Material change for a better environment

Environment Agency

Waste Protocols Project

Gypsum

Partial Financial Impact Assessment of a Quality Protocol for the production and use of gypsum from waste plasterboard

Contents

Objective

This high level impact assessment focuses on the financial costs and benefits of the Quality Protocol to those involved in the supply of gypsum from waste plasterboard. It excludes social and environmental impacts with the exception of carbon dioxide emissions. The analysis examines only the financial costs and benefits to the producers, reprocessors and users of the waste. It does not consider the impact on those involved in the supply of virgin or other secondary materials.

1.0 The Market for Gypsum from Waste Plasterboard

1.1 Arisings of gypsum

1.1.1 The four main arisings of gypsum in the UK are:

- natural gypsum – mainly from underground mining;
- synthetic gypsum – a by-product of industrial processes;
- imports of natural and synthetic gypsum; and
- gypsum from waste plasterboard.

1.1.2 **Natural gypsum**. British Gypsum Ltd is the only company mining natural gypsum in the UK. It has six underground mines and one opencast mine. Data reported by the British Geological Society (BGS) indicate a 61 per cent reduction in the area of underground gypsum mines between 1994 and 2000 [1]. Additional demand is likely to be met by synthetic gypsum supplies or imports. Table 1 shows the estimated quantities of reserves left in the mines and quarries in the UK. Although this table is not complete, it suggests that supplies of natural gypsum available in the UK are over 57 million tonnes (Mt) (i.e. sufficient for 30+ years).

Table 1: Reserves of natural gypsum in the UK

Site name	Location	Reserves (Mt)	Reference
Barrow Mine	East Leake, Loughborough	18–19	• BGS Mineral Planning Factsheet • Nottingham County Council website
Marblaegis Mine	Nottinghamshire	4	• BGS Mineral Planning Factsheet
Fauld Mine	Staffordshire	4	• BGS Mineral Planning Factsheet
Newbiggin	Kirkby Thore	Not known	• BGS Mineral Planning Factsheet
Birkshead	Kirkby Thore	6	• BGS Mineral Planning Factsheet
Brightling	East Sussex	15–20	• BGS Mineral Planning Factsheet • East Sussex and Brighton & Hove Mineral Local Plan
Kilvington Quarry	Newark	10 (only half has planning permission for extraction)	• BGS Mineral Planning Factsheet • Nottinghamshire County Council website
Bantycock Quarry	Newark	Predicted stores until 2015	• Nottinghamshire County Council website
Total		**>57**	

Source: WRAP, 2006 [2]

1.1.3 **Synthetic gypsum**. There are a number of types of synthetic gypsum including:

- desulphogypsum;
- titanogypsum; and
- fluorogypsum.

1.1.4 Knauf Drywall has reported that it costs around £30–40 per tonne to import synthetic gypsum from Brindese in Italy compared with the cost of £5–10 per tonne for synthetic gypsum sourced in the UK [3].

1.1.5 Desulphogypsum (DSG) is the most commonly used synthetic gypsum in the UK. DSG is formed as a by-product when sulphur dioxide (SO_2) is removed from the flue gases of large combustion plants using flue gas desulphurisation (FGD) technology. The technology has also been used in UK power plants in response to the requirement under the EC Large Combustion Plant Directive (LCPD) to reduce total sulphur dioxide emissions. With FGD technology, it is possible for DSG to have purity levels of 96 per cent compared with 80 per cent for natural gypsum from the UK [2].

1.1.6 Table 2 lists UK large combustion plants and indicates whether they have FGD technology, plans to obtain FGD technology, or are opting out of the need to comply with the LCPD by closing (sites will be allowed to operate for a maximum of 20,000 hours after January 2008).

1.1.7 Table 2 also shows the total estimated annual DSG arisings for all plants with FGD technology. However, this figure should be treated with caution as it has been calculated using an average of gypsum produced from existing FGD plants per GWe, which will vary according to the technology and fuels being used.

Table 2: UK Combustion plants and their potential annual desulphogypsum arisings* [4, 5]

Station	Operator	Capacity (GWe)	FGD (as % of capacity)	Gypsum arising (+estimated)	Stage
Aberthaw	RWE Npower	1.5	100	0.25 Mt	Granted consent
Didcot		2.0			Will close
Fawley		0.5			Will close
Littlebrook		1.4			Will close
Tilbury		1.1			Will close
Grain	E.ON	1.3			Will close
Kingsnorth		2.0			Will close
Ratcliffe		2.0	100	0.35 Mt	Complete
Ironbridge		1.0			Will close
Rugeley	International Power	1.0	100	0.2 Mt	Planned
Cottam	EDF	2.0	100	0.35 Mt	Complete by the end of 2007
West Burton		2.0	50	0.4 Mt	Complete
Ferrybridge	Scottish & Southern Energy	2.0	100	0.2 Mt	Complete by early 2008
Fiddler's Ferry		2.0	50	0.35 Mt	Complete by early 2008
Eggborough	British Energy	2.0	100	0.2 Mt	Complete
Drax	Drax Power	3.9	100	0.65 Mt	Complete
Uskmouth	Uskmouth Power Company	0.4	100	0.1 Mt	Complete
Total estimated gypsum arisings = 3.05 Mt					

*Additional desulphogypsum supply was calculated using existing plant data showing that, on average, each gigawatt of FGD applied capacity produces approximately 0.175 Mtpa of gypsum. This figure should be viewed with caution due to varying technology and fuel used.

1.1.8 Titanogypsum is a by-product from the manufacture of titanium dioxide. UK titanogypsum production is approximately 0.48 million tonnes per annum (Mtpa).

1.1.9 Fluorogypsum is a by-product from the manufacture of hydrofluoric acid from fluorspar and sulphuric acid. Hydrofluoric acid is used in a number of different industries including the manufacture of products containing fluorinated organic compounds such as teflon and refrigerants. The current UK production of fluorogypsum is approximately 0.04 Mtpa [2].

1.1.10 **Imported gypsum**. Levels of gypsum imported into the UK have risen since the 1980s. In 2004, imports were reported by the British Geological Survey to be 800,000 tonnes [6], though import figures from different sources vary. The main supplying countries are Germany and Spain.

1.1.11 **Gypsum from waste plasterboard**. In general, the recycling process for gypsum involves the removal of non-gypsum materials (e.g. metals and plastics) from the gypsum waste stream accepted by the recycler. Any paper liners are then removed from the gypsum core before the gypsum is processed into powder form and transported back to manufacturers. Gypsum recycling in the UK in 2007 by specialist recyclers was estimated at 131,600 tonnes [7].

1.1.12 Recovered gypsum is defined as a gypsum waste that has been collected to be reused, whereas gypsum from waste plasterboard is the product produced from processing recovered gypsum.

1.1.13 **Waste gypsum – other sources**. Phosphoric gypsum is a source of waste gypsum that could be recovered from the monocell landfill where it is stored. There are currently 300,000 tonnes of phosphoric gypsum in one monocell and other sites are being identified. This source of gypsum is not included in the analysis as the Quality Protocol will not affect this material.

1.2 Uses of gypsum

1.2.1 The main uses of gypsum are:

- in plasterboard and plaster;
- in cement; and
- as a soil improver.

1.2.2 **Plasterboard**. There are three main plasterboard manufacturers in the UK:

- British Gypsum (part of the multi-national company BPB);
- Lafarge Plasterboard; and
- Knauf Drywall.

1.2.3 British Gypsum controls the majority of the plasterboard market, with a 58 per cent market share in the UK. British Gypsum is also the market leader in bagged gypsum. As mentioned above, British Gypsum is the only company that extracts natural gypsum in the UK. Lafarge and Knauf Drywall each control 21 per cent of the plasterboard market in the UK [2].

1.2.4 Lafarge's manufacturing plant in Bristol uses imported natural gypsum supplemented with a quantity of gypsum from waste plasterboard. Lafarge also has a factory at Ferrybridge in Yorkshire, which uses the DSG from the Cottam and Ferrybridge power stations. The Ferrybridge site also processes and recycles gypsum from waste plasterboard.

1.2.5 Table 3 shows the location and capacity of the sites operated by the three UK plasterboard manufacturers in 2004. Additional sites have since come online (Sherburn and Ferrybridge).

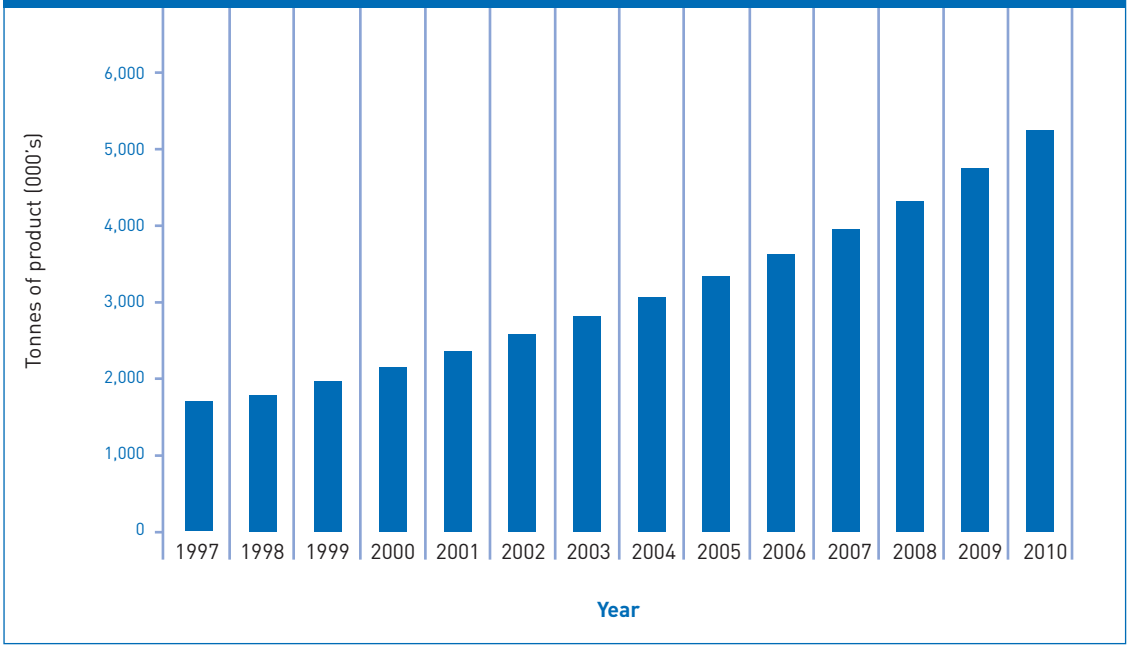
Table 3: Location and estimated annual gypsum throughput capacity of UK plasterboard plants, 2004

Company	Location	Plant	Capacity (mm^2/year) [8]	Capacity (Mtpa)*
British Gypsum	Penrith, Cumbria	Kirkby Thore Line 1	21.1	0.19
		Kirkby Thore Line 2	39.2	0.35
	Loughborough, Leicestershire	East Leake Line 1	31.4	0.28
		East Leake Line 2	39.2	0.35
	Robertsbridge, East Sussex	Robertsbridge	39.2	0.35
Approximate total			**170.1**	**1.52**
Knauf Drywall	Immingham, Lincolnshire	Immingham	27.9	0.25
	Sittingbourne, Kent	Sittingbourne	48.0	0.43
Approximate total			**75.9**	**0.68**
Lafarge	Bristol, Avon	Bristol Line 1	29.1	0.26
		Bristol Line 2	21.7	0.20
Approximate total			**50.8**	**0.46**
Approximate overall total			**296.8**	**~2.7**

* Assuming plank 15mm plasterboard, 9kg/m^2 average. These figures were calculated from annual figures provided by National Statistics for construction, housing, commercial building and population growth rates.

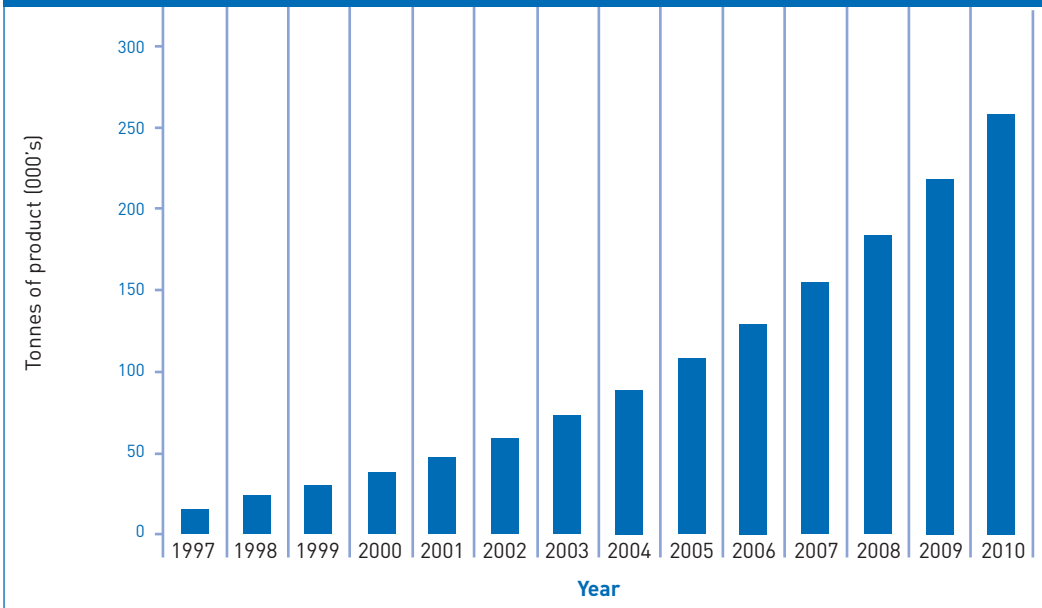
1.2.6 Figures 1 and 2 show projected demand for gypsum in the production of plasterboard (with and without facing) for the UK market. The graphs are based upon predicted household growth and recent trends in the plasterboard industry [9].

Figure 1: Projected UK gypsum demand for plasterboard with facing [2]



1.2.7 The trend for plasterboard 'with facing' (Figure 1) is one of significant growth. The quantity of gypsum supplied as plasterboard with facing is expected to increase from approximately 3 Mtpa in 2004 to over 5 Mtpa in 2010 (i.e. an increase of 66 per cent).

Figure 2: Projected gypsum demand for plasterboard (without facing) [2]

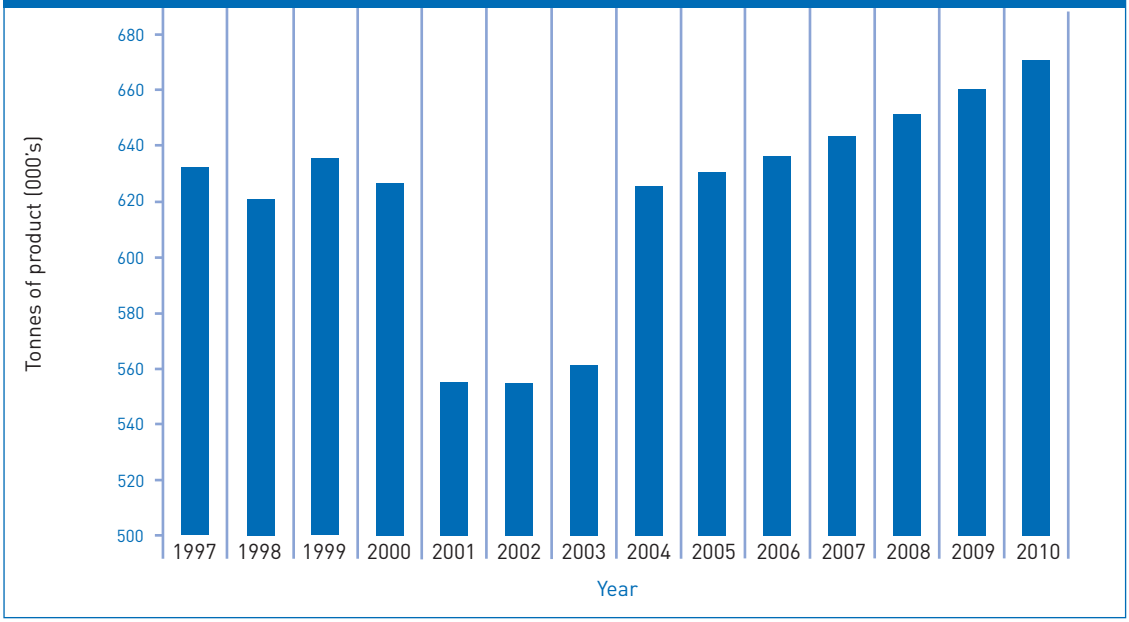


1.2.8 The trend for plasterboard without facing (Figure 2) shows significant growth in gypsum demand, increasing from approximately 0.1 Mtpa in 2004 to approximately 0.25 Mtpa in 2010. However, the increase of 0.15 Mtpa for plasterboard without facing is small compared with the additional 2 Mtpa predicted for plasterboard with facing.

1.2.9 **Cement.** The production of cement involves burning of limestone or chalk with finely ground clay or sand in a kiln to produce clinker. Gypsum is added to the clinker to control the rate at which the cement sets and to strengthen the final product. The end product contains 5 per cent gypsum. The cement industry uses approximately 0.6 Mtpa of gypsum [6].

1.2.10 Figure 3 shows the projected use of gypsum in cement in the UK market. The projection is based on predicted housing growth and recent trends in the plasterboard industry [9].

Figure 3: Predicted UK use of gypsum in cement



1.2.11 The predicted growth in the cement industry is more steady than that of the plasterboard industry. The quantity of gypsum supplied for cement manufacture is expected to increase by 8 per cent from approximately 0.63 Mtpa in 2005 to 0.68 Mtpa by 2010 [2].

1.2.12 **Soil improver**. Gypsum is used in the agricultural sector as a soil conditioner. Gypsum is thought to help to restore calcium and sulphur deficiencies, and to improve plant uptake of inorganic nitrogen fertiliser. Virgin natural gypsum has traditionally been used but, in recent years, farmers have looked for alternatives as use of natural gypsum has not been cost-effective. The cost of buying synthetic gypsum to spread on land costs £16 per tonne and about three tonnes is required per hectare. This gives a total of £59 per hectare including the cost of an Environmental Permit.[1] Agricultural gypsum (mined gypsum) in small bags can cost £80–90 per tonne [10].

1.2.13 Because gypsum from waste plasterboard is currently classed as a waste, farmers wanting to spread it on their land need to obtain an exemption from the need for an Environmental Permit from the Environment Agency. Registering a waste management licence exemption under Paragraph 7A cost £546 in 2007/08; there is no guarantee of permission being granted and no refunds are given if permission is not granted. The exemption can be used for up to a maximum of 50 hectares of land and a further exemption must be applied for if spreading to additional land.

1 The Environmental Permitting Regulations (England and Wales) 2007, which came into force in April 2008, combined the Pollution Prevention Control (PPC) and Waste Management Licensing (WML) regimes into a single regulatory framework.

1.3 Recycling and key markets for gypsum from waste plasterboard

1.3.1 The main waste plasterboard recyclers currently operating in the UK are listed below. In addition, there are a number of small independent companies.

- Coast to Coast Recycling Ltd;
- Gypsum Recycling UK Ltd;
- Mid UK Recycling Ltd;
- New West Gypsum Recycling (UK) Ltd;
- Roy Hatfield Ltd;
- Recyclet Ltd;
- British Gypsum – Waste Cycle Ltd & Bywaters UK Ltd;
- Knauf Recycling.

1.3.2 The amount of plasterboard entering the waste stream each year is estimated to be 300,000–450,000 tonnes per year from construction and 800,000–1,300,000 tonnes per year from demolition [11].

1.3.3 Therefore there is a readily available supply of waste plasterboard to fill the spare capacity identified at plasterboard recycling plants. The estimated annual capacity of UK plants to recycle waste plasterboard to produce gypsum is currently 525,000 tonnes [7].

1.3.4 A study by WRAP (Waste and Resources Action Programme) in 2006 [2] stated that the reason why gypsum recycling plants were not reaching their capacity was due to the inconsistent amounts of plasterboard waste being received. Possible reasons for this are highlighted below under 'Barriers'.

1.3.5 Plasterboard waste that is not recovered is sent to landfill. Plasterboard/gypsum products are a high sulphate waste and, by law, have to be sent to a monocell landfill. But if the total sulphate content of mixed waste is less than 10 per cent (the so-called '10 per cent rule'), it can be sent to a non-hazardous landfill and does not have to be segregated into specific cells (see Appendix B). However, from April 2009 the '10 per cent rule' will no longer apply, with the Environment Agency announcing in November 2008 that all gypsum waste (including plasterboard) should not be landfilled with biodegradable waste.

1.3.6 The gate fee for sending plasterboard/gypsum waste to a monocell landfill is in the region of £90–£135 per tonne [3]. The cost of sending plasterboard/gypsum waste to a non-hazardous landfill under the 10 per cent rule is only £15–£35 per tonne plus landfill tax. Landfill tax will rise to £48 per tonne in 2010/11.

1.4 Alternative markets

1.4.1 In addition to the three main markets (plasterboard and plaster, cement, soil improvers), possible alternative markets for gypsum from waste plasterboard include:

- manufacture of construction products;
- manufacture of growing media;
- soil stabilisation and binding;
- clarifying aquatic environments; and
- absorbent for liquid spills.

1.5 Constraints and opportunities for growth in end markets

Opportunities

1.5.1 Higher demand for plasterboard and hence increased demand for gypsum could result in higher prices for natural and synthetic gypsum. Higher prices could therefore make gypsum from waste plasterboard more economically feasible to the plasterboard industry. It is this higher demand that the Financial Impact Assessment (FIA) model has been based on, and it should be noted that the model does not take into account the temporary downturn of the construction industry.

1.5.2 Plasterboard production in the UK is believed to be rising by 3–4 per cent per year. In 2000, UK consumption of plasterboard was 388 Mm^2 (3.5 Mtpa). This is expected to nearly double by 2020 to 768 Mm^2 (6.9Mtpa)[2] as a result of the predicted increase in housing construction rate[3] [12]. The financial impact assessment (FIA) model based on these assumptions does not take into account the temporary current downturn in the construction industry.

1.5.3 Changes in UK building practice have also resulted in increasing demand for gypsum because thicker plasterboard products are needed to meet statutory fireproofing and sound insulation requirements. The percentage of gypsum used is expected to increase because of this legislation, but there are no data to support this increase and therefore it was not included in the FIA model.

1.5.4 Based on predicted household growth, it is estimated that the quantity of gypsum supplied to the plasterboard industry will increase by 10 per cent from just under 1 Mtpa in 2004 to close to 1.1 Mtpa in 2010.

1.5.5 The quantity supplied to the cement industry is expected to increase by 8 per cent from approximately 630,000 tonnes per year in 2005 to 680,000 tonnes per year by 2010. This estimate is based on predicted household growth and trends in the plasterboard industry [2].

1.5.6 Uncertainty exists in the supply of desulphogypsum.

- With greater amounts of low sulphur coal being used, the quantity of gypsum produced by FGD will be less.
- A longer term uncertainty is that alternative power sources (e.g. nuclear power) may become more dominant in the UK, resulting in DSG supplies gradually falling.

1.5.7 Demand for alternative supplies of gypsum such as gypsum from waste plasterboard may therefore increase. In the shorter term, however, the Large Combustion Plant Directive requires such plants to meet emission limit values and therefore a number of plants are in the process of installing FGD technology. This will increase the quantity of DSG as estimated in Table 2.

1.5.8 At a substitution rate of (only) 10 per cent gypsum from waste plasterboard into plasterboard manufacture, the demand predicted for gypsum from waste plasterboard is 0.4 Mtpa in 2010. However, the maximum amount of gypsum from waste plasterboard that can be incorporated into new plasterboard for commercial viability is considered to be 20–25 per cent, though incorporation of up to 40 per cent gypsum from waste plasterboard has been successfully tested [13].

1.5.9 Improved infrastructure (e.g. additional investment in collection bins and skips, transfer and bulking stations, and recycling machinery) could increase the plasterboard recycling industry's ability to provide sufficient material of the required quality.

1.5.10 The 2006 report by Oakdene Hollins for the Federation of Plastering and Drywall Contractors [3] stated that the difficulty in obtaining a waste management licence was one of the barriers to increased plasterboard reprocessing capacity. The difficulties cited in the report were the time it takes to obtain a licence being prohibitive and the inconsistent guidance provided during the licence application. The Quality Protocol presents an opportunity to remove this barrier.

1.5.11 The statutory requirement in England since April 2008 for Site Waste Management Plans for construction projects over £300,000 is also expected to encourage plasterboard recycling.

2 Assuming plank 15mm plasterboard, 9kg/m^2 average assumption. These figures have been calculated from annual figures provided by National Statistics for construction statistics, and housing, commercial building and population growth rates [9].

3 The values in paragraph 1.5.1 are inconsistent with Figures 1 and 2. Either Figures 1 and 2 or paragraph 1.5.1 will be updated if a new source of data can be found. The values from the Roskill report [12] have been used as this provides predictions to 2020 (required for the FIA model).

1.5.12 In addition, there has been a EU requirement since November 2007 under the Landfill Directive for all waste destined for landfill to be pre-treated. According to the Environment Agency, suitable treatments meeting the three-point test under this legislation include segregation/sorting for recycling, or monocell disposal. Given the difficulty and expense of the latter option, it is hoped that recycling will be increasingly the preferred route. Environment Agency guidance on pre-treatment can be found on their website at http://publications.environment-agency.gov.uk/pdf/GEHO0507BMQM-e-e.pdf

Barriers

1.5.13 Plasterboard manufacturers using desulphogypsum and natural gypsum require tight control of the particle size and contamination levels of gypsum from waste plasterboard.

1.5.14 There are relatively good supplies of both UK sourced and imported mined and synthetic gypsum, which compete with gypsum from waste plasterboard in terms of sales of gypsum to the plasterboard sector.

1.5.15 In general, demolition waste is seen as a less desirable source of gypsum from waste plasterboard compared with construction waste because:

- demolition practice often makes effective segregation impossible;
- contaminant levels may be high, resulting in the gypsum from waste plasterboard being difficult to quality assure; and
- the quantity of recovered waste plasterboard from demolition can be erratic:
  - the older buildings usually being demolished do not contain plasterboard; and
  - older plasterboard may be of lower quality gypsum than currently required.

However, it is these issues that a Quality Protocol is intended to address.

1.5.16 In England and Wales, Environment Agency guidance allowed the deposit of waste loads with up to 10 per cent sulphate content with other biodegradable wastes (10 per cent rule) – see Appendix B for more details. This guidance appears to have hindered the anticipated increase in availability of segregated gypsum wastes to recyclers by effectively allowing continued mixed landfilling of plasterboard waste. Given the availability of lower cost mixed landfill sites, it is likely that the majority of the estimated 1 Mtpa of gypsum being landfilled in the UK at present will continue to be landfilled rather than segregated for either monocell disposal or for recycling (provided landfilling remains the most cost-effective route) [2]. It should be noted though that a recent change in legislation will mean that the '10 per cent rule' no longer exists after April 2009, with gypsum waste having to be disposed of separately to biodegradable waste.

1.5.17 Large-scale production plants of the type found in the plasterboard sector require the availability of raw material on a sufficient scale and in consistent supply. The current relatively small quantities of post-consumer gypsum (i.e. not desulphogypsum) recovered only partially meet these requirements. This amount is highly influenced by factors affecting diversion from landfill such as the continued availability of low-cost landfilling of gypsum wastes possible under the '10 per cent rule'.

2.0 Methodology and Options

The options to be assessed within the financial impact assessment are:

- Option A – Business As Usual (BAU); or
- Option B – Introduce the Quality Protocol.

2.1 Option A – 'Business As Usual (BAU)'

2.1.1 This is the baseline. Under this option, no Quality Protocol would be introduced and the current situation with respect to waste management controls on gypsum from waste plasterboard would remain.

2.1.2 There would continue to be uncertainty among some purchasers over the point at which gypsum from waste plasterboard ceases to be waste. Gypsum from waste plasterboard would still be classified as waste, resulting in buyers still needing to comply with waste management controls. The market would continue to be constrained to some extent.

Assumptions used in Option A (baseline)

2.1.3 Supply

- The supply of DSG is based on the current energy output of the combustion plants. It does not take into account changes in fuel type (e.g. introduction of low sulphur coal) or any decrease/increase in future coal use. It also assumes that the number of combustion plants will remain constant until 2020.
- The supply of titanogypsum and fluorogypsum is based on current figures as little is known about the changes in supply from these sources.
- The current supply of gypsum from waste plasterboard originates from 75 per cent construction waste and 25 per cent demolition waste.
- For plasterboard an average mass of 9kg/m^2 was assumed. This figure was calculated from annual figures provided by National Statistics for construction statistics and housing, commercial building and population growth rates. This assumption is necessary to calculate the social cost of carbon dioxide emissions, though not the financial analysis.
- The supply level for synthetic and natural gypsum will not change with time. Any increase in gypsum demand not met by gypsum from waste plasterboard will be met by other gypsum sources. Sources show no increase in natural gypsum mining over recent years and no data were available on the future supply of synthetic gypsum.

2.1.4 Demand

- The demand for plasterboard will increase by 3.5 per cent per year throughout the assessment period. This assumption is based on the data provided by the Roskill report [12].
- The demand for cement will increase by 1.5 per cent per year throughout the assessment period. This assumption is based on data provided by the WRAP 2006 study [2].
- As part of the voluntary Ashdown Agreement,[4] UK plasterboard manufacturers have signed up to a target to recycle 50 per cent of waste plasterboard by 2010. Taking this into account together with the expected increase in recycling by independent recyclers, a recycling rate of 50 per cent for construction plasterboard waste was assumed for 2010.
- Recycling of construction waste will increase to 70 per cent by 2020.
- The quantity of gypsum applied to land will not be less than 25,000 tonnes per year (i.e. current demand). This demand will grow to 35,000 tonnes per year by 2020.

4 http://www.wrap.org.uk/wrap_corporate/news/industry.html

- Based on information provided at the Technical Advisory Group (TAG) meeting on 20 August 2007, it was assumed that 90 per cent of the gypsum applied to land will come from supplies of mined supplies and the other 10 per cent will come from supplies of gypsum from waste plasterboard.
- There will be no increase in demand for gypsum from other applications between 2007 and 2020. In addition, none of the gypsum used in other applications will be sourced from gypsum from waste plasterboard.
- There will be an increase in the demand for cement and hence an increase in demand for gypsum. It is assumed that 2 per cent of the gypsum used in cement is currently from waste plasterboard and this will increase to 20 per cent by 2020. These values are estimates verified by the TAG.

2.1.5 Costs

- Marketing the sale of gypsum from waste plasterboard will require one employee per recycling site. One employee working full-time will be paid approximately £20,000 and will have an expenses allowance for marketing of £5,000. These figures include employers' National Insurance contributions and other non-salary costs.
- There are no forecast data for the gate fee for monocell or non-hazardous landfill (suggested by Defra's partial RIA of the Waste Strategy). Therefore it was assumed this will not increase between 2007 and 2020.

2.2 Option B – Introduce the Quality Protocol

2.2.1 See the Quality Protocol for details.

2.2.2 The Quality Protocol will be voluntary. If recyclers do not comply, their gypsum from waste plasterboard will still be waste and their buyers will need to comply with waste management controls.

Assumptions used in Option B

2.2.3 Supply

- The same assumptions as in paragraph 2.1.3 apply.
- The amount of construction and demolition plasterboard recycled will increase by 10 per cent by 2020 due to higher market demand for gypsum from waste plasterboard.
- The price of gypsum from waste plasterboard will not change. Due to the availability of other sources, it will stay the same as in the baseline.

2.2.4 Demand

- The assumptions made with regard to the demand for plasterboard and cement as in paragraph 2.1.4 apply.
- As in the baseline scenario, a recycling rate of 50 per cent for construction plasterboard waste was assumed for 2010. The recycling rate will be 10 per cent higher in 2020 under the Quality Protocol scenario than in the baseline because of increased demand for gypsum from waste plasterboard.
- As in the baseline scenario, the quantity of gypsum applied to land will not be less than 25,000 tonnes per year (i.e. current demand). In the Quality Protocol scenario, demand will grow to 40,000 tonnes per year by 2020. This increase of 15,000 tonnes per year assumes that marketing will encourage the re-introduction of gypsum application to land instead of the alternative land conditioners currently leading the market. This marketing effort will focus on Quality Protocol gypsum from waste plasterboard.

- Any increase in gypsum application from land will come from Quality Protocol gypsum from waste plasterboard and not from mined gypsum. The introduction of the Quality Protocol and the marketing effort will result in a shift from the present 90:10 split between mined and gypsum from waste plasterboard to a 75:25 split by 2020.
- The demand for gypsum for 'other uses' will double from 50,000 tonnes to 100,000 tonnes per year by 2020 as a result of improved quality assurance.
- The gypsum from waste plasterboard used in 'other uses' with the introduction of the Quality Protocol will increase from zero to 25 per cent by 2020.

2.2.5 Costs

- The same assumptions as in paragraph 2.1.5 will apply.
- There will be an additional cost at the segregation and processing stage for recovered gypsum. Infrastructure such as bins will need to be put in place at the segregation stage and some kind of inspection will be needed at the processing stage to check the gypsum from waste plasterboard complies with the Quality Protocol.
- The Quality Protocol will be marketed in some way and therefore the marketing costs for gypsum recyclers will fall by 50 per cent by 2020.
- The price of gypsum from waste plasterboard will stay the same between the baseline and the Quality Protocol scenarios. There is no evidence of a shortage in supply of other gypsum sources and therefore the price of gypsum from waste plasterboard will need to stay competitive.
- There will be no additional cost to make gypsum from waste plasterboard Quality Protocol compliant. The Quality Protocol is based on a Publicly Available Specification (PAS) standard that will be adopted by the industry even in the absence of the Protocol. However, to comply with the Quality Protocol, recyclers are expected to carry out compositional tests to prove that their output complies with the PAS. Tests are required for every 1,000 tonnes produced or every three months, whichever is sooner. The cost of tests is estimated to be £32 + VAT. On the advice of the TAG, we assume that all producers process more than 1,000 tonnes every three months, leading to an estimated testing cost of 3.76 pence per tonne.

2.3 Methodology

2.3.1 The method for assessing the financial impact of the Quality Protocol for gypsum from waste plasterboard involves comparing Option A with Option B.

2.3.2 The quantifiable benefits and costs of the Quality Protocol were calculated for each year over a 10-year assessment period. They were then discounted at 3.5 per cent (following HM Treasury Green Book guidance[5]) and summed to provide the total present value benefit or cost. Landfill tax costs as a set price were deflated at Treasury projections of inflation. Costs for climate change benefits are based on the Shadow Price of Carbon (SPC) as set out in Defra guidance[6] at £25.50 and inflated at 2 per cent per year.

5 The Green Book. Appraisal and evaluation in central government. 3rd edn. HM Treasury, 2003. Available from: http://greenbook.treasury.gov.uk/

6 How to use the Shadow Price of Carbon in policy appraisal. Interim Guidance, Defra, 2007. Available from: http://www.defra.gov.uk/environment/climatechange/research/carboncost/index.htm

2.3.3 For example, the annual additional total market value attributable to the Quality Protocol was calculated by subtracting the annual total market value[7] for Option A from the annual market value for Option B. This was repeated for each year over the 10-year assessment period. These additional market values were then discounted (using 3.5 per cent) and summed to provide the increase in market value as a result of the Quality Protocol. This produced an overestimate of the benefits. The true benefits are the increase in profits, but it was not possible to estimate this increase for reasons of confidentiality.

2.3.4 The reduction in the cost of complying with waste management controls as a consequence of the Quality Protocol was calculated by subtracting the annual total compliance cost in Option B from that in Option A. The annual net compliance costs were then discounted and summed to provide the total benefit of the Quality Protocol.

2.3.5 The estimates are an underestimate because the benefits could continue beyond the 10-year assessment period.

Consultation

2.3.6 The Technical Advisory Group and wider industry (as appropriate) were contacted to gain a better understanding of the impacts of the Quality Protocol. The following sections highlight the main benefits of the Quality Protocol identified by those consulted.

7 To calculate market value, the costs associated with processing are multiplied by the quantity processed. This is repeated for each sector and the products summed. A lower cost operation or an increase in market share would increase these values.

3.0 Costs and Benefits to Industry of the Quality Protocol

This section sets out the costs and benefits to industry of the Quality Protocol including the sectors and groups affected.

3.1 Benefits of the Quality Protocol and groups affected

3.1.1 Development of a quality assurance regime (including standards, testing, etc.) will help plasterboard manufacturers meet their commitments to the government under the voluntary Ashdown Agreement. This will require a rapid increase in the proportion of gypsum from waste plasterboard used in new plasterboard. The Quality Protocol offers a regulated way of confirming quality, while also reducing costs and providing administration savings.

3.1.2 Current users of gypsum from waste plasterboard who apply for Environmental Permits would benefit from an avoidance of the costs of complying with waste management controls. This would include the cost of:

- Environment Agency exemption or permit fees;
- use of licensed waste carriers;
- admin burdens for completing permit applications; and
- training and registration for Waste Management Industry Training and Advisory Board (WAMITAB) purposes.

3.1.3 The Quality Protocol may reduce marketing costs by providing users with information/knowledge about the product and thereby engender confidence in the product.

3.1.4 A Quality Protocol will help to expand the market for gypsum from waste plasterboard as the stigma associated with the word 'waste' would be removed. Increased demand for gypsum from waste plasterboard from end markets would mean more waste plasterboard being diverted from landfill for recovery. The use of gypsum from waste plasterboard in markets other than new plasterboard would also be encouraged. However, other barriers such as price and technical barriers (the technical limit on the proportion of gypsum from waste plasterboard that can be incorporated in new plasterboard) will ultimately limit the increase in demand for gypsum from waste plasterboard and act as a ceiling to growth in terms of recovered gypsum.

3.1.5 A Quality Protocol is unlikely to affect the price of gypsum from waste plasterboard going into new plasterboard as it will be competing with synthetic and mined gypsum where there are no major supply issues. However, the cost savings of not being regulated will lead to administration savings (and thus lower operating costs). In particular, this is likely to be beneficial for the spreading of gypsum from waste plasterboard to land. Spreading gypsum from waste plasterboard to land is currently cheaper then using natural/synthetic gypsum, but the complications of applying for an Environmental Permit may be deterring landowners from using gypsum from waste plasterboard.

3.1.6 The Government policy of reducing the disposal to waste to landfill is highlighted by targets defined in the Waste Strategy for England 2007[8] and the Strategy for Sustainable Construction[9] agreed jointly by Government and industry. This policy is driven in part by a rapidly reducing landfill void in the UK and the environmental benefits from diversion from landfill and increased material resource efficiency. Waste plasterboard is a resource that is readily recoverable and therefore would benefit from the adoption of a Quality Protocol. This in turn will contribute to the achievement of policy targets.

8 http://www.defra.gov.uk/environment/waste/strategy/
9 http://www.berr.gov.uk/sectors/construction/sustainability/page13691.html

3.1.7 In using gypsum from waste plasterboard there will be a change in the carbon balance – in carbon dioxide (CO_2) equivalents – due to the avoided landfill of plasterboard waste.

3.2 Costs of the Quality Protocol and groups affected

3.2.1 Although welcoming the Quality Protocol initiative, plasterboard manufacturers do not foresee any significant change/reduction in manufacturing costs arising from it. It is hoped that the Quality Protocol will encourage gypsum recycling and lead to higher volumes of gypsum from waste plasterboard becoming available for use. This may help the industry meet its environmental targets such as the voluntary Ashdown Agreement commitments.

3.2.2 There will be significant costs to make the infrastructure improvements necessary such as additional investment to provide collection bins and skips, transfer and bulking stations, and recycling machinery. However, this investment cannot solely be attributed to the cost of the Quality Protocol as an increase in day to day business would have resulted in the increase in need for this infrastructure (and its associated costs) regardless of the Protocol's introduction. However, the risk of investment in such infrastructure is higher while the supply market is undermined by the continued low cost of disposal.

3.2.3 Eurogypsum,[10] of which the Gypsum Products Development Association (GPDA) is a member, is drafting a specification for gypsum from waste plasterboard. It is likely to be a requirement of the recyclers who sell plasterboard to meet this specification. TAG members were keen to explain that they must abide with the Eurogypsum specification and that it was not competition to the Quality Protocol.

3.2.4 The FIA model does not include the cost for additional processing and segregation borne by recyclers in complying with the Quality Protocol. This is because the Quality Protocol is based on a PAS standard, which will be adopted by the industry even without the introduction of the Quality Protocol. However, recyclers must carry out additional composition tests to prove compliance with the PAS standard under the terms of the Quality Protocol. They are required to perform these tests for every 1,000 tonnes of material or every three months, whichever is sooner. Based on information from the TAG, it is assumed that all recyclers produce more than 1,000 tonnes every three months.

3.2.5 The model results are presented in Table 5.

10 European Federation of National Associations of Producers of Gypsum Products

Table 5: Quantified benefits of the Quality Protocol (QP) (based on 2007 prices)

	Baseline cost (£k)		QP applied cost (£k)		Difference (£k)	
	10 years	Average value	10 years	Average value	10 years	Average value
Costs						
Total processing costs	£57,620	£7,118	£66,314	£8,233	£8,694	£1,115
Marketing costs for recycled product	£1,030	£127	£585	£73	-£446	-£55
Transport costs	£40,571	£5,010	£53,704	£6,664	£13,134	£1,654
Total segregation costs to construction and demolition sectors	£94,665	£11,690	£107,409	£13,328	£12,744	£1,638
Total cost of landfill	£1,352,513	£164,376	£1,280,375	£155,085	-£72,137	-£9,291
Land application regulation cost	£82	£10	£0	£0	-£82	-£10
Land application admin burden	£57	£7	£0	£0	-£57	-£7
Total costs	£1,546,537	£188,337	£1,508,272	£183,368	-£38,265	-£4,969
Benefits						
Market value of gypsum from waste plasterboard	£81,142	£10,020	£92,065	£11,424	£10,923	£1,404
Net benefit					£49,073	£6,359
Social cost of CO_2	£116,874	£14,243	£117,059	£14,267	£184	£24

3.2.6 The results show that the Quality Protocol will benefit for the gypsum industry as a whole. The net benefit over the 10-year assessment period will be approximately £49.1 million.

3.2.7 The construction and demolition industry should experience reduced costs in terms of diverting waste plasterboard from landfill and avoiding landfill gate fees (assuming landfill tax reaches a maximum of £48 per tonne as predicted). The average annual saving from not landfilling plasterboard waste is over £9.3 million, which minus the annual average cost of paying recycler gate fees (see processing costs in Table 5), gives an annual average saving of over £8.2 million.

3.2.8 The CO_2 equivalent saving was derived from WRAP's life cycle assessment of plasterboard report [14].

3.2.9 There are substantial uncertainties in the modelled results regarding the supply and demand of gypsum from waste plasterboard. A sensitivity analysis was therefore performed with a set of low and high assumptions for supply and demand. Table 6 sets out the assumptions used in the sensitivity analysis.

Table 6: Input assumptions for sensitivity analysis – percentage recycled

Scenario	Low	Baseline	High
Percentage of construction waste recycled	70%	80%	90%
Percentage of demolition waste recycled	20%	30%	60%
Percentage of gypsum from waste plasterboard used by smaller markets	15%	25%	45%

3.2.10 Tables 7 and 8 shows the results obtained for the 'low' and 'high' sensitivities respectively.

Table 7: Results of 'low' sensitivity analysis

	Baseline cost (£k)		QP applied cost (£k)		Difference	
	10 years	Average value	10 years	Average value	10 years	Average value
Costs						
Total processing costs	£57,620	£7,118	£57,721	£7,131	£102	£13
Marketing costs for recycled product	£1,030	£127	£515	£64	-£515	-£64
Transport costs	£40,571	£5,010	£47,333	£5,845	£6,762	£835
Total segregation costs	£94,665	£11,690	£94,665	£11,690	£0	£0
Total cost of landfill	£1,352,513	£164,376	£1,352,513	£164,376	£0	£0
Land application regulation cost	£82	£10	£0	£0	-£82	-£10
Land application admin burden	£57	£7	£0	£0	-£57	-£7
Total costs	£1,546,537	£188,337	£1,552,645	£189,092	£6,108	£755
Benefits						
Market value of gypsum from waste plasterboard	£81,142	£10,020	£81,142	£10,020	£0	£0
Net benefit					-£6,210	-£767
Social cost of CO_2	£116,874	£14,243	£117,108	£14,273	£234	£30

Table 8: Results of 'high' sensitivity

	Baseline cost (£k)		QP applied cost (£k)		Difference	
	10 years	Average value	10 years	Average value	10 years	Average value
Costs						
Total processing costs	£57,620	£7,118	£81,130	£10,054	£23,511	£2,936
Marketing costs for recycled product	£1,030	£127	£701	£87	-£329	-£40
Transport costs	£40,571	£5,010	£64,427	£7,985	£23,856	£2,975
Total segregation costs	£94,665	£11,690	£128,853	£15,969	£34,188	£4,280
Total cost of landfill	£1,352,513	£164,376	£1,160,011	£140,216	-£192,501	-£24,160
Land application regulation cost	£82	£10	£0	£0	-£82	-£10
Land application admin burden	£57	£7	£0	£0	-£57	-£7
Total costs	£1,546,537	£188,337	£1,434,985	£174,293	-£111,552	-£14,044
Benefits						
Market value of gypsum from waste plasterboard	£81,142	£10,020	£110,446	£13,688	£29,304	£3,668
Net benefit					£140,718	£17,695
Social cost of CO_2	£116,874	£14,243	£116,953	£14,255	£79	£12

3.2.11 Table 9 shows the results obtained using the extreme values (high and low) for the amounts of plasterboard waste recycled. The range of results for net benefit is approximately £147 million. The sensitivity work confirms that the main model is an accurate reflection of the benefits that will arise from the introduction of the Quality Protocol. Although the exact scale of benefit changes, the general message of improvement is evident under low and high sensitivity analysis.

Table 9: Summary of results from the sensitivity analysis

Scenario	Net benefit (£k)		Value of carbon (£k)	
	10 years	Average value	10 years	Average value
High	£140,718	£17,695	£79	£12
Baseline	£49,073	£6,359	£184	£24
Low	-£6,210	-£767	£234	£30

4.0 Small Firms Impact Test

4.1.1 All the companies that make up the existing plasterboard recycling industry in the UK are small and medium enterprises (SMEs). Although it should be noted that the main manufacturing operations at Knauf, British Gypsum and Lafarge are not classified as an SME, it is just the recycling section of the business that is classified as a SME.

4.1.2 Therefore the introduction of a Quality Protocol would not impact one recycler more than another. If any larger companies were to enter the market then they are likely to benefit from economies of scale when implementing the Quality Protocol, e.g. their testing costs per tonne may be less as testing could occur on bigger batches.

4.1.3 It is not possible to exempt small companies from the Quality Protocol as this would mean all recyclers currently in the market would be exempt.

4.1.4 The customers of the SME recyclers will not be disproportionately affected because all recyclers are of a similar size and thus any costs associated with the introduction of the Quality Protocol would be seen in the prices of all gypsum recyclers.

4.1.5 The cost of implementing the Quality Protocol on average per year for each of the eight SMEs currently in the market is calculated to be -£60,907, i.e. a net benefit. This cost is calculated from the additional market revenue, the savings from gate fee costs minus any additional cost to reprocessors for implementing the Quality Protocol.

4.1.6 The Quality Protocol is voluntary. Recyclers can avoid the costs involved by choosing not to comply should they wish.

5.0 Competition Assessment

5.1.1 The impact on competition is limited by the voluntary nature of the Quality Protocol. The current market can be classed as 'difficult' and sales to users of gypsum are governed by long-term relationships and strong marketing skills. The introduction of the Quality Protocol will provide an option to secure markets and open new markets, but it is unlikely to influence the overall competitive market. All producers will be able to work to the Quality Protocol if it becomes a market requirement to sell gypsum from waste plasterboard.

5.1.2 For those that provide gypsum from waste plasterboard to other outlets (e.g. as a soil improver), introduction of a Quality Protocol is unlikely to increase competition in the short term. Virgin natural gypsum has traditionally been used for agricultural uses but, in recent years, the cost of this material to farmers has increased and they have sought alternatives for soil conditioning. For gypsum from waste plasterboard to be competitive against other soil improvers on the market, the market for gypsum itself as a soil improver would need to be redeveloped.

5.1.3 One area that may prove to be interesting is how the commercial and industrial sector makes use in their corporate social reporting of the environmental benefits from using gypsum from waste plasterboard. Enhanced waste treatment (recovery) will show environmental benefits that can be reported and provide carbon trading benefits to those companies in the carbon trading scheme, as well as the 'green' image benefits that may be used in marketing.

Required Tests

5.1.4 *Will the introduction directly or indirectly limit the number or range of suppliers?* There is no evidence to suggest that the number of suppliers would fall as a result of the introduction of the Quality Protocol. The current market is likely to increase with or without the Quality Protocol. This expansion will be generated by organic growth as well as new entrants. Those players that choose not to comply with the Quality Protocol may face greater competition from those that do, but its voluntary nature means that suppliers can decide whether or not they would benefit from complying.

5.1.5 *Will the introduction limit the ability to compete?* The voluntary nature will allow all players to comply with the Quality Protocol. At the time of writing, the details of the Quality Protocol procedures are not finalised but the controls required are unlikely to preclude any recycler from complying as they are unlikely to affect the plasterboard recycling technology itself. Controls will be placed on the wastes that can be accepted and how the products are handled. The TAG is not aware that any of the existing suppliers will be compromised by infrastructure issues, although all are likely to have initial investment to meet the requirements and a constraining factor may be access to capital.

5.1.6 *Will introduction reduce suppliers' incentive to compete vigorously?* The industry will be increasingly competitive with initiatives such as the voluntary Ashdown Agreement resulting in a growing supply of waste plasterboard entering the market. Suppliers will not only be competing for this supply, but also for a market for their gypsum from waste plasterboard. The Quality Protocol will be one way in which suppliers can gain a competitive edge.

6.0 Conclusions

6.1.1 The Quality Protocol is generally welcomed by the gypsum industry as it will aid marketing and provide security to existing users of gypsum from waste plasterboard.

6.1.2 Introduction of the Quality Protocol will have a net benefit as the increase in market value of gypsum from waste plasterboard will outweigh the costs of implementing the Quality Protocol.

6.1.3 In the short term, introduction of the Quality Protocol is not expected to affect the price paid for gypsum from waste plasterboard.

6.1.4 Overall, the net benefit to the industry is approximately £49.1 million over the 10-year assessment period modelled. Recyclers will incur increased costs due to the need to process higher tonnages, but this will be countered by increased gate fee revenue. The construction and demolition industry should experience lower costs in terms of diverting waste plasterboard from landfill and avoiding landfill gate fees. After paying recyclers' gate fees, there should be a saving of approximately £8.2 million over the 10-year assessment period.

6.1.5 The benefit to environment due to reduced CO_2 emissions over the 10-year assessment period is estimated at £184,000 (from a baseline cost of £116.874 million to a Quality Protocol applied cost of £117.059 million).

6.1.6 The Quality Protocol will provide regulatory clarity to industry and will help to encourage recovery, recycling, resource efficiency, market growth and diversion from landfill.

7.0 References

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Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	Results in Evidence Base?	Results annexed?
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	Yes	In model Yes
Other Environment	No	No
Health Impact Assessment	No	No
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No

Appendix A: Technical advisory group membership

Name	Company	Type of member
Suzanne Laidlaw	Chair (Environment Agency)	Attending
Sarah Clayton	Project Team (WRAP)	Attending
Michelle Steer	Project Team (Environment Agency)	Attending
Hana Leithgoe	Technical Secretary (Environment Agency)	Attending
Ahlim Hashm	Technical Support to Project Team	Attending
Dave Marsh	WRAP	Attending
Keith Lawton	Entec (technical support to Project Team)	Attending
Victoria Sturt	Soils Policy Advisor (Environment Agency)	Attending
Roger Meaden	Gypsum Recycling UK Ltd (GRUK)	Attending
Bob Curd	New West Gypsum Recycling Ltd (NWGR)	Attending
Mark Hatfield	Roy Hatfield Ltd	Attending
Matthew Purdie	Plasterboard Recycling UK (PBRUK)	Attending
Chris Mountain	Mid UK Recycling Ltd	Attending
Warren Fothergill	Recyclet Ltd	Attending
Crispin Dunn-Meynell	Gypsum Products Development Association (GPDA)	Attending
Steve Hemmings	Lafarge (on behalf of GPDA)	Attending
Heidi Barnard	British Gypsum (on behalf of GPDA)	Attending
Amanda Owen	Knauf Drywall	Attending
Rob Enticott	Sustainable Business Solutions – on behalf of New West Gypsum Recycling (UK) Ltd	Attending
Mike Taylor	British Cement Association (BCA)	Corresponding
David Coning	Coast to Coast Recycling Ltd	Corresponding
Chris Deed	Environment Agency (Policy Advisor)	Corresponding
Clare McCallan	Environment Agency (Policy Rep)	Corresponding
Kathryn Harriss	Environment Agency (Legal Rep)	Corresponding
Becky Favager	Environment Agency Wales (Policy Rep – Wales)	Corresponding
Mark Heggie	SEPA (Policy/Strategy Rep – Scotland)	Corresponding
Tony Osborne	NIEHS (Policy Rep – Northern Ireland)	Corresponding
Aarun Naik	NFU	Corresponding

Appendix B: Current Regulatory Position

Environmental Permitting (England and Wales) Regulations 2007

Under Environmental Permitting (England and Wales) Regulations 2007 the landspreading of gypsum waste from specific sources may be exempt from waste management licensing controls as a use for the benefit of land. The arisings must be from:

- the manufacture of cement, lime and plaster and articles and products made from them; or
- power stations and other combustion plants.

The exemption only applies if certain rules are complied with as set out in the Regulations. These include the operation being carried on in relation to an area of land of 50 hectares or less, limitations on the amount of waste to be used in any period of 12 months and compliance with and applicable animal by-products legislation. The land in questions must not be used for agriculture and the treatment must result in ecological benefit.

Landfill Directive 99/31/EC

In the UK, most waste plasterboard is currently disposed to landfill. The Environmental Permitting (England and Wales) Regulations 2007 implement the Landfill Directive. The Directive sets out strict operational and technical requirements for landfill disposal designed to reduce the negative effects of landfill. Landfilling of gypsum-based wastes is only allowed at such sites that hold an environmental permit covering such an activity, and in accordance with the requirements of the Landfill Directive.

European Council Decision 2003/33/EC requires Member States to limit the disposal of non-hazardous 'gypsum-based materials' to landfill cells where only non-biodegradable wastes are deposited. It also placed limits on the organic content of any other (non-biodegradable) wastes that may be landfilled in the same cell as gypsum-based material.

In England and Wales, this Decision has also been implemented under the Environmental Permitting (England and Wales) Regulations 2007. This extends the scope of the Decision's requirement to include 'other high sulphate bearing materials'.

Large Combustion Plant Directive 2001/80/EC

The Large Combustion Plant Directive (LCPD) applies to combustion plants with a thermal output of greater than 50 MW. The Directive aims to reduce acidification, ground level ozone and particles throughout Europe by controlling emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_X) and dust (particulate matter) from large combustion plants.

New combustion plants must meet the emission limit values (ELVs) given in the LCPD. For those plants in operation before -1987, Member States can choose to meet the obligations by either:

- complying with the ELVs for NO_X, SO_2 and particles; or
- operating within a 'National Plan' that sets an annual national level of emissions calculated by applying the ELV approach to existing plants on the basis of those plants' average actual operating hours, fuel used and thermal input over the five years to 2000.

Construction Products Directive (CPD) 89/106/EC

The main aim of this legislation is to ensure the quality of any product intended for the permanent incorporation into a building or civil engineering works. The main factors influencing products containing gypsum are:

- safety in case of fire;
- hygiene, health and the environment;
- safety in use;
- sound insulation; and
- energy economy and heat retention.

As part of the CPD mandate, harmonised CEN standards are being developed to ensure consistency across Europe on products. This is a lengthy ongoing process as the old BS standards are converted and is due to be completed by 2012.

Energy Performance of Buildings Directive (EPBD) 2002/91/EC

The EPBD looks at the energy efficiency of new and existing buildings. An important element is reducing heating losses by air-tightness, which is intrinsically linked to the building construction and standard details. Therefore, there may be an influence on installation specifications for plaster and plasterboard.

The Environmental Protection (Duty of Care) Regulations 1991 (as amended)

These Regulations require gypsum product manufacturers to handle waste safely and in accordance with the law. This Duty of Care applies to anyone who produces, imports, carries, keeps, treats or disposes of controlled waste such as gypsum waste from business or industry.

Waste producers are responsible for ensuring the safe and proper disposal or recovery of the gypsum waste they produce, even after it has been passed on to another party such as a waste contractor or recycler. The Duty of Care has no time limit, and extends until the waste has either been finally and properly disposed of or fully recovered.

Waste should only be handled by individuals or businesses authorised to deal with it. A record should be kept of all waste received or transferred through a system of signed transfer notes.

Control of Pollution (Amendment) Act 1989 and the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 (as amended)

In England, Scotland and Wales, the carriage of waste is regulated under the Control of Pollution (Amendment) Act 1989 and the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 (as amended).

Gypsum manufacturers who wish to transport or arrange the disposal or recovery of controlled waste such as gypsum waste may be required to register with their environmental regulator. Unless it is construction or demolition waste, the carriage of an organisation's own wastes does not usually require registration.

Waste & Resources Action Programme

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