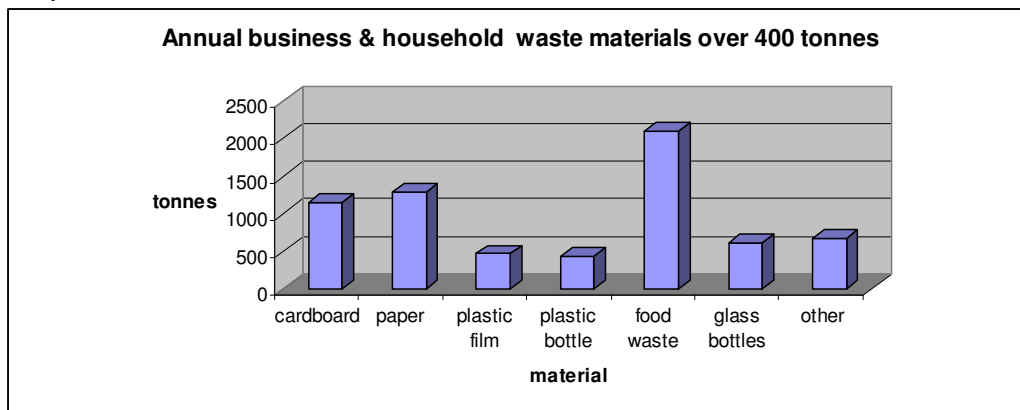
The graph shows that 35% of tourism waste is recycled. While this figure appears very high, a number of accommodation providers interviewed were avid recyclers (This gives slightly untrue results). In reality, if research was to be broken down we would expect this rate of recycling to be lower.

Similar to tourism, householders recycle approximately 30% of their waste. Given the services available, this could be a lot more.

Farmers actually have the highest recycling rate of all businesses if dead livestock removal is considered as recycling.

2.1.3 Total annual waste tonnage by material

Graph 5



Graph 5 shows the highest tonnage of waste materials produced annually. Graphs 6 and 7 show the lesser make up of annual waste materials.

Food Waste makes up the greatest tonnage. This material will have a high water content, is rich in nutrients and potential energy. It is heavy to transport to landfill and *potentially* dangerous once dumped as may be open to vermin. (Llanidloes landfill separate out as much organic waste as possible, compost it under cover and use it to cover the site at the end of each working day).

Ideally (but in a minority of cases) this material would be home composted and re-used in the home garden. If not it could be collected by a local scheme and processed through an in-vessel composter (such as the rocket) or composted indoors (in a large space) in wind rows. The resultant material could then be sold on as soil conditioner or spread on farmland. This would however be complicated to authorise given present regulations.

Paper is our next largest waste material. There may be a possibility of composting this in combination with other materials. Research would need to be made into what level it would be economical to recycle paper commercially in order to consider whether it may be possible to set up a small scale local industry.

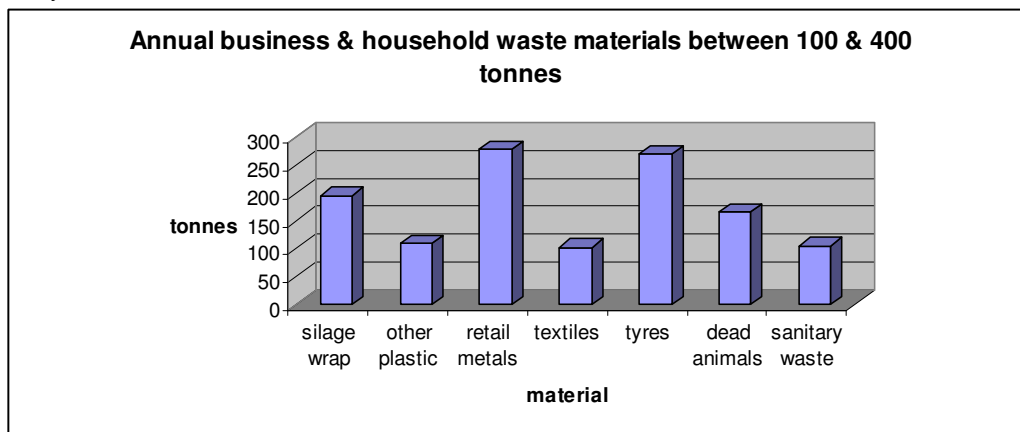
Cardboard may be of interest to local farmers who have expressed an interest in shredding card to produce animal bedding. The main barrier at present is once again regulations, such as waste transfer licenses etc. A scheme could be considered whereby present collectors of cardboard deliver to a number of farms in the valley, card is shredded and sold as an alternative to straw bedding. This would reduce transport of outgoing card and incoming straw. Research needs to be carried out in order to consider the viability of card shredding and its true suitability as animal bedding. A number of organisations within the UK are presently involved in this process. This idea would also need to be discussed with Powys County Council as they have previously expressed an interest in a local collector / user of waste cardboard.

Glass collections are a problem in Powys, as the sorting station which receives the recycling bags from the council are unable to take this material. Some recycling banks exist, but this greatly reduces the number of individuals and businesses recycling glass. Gwynedd county council

collect glass, but this service is only available to householders. Ceredigion have bring banks for householders. A private company in Ceredigion does collect glass from businesses but does not travel as far as the Dyfi Valley. Powys county council have plans to establish a glass collection for local businesses. Possibly the best way forward would be to work with county councils to develop effective collections for both businesses and householders.

Plastics of varying types are increasingly recycled as reprocessing technologies develop. Small scale reprocessing appears uneconomical. As with all other materials, our primary focus here should be on reducing the use of plastics as far as possible. Failing this, plastic recycling can be encouraged through existing schemes and encouraging councils to develop schemes where they do not exist. The Ceredigion Recycling Association are planning on setting up a reprocessing plant in Aberystwyth that would deal with plastic waste. This could provide an outlet for Dyfi Valley plastics in coming years.

Graph 6

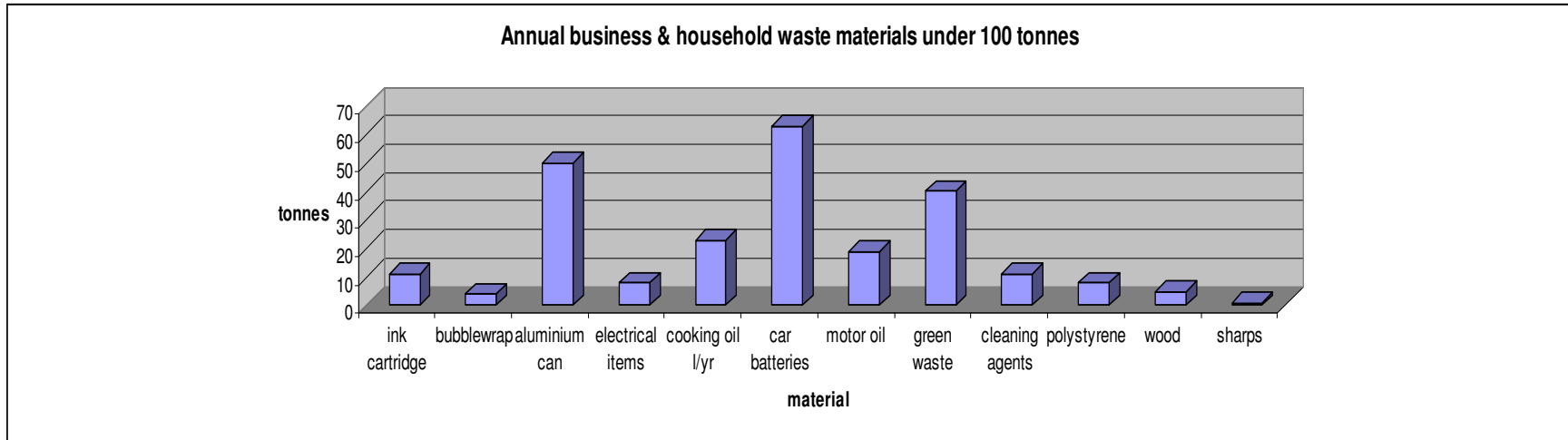


Silage wrap is a major problem for farmers. Farmers are generally low waste producers. In many cases, the silage wrap is the only real waste on small farms. There are presently a small number of collectors, but farmers complain that these collectors are expensive. This is an area that needs to be investigated to find out if a local scheme can be organised to reduce costs. One farmer suggested a collection at Potters Yard, which local farmers would deliver to themselves.

Dead animals are another issue facing local farmers. At present farmers call the fallen stock line and dead stock is transported to a registered

area for disposal. This can often be considerable distances. Emissions could be reduced and potential energy retained locally if it were possible to dispose of these carcasses in a biogas plant along with butchers waste.

Graph 7



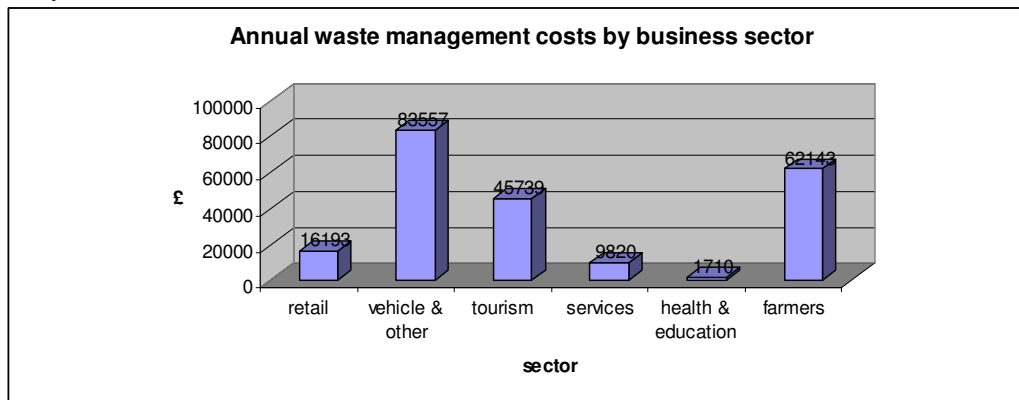
2.2 Miles

There is an average of 27 miles of transport for every waste collection/delivery made from a business (householders not included) to its initial destination. This may be the business operator delivering to Potters yard, a council collection taking waste to landfill in Llanidloes or a specialist collector transporting waste oil to the Midlands.

If needed the collected data (found in spreadsheet 'sector by sector analysis') could be further analysed to gain specific distance to weight and materials ratios.

2.3 Costs analysis

Graph 8



Waste costs will govern how seriously businesses think about the quantity of waste they produce over and above the environmental implications.

Our highest waste disposal costs occur within the 'vehicle and other' sector. These results have been distorted through the inclusion of the local swimming pool within the research. They had high costs for general waste disposal, pool cleaning, waste cooking oil collection and separate special waste collections.

Vehicle related businesses have high waste costs for disposal of oils, tyres and broken engine parts. In many cases, garages stock pile tyres as long as possible to put off collection charges.

Overall, this sector is probably closer to that of tourism than this graph suggests due to the swimming pool distortion.

Farmers have the second largest waste costs while they have the lowest waste tonnage. This is purely down to disposal of dead animals and the high number of farming businesses in the area. These costs could be greatly reduced given a local collection and disposal option.

Tourisms high costs can be attributed largely to caravan parks. Although much of the waste is seasonal, spread over nine months of the year, these sites produce large quantities of household type waste which is collected by local councils or private companies as business waste.

Retail and service sectors have relatively low waste disposal costs. This can be attributed in part to their lower waste tonnage. It may also be attributed to the fact that many of these businesses take advantage of putting out waste on the market day or dropping it to Potters Yard thereby avoiding payment for its disposal.

2.4 General Attitudes and Practices Analysis

We will take questions 1 - 19 as asked in the questionnaire to consider any key issues arising.

Questions to accompany Dyfi valley waste audit questionnaire sheet

1. Who is responsible for managing your waste? You / regional or head office / facility manager / other

In almost every case throughout the sectors, the interviewee was personally responsible for managing their business waste.

2. Do you think you could reduce your waste or recycle more?

Who answered yes?

25% Retail
62% Vehicle & other
67% Tourism
89% Services
60% Health & education
14% Farmers

Both farmers and retailers were not so sure that they could reduce their waste a great deal further.

In the case of farmers, this was because their waste was fairly minimal. The key issue for them being a need for a farm plastics collection service.

Retailers generally thought that they were doing a fairly good job of recycling what they could and didn't think that there was a service available to improve their recycling rates. They were also keen to impress their lack of time & money to invest in recycling initiatives. Looking back at the graphs, it is clear that retailers have the poorest recycling rate & the highest percentage of materials going to landfill. They also produce the third highest annual tonnage across the business sectors studied. While Powys County Council provide a recycling service to local businesses, few of them seem to be aware of it or interested in taking it up. This is an area for investigation.

All other sectors were fairly confident that they could reduce waste & recycle more, given the services to make this possible. Once again, Powys County Council recycling scheme did not appear well publicised or popular.

3. Do you conduct waste audits?

Virtually no-one conducted waste audits. Most people didn't know what a waste audit was and when explained, considered that to be a waste of time. The few that did were from the retail and tourism sector and were required to do so as company policy.

Considering the general business size and type it may not be worth pushing the idea of waste audits as they is unlikely to be much uptake.

4. Do you have an environmental policy?

As above very few did apart from larger companies where it was policy. A lot of businesses did say that their environmental policy was in their attitudes & practices, but not on paper.

5. If so, does it specifically cover waste?

Most people with an environmental policy covered waste.

6. Are there management systems to implement that policy?

Yes in all cases.

**7. Do you re-use, give away or trade any waste?
e.g. cardboard boxes for packing/shredding/composting**

Who answered yes?

31% Retail
38% Vehicle & other
17% Tourism
22% Services
0% Health & education
87% Farmers

Farmers are exceptional re-users given their low incomes and the nature of their work. They produce very little waste and re-use whatever they can.

In health it is understandable that none of their waste is not re-used. However, it is surprising to see so little re-use in the education sector. By far the majority of waste from this sector is shown to be paper. Although most local schools are eco-schools and the majority are recycling, it may be worth impressing the need to re-use more paper within the school before throwing it into the recycling bin.

8. Interested in a free visit from waste/energy advisor (ARENA / Envirowise)?

Approximately 20% of interviewees were interested in this service. The majority seemed to have an idea of the kind of advice they would receive and considered it a waste of their time. There was some negative feedback from groups who were or had been involved in The Green Dragon environmental scheme, who thought it was more paper work than good waste practice. They thought it may be useful within the tourism sector if it was more widely recognised.

Two businesses interviewed had David Bellamy awards for their environmental efforts. These businesses (both tourism) were happy to be involved in this scheme.

9. Interested in More information on the council recycling scheme?

Services and retail were the only sectors that expressed an interest in knowing more about this scheme. Other sectors were either not interested or already knew about the scheme, were involved in it or had chosen not to take part.

Promotions of the trade waste recycling schemes available should be pushed to all sectors with an emphasis on retail and services as these groups have expressed an interest to know more.

10. Interested in KNOWING MORE ABOUT Potters Yard?

Few businesses did not already know of Potters Yard Recycling. Their advertising seems to be more effective than council initiatives. There were a number of complaints that costs for businesses to use the service were being raised to a level that was not reasonable for small businesses.

Potters Yard is generally a very well received service.

11. Interested in helping to form a local business waste forum to share materials, best practice, services etc?

A few percent of those interviewed were interested in joining a waste forum. Overall people did not think that they had the time or interest.

It may be worth discussing this issue further and possibly gathering that few percent to form a business waste forum. Such a group could be useful in gaining first hand knowledge of promoting recycling schemes within the business sector, sharing knowledge and possibly waste materials.

12. Interested in A free waste training event to be run locally?

This was not a particularly popular idea as people were not keen to give up the time. Services, tourism, retail, vehicle and other sectors would be interested in some kind of waste training event. Within these sectors there was still a minority of businesses interested.

13. What subject would you like this training to cover?

All of those that expressed an interest said they would like a training on general recycling.

If this were to be carried out it may be worth running in an evening and combining with general awareness raising to all businesses on council recycling schemes available.

Alternatively, the training could be used to invite key local businesses and specialists to deal with a key issue such as;

Waste oil being recycled into biodiesel.

The establishment of a local farm plastics collection.

Dealing with slaughter house waste from local butchers in a biogas scheme. (Presently 7.5 tonnes a year of offal transported out of country).

Establishment of a scheme to deal with our largest tonnages of local wastes such as card, paper and food waste.

14. Please indicate how interested you would be to reduce your waste costs:

Table 7

% from each sector that would choose the following options;	Retail	Vehicle & other	Tourism	Services	Health & education	Farmers
<i>Remain with present waste management</i>	63	33	10	56	40	29
<i>Make a little effort to reduce costs</i>	47	50	45.5	33	40	71
<i>Make a lot of effort to reduce costs</i>	0	17	45.5	11	20	0

Retailers and the service sector are least likely to make the effort to change their habits to reduce costs and increase recycling rates. This is in conflict with the results that show these two sectors to be most interested in knowing more about council recycling initiatives. Possibly this suggests an emphasis on local recycling services being as simple and cheap to access as is feasible.

The tourism sector is willing to make greatest effort in order to increase recycling rates. The majority of their recyclables are seasonal for nine months of the year and relatively easy to capture within household collection systems or by provision of recycling banks within caravan and holiday parks.

Schools are willing to make a considerable effort to reduce costs and increase recycling rates. Although all local schools are involved in recycling schemes, the emphasis seems to be on classroom waste. Pupils are unaware of other waste such as kitchen waste. There is also little re-use of waste materials within the schools and an even lesser emphasis on refusing and reducing the waste coming into schools. A waste audit or similar project with all local schools involving refusing and reducing waste is needed.

Farmers are willing to make an effort to particularly reduce farm plastic waste. All have expressed a desire for a local collection or drop off points.

The majority of vehicle and other sectors are willing to make some effort to reduce costs and improve recycling. Again the emphasis needs to be on straight forward, cheap services and effective awareness raising about services available.

15. How well do local waste / recycling services serve you?

General feedback was very positive. Businesses were very pleased with general waste collection services although the availability of recycling services was a problem for all sectors.

The following opinions were recorded from each sector;

Retail

All satisfied with services available, especially Potters Yard. One expressed very poor services to businesses in Gwynedd.

Vehicle & other

Ranging from OK to fairly good.

Tourism

Ranging from OK to excellent. Some expressed problem with Borth CA site not taking business waste at all meaning a long drive to Machynlleth.

Services

Ranging from not great to very good. Some expressed poor and expensive business recycling facilities. Some unaware of any business recycling facilities.

Health & education

Ranging from good to very good. Poor facilities for glass recycling. One quoted 'Rubbish compared to Germany, but good for Wales'.

Farmers

Mostly good except for lack of plastics recycling. Also Borth CA site unable to take farm waste.

16. How do you think they could be improved?

Retail

Provide more plastic collection points throughout valley.
More Potters Yard type facilities easily accessible to businesses.
Make recycling services free.

Vehicle & other

Push business recycling schemes.
Make a glass recycling collection to businesses.
Promote waste minimisation above recycling.
Place recycle bins on main streets.
Enforce business recycling.
Make a local cardboard recycle collection.

Tourism

Free business recycling.
Fine non recyclers.
Boxes instead of bag recyclate collections.
More village recycle points.
Keep Potters business service at £15 per year.
Collect glass for recycling.

Services

Collect glass for recycling.
Cheap or free business recycling.
More waste awareness raising.

Health & education

More recycle bins in towns and villages.
Box recyclate collections rather than bags.

Farmers

All expressed need for local plastics collection.
Possible local dead animals' collection to be combined with a local butcher waste project.

17. What incentives would help you to reduce / re-use / recycle more as a business?

Many of the issues raised here are covered under the previous question.
Other issues include;

Pay people to recycle!
Awareness on increased global warming.
Separate recycling boxes in work place.
Awards for best schools and villages recycling.
Knowing what end products are from recyclate.
Tax on packaging.

18. Do you think you can have a positive environmental impact by reducing your waste?

No-one denied that waste reduction could have a positive environmental impact. Some expressed a worry that recyclate was transported across the country for energy intensive reprocessing, so overall may have a negative environmental impact.

19. Are there any other issues you wish to discuss?

We should charge as in Ireland for carrier bags.

Powys county council are threatening to charge charities in future for recycling bags.

There is a huge amount of water waste from the local pool as it is emptied regularly for cleaning. What can we do about this?

Very frustrating that new Potters Yard costs are going up to £105 from £15 a year.

3 Conclusions

3.1 Have we done what we set out to do?

- Map flows of waste materials in the Dyfi Valley

We have basically mapped what materials are transported out of the Dyfi Valley and to where they are transported.

- Identify materials that may be processed & / or marketed locally

We have identified cardboard and food waste as key materials for local reprocessing.

- Identify problems with present waste management / recycling

These have been identified mainly through feedback from interviewees.

- Raise awareness of present recycling opportunities

This has been done via direct discussion with 10% of local businesses.

- Raise awareness of free professional waste minimisation advice for businesses

We have passed on some contacts to Envirowise and the ARENA Network for further help with waste minimisation.

- Establish a local waste database for possible exchange

This has not been realised within the time of the project, but may be possible over the coming year.

- Establish a methodology that can be transferred to other areas

We have gained much experience through our mistakes in the design of this project. We are in a position to advise other groups who wish to carry out similar studies.

3.2 Conclusions on project methodology

Although we had some good pointers from the BRASS research unit at Cardiff University, our project was on a smaller scale with funding to cover only one person working 2 days a week over approximately six months, so the methodology had to be suitable. In fact we still underestimated the size of the job and the time spent far outweighed the funding received.

Creating a business directory from which to begin our project was in itself a big chunk of work. Business directories available from the local councils were either not in existence or badly out of date. We made a number of enquiries to other groups and on line providers, but we were unable to locate a complete up to date local business directory. The creation of our own directory has been a worthwhile project as it will be of use in further work for ecodyfi, local residents and other groups.

Our definition of the analysis sectors was fairly basic and given the final results, we would have been better to break the groups down further to avoid misrepresentation in statistical analysis.

Our initial questionnaire was based on an environment agency questionnaire. This was adapted through trials to arrive at the one seen in appendix 1 and 2. This worked well and could be easily adapted to suit any area or particular waste study.

Having made a number of trials with the interview technique we settled on the phone interview which proved to be very effective. We would advise anyone carrying out a similar project to use only this method.

The spreadsheets became too large and complicated and it would have been more practical to use a database if we had the time or expertise to develop one.

The statistical analysis was carried out with the help of a private company. Given more in organisation time and understanding of statistics we could have made a lot more of this area of the study.

3.3 Conclusions on project results

3.3.1 General trends

As expected, the general trend across all sectors including household is for the majority of waste to be landfilled. The key issues creating this situation are lack of time, awareness, interest, money or access to recycling services. Recycling services are developing relatively quickly, especially within Powys for both householders and businesses.

It was obvious through interviews that the Powys County Council business waste recycling service is very under used. Many people claim to have no knowledge of the service, whilst others do not see any advantage to using this system given the extra time for waste separation and little if any reduction in waste disposal costs.

Householders have the highest overall landfill tonnages when compared to other business sectors, therefore it makes sense to concentrate efforts on reducing household waste and increasing their recycling rates. They also still have a higher annual tonnage when compared to all business sectors combined. (This may not be the case if building trades were to be included within the survey).

Within the business sectors, tourism had the highest landfill tonnages. Recycling facilities and services to caravan parks would be essential in order to reduce landfill in this sector.

Although the retail and service sectors produce less waste annually their waste is less complicated and more easily captured for recycling. There needs to be more promotion and encouragement for local businesses to sign up to the Powys county council scheme. Potters Yard should also

further promoted to local businesses and ideally costs for use of this site should not be raised, but kept to a minimum. This is a great potential asset to local recycling if businesses are not deterred by the council raising entry fees.

Farmers have the highest recycling rate of all sectors, but one of the highest waste costs due to dead animal disposal. It would be a great advantage of the area to develop a biogas unit that could digest these carcasses along with butchers waste. Both dead animals and butchers waste are presently transported a huge distance for disposal. These materials could be a valuable and consistent material for local energy production.

3.3.2 Materials

Our greatest tonnage of waste materials which are all presently transported out of the area (in order of greatest first) are; food waste, paper, cardboard, glass and plastics.

Food waste should be dealt with via home composting and large scale composting. This could include combining this waste with a biogas project. Kestrel Maranta has developed a scheme to deal with the towns food waste, which if successful could be expanded to other areas. Given the huge tonnages of food waste produced, this should take priority in the search for solutions to landfill.

It may be possible to recycle paper locally. This needs research.

Cardboard would be ideal in a large scale composting process. Also it could be shredded by local farmers for animal bedding.

It is unlikely that a local glass recycling industry is viable. We need to work with local councils to ensure that glass recycle collections are developed.

Alongside plastics collections for delivery to Cae Post and awaiting further developments of a reprocessing plant in Aberystwyth, we should be encouraging people and businesses to use less plastics. Working in partnership with local shops and county councils will be essential. Associated with the plastics issue is that of farm plastics. Schemes exist

for collecting farm plastics, but a local affordable collection would encourage farmers to get involved. Ideally something could be negotiated with Potters Yard as a lot of local farmers are already using this facility.

3.3.3 Miles

Very little has been made of the waste mile calculations. We have discussed simply that on average any waste collected is transported 27 miles from collection to initial drop off at landfill or for sorting prior to recycling.

3.3.4 Disposal costs

Our greatest waste disposal costs in the Valley include; vehicle accessories, tourists waste and dead animals on farm.

In terms of vehicle waste it may be worth local vehicle businesses getting together to see how they could reduce costs through combined collections or searching for local re-use options.

Tourism waste costs could be dealt with by on site composting and recycling facilities. Whilst recycling facilities may be expensive to set up they would reduce overall waste disposal costs in the long term. If materials were separated on site, recycle collectors may be willing to collect certain materials freely, or pay for them in the case of aluminium cans. Combined with on-site composting, this could greatly reduce the tonnage of weekly waste collections.

3.3.5 Attitudes and practices

The majority of business sectors believed that they could reduce their waste given relevant recycling services. Farmers did not consider themselves to have a big waste problem aside from plastics. Retailers however have poor recycling rates, high landfill tonnage and many have recycling services available from Powys county council but they are still not confident that they can reduce their waste. A clear incentive needs to be provided to this group to show that it is worthwhile economically for them to recycle. This could come through reduced price recycling,

free or cheap access to Potters Yard or alternatively recycling will not to be made obligatory.

There was shown to be little re-use of waste materials within the education sector which is surprising given that many of the schools are ecoschools. This may be a misrepresentation somehow within the data collection, but this is worthwhile following up and working with local schools to re-use more of their waste which is largely paper.

Considering who is most likely to change their attitudes, this research suggests that the schools and the tourism sector are most likely to make an effort. However, service and retail sectors have services available which they need to be persuaded into using. Farmers have no option to oblige given new farm waste regulations, but will need help with plastic schemes given their financial constraints.

Businesses were generally very satisfied with waste services, particularly within Powys. They had a great number of suggestions for improvement of which the main points included provision of more recycling services, reducing costs of recycling, retaining cheap access to Potters Yard, making a glass collection and promoting present recycling services.

4 Key points for further action

- Gather individuals for a meeting who expressed an interest in forming a local business waste forum to share materials, best practice etc.
- Organise a training/research event with remaining £500 of Glasu funds to cover one or a number of the following;
 1. general recycling services and best practice - aimed at services, retail, tourism, vehicle and other sectors
 2. waste oil reprocessing to biodiesel
 3. establishment of local farm plastics collection
 4. local biogas schemes to digest slaughterhouse waste, food waste, dead animals, cardboard and paper
 5. establishment of schemes to deal with our three highest tonnage wastes - card, paper and food.
- Develop recycling collection systems in caravan parks and holiday villages.
- Work with schools to emphasise refusing, reduction and re-use above recycling. Widen their view of waste to the whole school, rather than just the classroom. The happy bin project may cover this.
- Develop a local farm waste plastics collection, possibly via Potters Yard.
- Promote local business recycling services especially to service and retail sectors.
- Discuss the possibility of keeping Potters Yard free or at a minimum entry cost to local businesses.
- Retain free recycling for charities via Powys county council.
- Investigate options for reducing water waste at Bro Ddyfi Leisure centre.

APPENDICES

Appendix 1 - Final questionnaire sheet format

Dyfi valley waste audit interview sheet

Audit code	County	Date	SIC	PH/PO/PE/TR	Name	FT	PT	What your business does	
Container type			No. / yr (size if applicable)			Other info			
Material	Container	No. containers / yr	% space	R/L/O	Contractor	Cost/inc/yr £	1 st destin	Final destin	

Questions 1 – 12

1	2	3	4	5	6	7	8	9	10	11	12

Questions 13 – 19

13
14
15
16
17
18
19

Appendix 2 –

Questions to accompany Dyfi valley waste audit questionnaire sheet

20. Who is responsible for managing your waste? You / regional or head office / facility manager / other
0 = you
1 = regional manager
2 = on site manager
3 = other
21. Do you think you could reduce your waste or recycle more?
0 = no
1 = yes
2 = interested
22. Do you conduct waste audits - IF NO GO TO Q7
0 = no
1 = yes
2 = interested
23. Do you have an environmental policy?
0 = no
1 = yes
2 = interested
24. If so, does it specifically cover waste?
0 = no
1 = yes
2 = interested
25. Are there management systems to implement that policy?
0 = no
1 = yes
2 = interested
26. Do you re-use, give away or trade any waste?
e.g. cardboard boxes for packing/shredding/composting
0 = no
1 = yes
2 = interested
27. Interested in A free visit from waste/energy advisor (ARENA / Envirowise)?
0 = no
1 = yes

28. Interested in More information on the council recycling scheme?
 0 = no
 1 = yes
29. Interested in KNOWING MORE ABOUT Potters Yard?
 0 = no
 1 = yes
30. Interested in helping to form a local business waste forum to share materials, best practice, services etc?
 0 = no
 1 = yes
31. Interested in A free waste training event to be run locally?
 0 = no
 1 = yes
32. What subject?
33. Please indicate how interested you would be to reduce your waste:
 Remain with present waste management 0
 Make a little effort to reduce costs 1
 Make a lot of effort to reduce costs 2
34. How well do local waste / recycling services serve you?
35. How do you think they could be improved?
36. What incentives would help you to reduce / re-use / recycle more as a business?
37. Do you think you can have a positive environmental impact by reducing your waste?
38. Are there any other issues you wish to discuss?

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