Factors Influencing the Implementation of Site Waste Management Plans on UK Projects of all sizes

RICS COBRA 2013

University of ULSTER

COBRA 2013

10th – 12th September

New Delhi India

RICS COBRA 2013

The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors

Held in New Delhi, India in association with the University of Ulster and IIT Delhi

10th-12th September 2013

Royal Institution of Chartered Surveyors
Parliament Square
London SW1P 3AD
United Kingdom

www.rics.org/research

The RICS COBRA Conference is held annually. The aim of COBRA is to provide a platform for the dissemination of original research and new developments within the specific disciplines, sub-disciplines or field of study of:

Management of Building and Infrastructure Projects

- Cost and value management
- Building technology
- Building regulation and control
- Construction procurement and Project Delivery Systems
- Public Private Partnerships
- Contract management

- Health and safety management
- Risk management
- Project management
- Infrastructure Planning and Development
- Built Environment Modelling and Building Information Modelling

RICS Legal Research Symposium

- Property Law
- Construction Law
- Environmental Law
- Housing Law
- Planning Law
- Building Regulation & Control
- Alternative Dispute Resolution
- Professional Liability & Ethics
- Legal Education in Property & Construction
- International & Comparative Law

Real estate

- Asset, property and facility management
- Housing policy, markets, and finance
- Property investment theory and practice
- Market research, analysis and forecasting
- Urban real estate and land economics
- Financial analysis of the property market and property assets
- Global comparative analysis of property markets
- Sustainable real estate and infrastructure development
- Urban regeneration policy and practice
- Financing urban development

- Real estate risk & portfolio management
- Property valuation
- Land and Resource Management

Peer review process

All papers submitted to COBRA were subjected to a peer review refereeing process.

Referees were drawn from an expert panel, representing respected academics from the construction and building research community. The conference organisers wish to extend their appreciation to the following members of the panel for their work, which is invaluable to the success of COBRA.

Alan Abela	Nottingham Trent University
Alastair Adair	University of Ulster
Ajibade Aibinu	University of Melbourne
Jorge Aimite	University of the Western Cape
Anuar Alias	University of Malaya
Sara Alsaadani	Cardiff University
Matthew Bell	University of Melbourne, Australia
Jim Berry	University of Ulster
Rodrick Chilipunde	University of Malawi
Jaehyun Choi	Korea University of Technology and Education
Nigel Craig	Glasgow Caledonian University
Neil Crosby	University of Reading
Ayirebi Dansoh	Kwame Nkrumah University
Michelle de Oliveira	North West University
Hemanta Doloi	University of Melbourne
Charles Egbu	University of Salford
Mart-Mari Els	University of the Free State
Dhaval Gajjar	Arizona State University
Shane Galvin	University of Glamorgan
Abdulkadir Ganah	University of Central Lancashire
Masoud Gheisari	Georgia Institute of Technology
Jack Goulding	University of Central Lancashire
Manisha Gulati	IDFC
Murat Gunduz	Middle East Technical University
Martin Haran	University of Ulster
Barry Haynes	Sheffield Hallam University
Lesley Hemphill	University of Ulster
Danie Hoffman	University of Pretoria
Norman Hutchison	University of Aberdeen

Bon-Gang Hwang	National University of Singapore
Godwin Idoro	University of Lagos
Anil Kashyap	University of Ulster
Qiulin Ke	UCL
Nthatisi Khatleli	University of the Witwatersrand
Jasmine Lim	University of Ulster
Jamie MacKee	University of Newcastle
Kim Maund	University of Newcastle
Pat McAllister	UCL
Steven McCabe	Birmingham City University
Stanley McGreal	University of Ulster
Richard Moore	Anglia Ruskin University
Anywhere Muriro	University of Salford
Roisin Murphy	Dublin Institute of Technology
Nur Emma Mustaffa	Universiti Teknologi Malaysia
Anupam Nanda	University of Reading
Noorsidi Noor	Universiti Teknologi Malaysia
Frederick Nuamah	KAAF University
Henry Odeyinka	University of Ulster
Alfred Olatunji	University of Newcastle
Darren Olsen	Auburn University
Ali Parsa	Royal Agricultural University
Joao Pedro	National Civil Engineering Laboratory Portugal
Rahul Ralegaonkar	VNIT Nagpur
Les Ruddock	University of Salford
Paul Ryall	University of Glamorgan
Mohamad Saifulnizam	Queensland University of Technology
Sarah Sayce	Kingston University
Venkatachalam Senthilkumar	University of the Witwatersrand
Shaleen Singhal	TERI University
Mohan Siriwardena	University of Salford
John Spillane	Queens University Belfast
A.K. Srivastava	RICS School of the Built Environment, Amity University
Subashini Suresh	University of Wolverhampton
Paloma Taltavull de la Paz	Universidad de Alicante
Isilay Tekce	Istanbul Technical University
PiyushTiwari	RICS School of the Built Environment, Amity University
Lene Faber Ussing	Aalborg University
Saurabh Verma	Amity University
Jason von Meding	Queens University Belfast
Soren Wandahl	Aarhus University
Craig Watkins	University of Sheffield
Michael White	Nottingham Trent University

Sara Wilkinson	University of Technology Sydney
Benita Zulch	University of the Free State

In addition to this, the following specialist panel of peer-review experts assessed papers for the RICS COBRA Legal Symposium

Julie Adshead	University of Salford, UK
Alison Ahearn	Imperial College London, UK
Deniz Artan Ilter	Istanbul Technical University, Turkey
Francine Baker	KCL, UK
Jane Ball	Newcastle University, UK
Luke Bennett	Sheffield Hallam University
Michael Brand	University of New South Wales, Australia
Penny Brooker	University of Wolverhampton, UK
Sai On Cheung	City University of Hong Kong
Alice Christudason	National University of Singapore
Paul Chynoweth	University of Salford, UK
Julie Cross	University of Salford, UK
Steve Donohoe	University of Plymouth, UK
Ari Ekroos	University of Helsinki
Paula Gerber	Monash University, Australia
Tilak Ginige	Bournemouth University
Jan-Bertram Hilig	Herrenknecht AG, Germany
Anthony Lavers	Keating Chambers, UK
Wayne Lord	Loughborough University
Tinus Maritz	University of Pretoria
Jim Mason	University of the West of England, UK
Tim McLernon	University of Ulster, UK
Frits Meijer	University of Delft
Issaka Ndekugri	University of Wolverhampton, UK
John Pointing	Kingston University, UK
Yvonne Scannell	Trinity College Dublin, Ireland
Julian Sidoli del Ceno	Birmingham City University
Linda Thomas-Mobley	New School of Architecture & Design, USA
Karen Tweeddale	London South Bank University, UK
Henk Visscher	TU Delft, The Netherlands
Peter Ward	University of Newcastle, Australia

2013 RICS COBRA
New Delhi, India
September 10-12, 2013

FACTORS INFLUENCING THE IMPLEMENTATION OF SITE WASTE MANAGEMENT PLANS ON UK PROJECTS OF ALL SIZES

Jason von Meding[1], Yiu Ming Shek[2], John Spillane[2] and Ashwini Konanahalli[2]

[1]*School of Architecture and Built Environment, University of Newcastle, A102, University Drive, Callaghan, New South Wales 2308, Australia*

[2]*School of Planning, Architecture & Civil Engineering, Queen's University Belfast, David Keir Building, Stranmillis Road, Belfast, BT9 5AG, Northern Ireland*

ABSTRACT

The purpose of this research is to identify and assess the opportunities and challenges of implementing a Site Waste Management Plan (SWMP) on projects irrespective of size. In the UK, construction and demolition waste accounts for a third of all UK waste.

There are a number of factors that influence the implementation of SWMPs. In order to identify and analyse these factors, 4 unstructured interviews were carried out and a sample of 56 participants completed a questionnaire survey. The scope of the study was limited to UK construction industry professionals.

The analysis revealed that more needs to be done if the industry is to meet government targets of reduction in construction related waste going to landfill. In addition, although SWMP may not yet be legally required on all construction projects, clients and contractors need to realise the benefits to cut costs and implement best practice by adopting a SWMP. The benefits of implementing a SWMP will not only help to achieve this but also gain significant cost savings on projects and is also extremely beneficial to the environment.

This study presents evidence that contractors need to do more to reduce waste and draws a clear link between waste reduction and the implementation of SWMPs. The findings are useful in the ongoing efforts to encourage the industry to find smarter, more efficient and less damaging ways to operate.

Keywords: construction, demolition, site waste management plan, UK, waste

INTRODUCTION

The purpose of this research is to identify and assess the benefits and challenges to UK construction firms of implementing a SWMP on projects regardless of size. The primary objectives are to identify the types of construction waste, identify and assess the opportunities of implementing a SWMP, examine the implications of carrying out a SWMP and establish the future of SWMP in the construction industry. By investigating the influencing factors on SWMP adoption, the researchers will be able

[1] j.vonmeding@qub.ac.uk

to bring evidence forward that encourages UK firms of all sizes to become proactive in implementation due to the inherent benefits of such practice.

The cost of disposal to the industry is escalating each year with the amount of construction and demolition waste produced increasing year after year. The problem is waste equals money and businesses are losing money as a result of waste. Indeed, construction and demolition waste is the single largest UK waste stream, which includes over 20% of all hazardous waste and 20% of fly-tipped waste (CRW 2010).

The construction sector today not only consumes the most energy of all sectors in the UK and creates the most CO2 emissions; they also create the most waste, use the most non-energy related resources, and are responsible for the most pollution (NBT 2011). The potential of a SWMP is to help construction companies of all sizes to start taking action against their own waste produced and try and reduce the amount going to landfill. It also helps companies to avoid prosecution by ensuring all waste ends up in the right place (Contract Journal 2007). The landfill tax that took effect in the UK on 1st October 1996 was the first UK environmental tax and currently generates over £1.5 billion.

The larger research study will look to identify ways of improving practice, and make recommendations for change in the construction industry. The introduction and affect of SWMP regulations on the construction industry is significant, as the Government sets targets to significantly reduce construction related waste going to landfill.

The definition of 'waste' as described by the Waste Framework Directive (WFD) (European Parliament 2008) is *'any substance or object which the holder discards or intends or is required to discard'*. The Dictionary defines Construction and Demolition Waste (CDW) as *'unwanted material produced directly or incidentally by the construction and/or demolition industries'*.

With construction being the UK's largest industry (White 2010), the amount of waste going to landfill is increasing year after year (around 36 million tones, (Jennings 2006)). The disposal of construction waste is costing the industry more and more each year (around £1.5 billion, (NetRegs 2011)), and if construction companies do not do anything about it the UK will face a serious crisis related to landfill (Dreschler 2006)

SWMP

The Site Waste Management Plans Regulations 2008 was introduced on 6th April 2008. It is defined by the WFD (European Parliament 2008) as *'a plan that details the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites'*. As a result it is now a legal requirement for all construction projects in England over £300k to have a SWMP, with a more detailed plan required for projects over £500k. In Northern Ireland any public sector construction project over £200k must have a SWMP or any construction company in the UK that wants to follow good industry practice plus all suppliers to the construction industry (Ruddock 2008).

The aim of SWMP legislation is to encourage better waste management practices amongst the construction industry, improve environmental friendliness, reduce the cost of waste disposal, minimise hazardous waste going to landfill and avoid waste

crime such as fly-tipping. Construction companies of all sizes need to take action regarding their own waste produced during projects. This research argues that a change in company attitude and behaviour will be advanced not only through legislation and penalisation, but through positive action such as research demonstrating the benefits of implementing SWMP and identifying proactive ways to reduce the amount of waste being disposed to landfill.

WRAP is the government's recycling delivery body, and together with the Government's Waste Strategy and draft Sustainable Construction Strategy, they put forward the Halving Construction Waste to Landfill by 2012 scheme (WRAP 2008).

A SWMP sets out how to manage resources effectively and waste control at every stage of a construction project. It establishes:

- Who is responsible for resource management within the project team;
- Identify the types of waste generated;
- How to manage the waste i.e. reduce, reuse or recycle;
- The contractor who will be responsible for recycling or disposing of the waste legally; and
- How to measure the quantity of waste produced during the project

Benefits of SWMP

In addition to implementing a SWMP to obey the law or face prosecution, it helps to protect the environment through managing and reducing the amount of waste being produced by construction projects consequently less waste going to landfill. Other environmental benefits such as lower energy consumption, greater use of recycled materials, less damage to local environment and reduce fly tipping. The most important factor to construction companies when implementing a SWMP is to save money and this is why further research providing evidence of this potential efficiency is valuable. Once SWMP are completed from previous project and the implications documents, it will provide companies with valuable information for future projects in how to manage resources more efficiently.

Challenges and Implications of SWMP

One of the major issues with SWMPs is their cost effectiveness on projects over a certain cost barrier. DEFRA (2008) estimated that a basic level SWMP is cost effective for new build domestic projects from £250k whereas high-level plans demonstrate a clear cost saving at £400k.

As for non-domestic new build projects, a basic level SWMP could break even at £250k with clear cost savings at £400k. Whilst high level plans are cost effective from £1.6m of project costs. Refurbishment of non-domestic projects is shown to benefit at £150k for basic levels plans and £1.6m for high level.

A study carried out by Databuild on behalf of WRAP shows three components of costs associated with the introduction of SWMPs, these are:

- Time taken to prepare and draft the SWMP – this was considered to be the main cost component. The cost includes research time such as locating nearby recycling points; estimate research such as anticipated waste volume; and time

and effort to draft the plan and obtain confirmation and signatures of those involved with the plan (WRAP 2006).

- Implementing the SWMP – the costs involved are additional skip hiring charges, and communicating and training of staff. Construction and demolition companies have identified waste segregation as the most beneficial element of implementing a SWMP (Gritten 2007).
- Monitoring, updating and reviewing SWMP – extra costs are required for further management and supervision of contractors to make sure they are all complying and adhering to the plan. Also accurate measurements of actual waste compared with those that were predicted and estimating final cost savings.

Internationally

Germany and the Netherlands reuse or recycle around 80% of their construction waste, whilst Denmark has exceeded 90% (Drechsler 2006). This shows that the knowledge and expertise already exist and that there are excellent examples and solutions to reducing construction related waste.

The future for the UK construction industry is to adapt similar procedures as their European cousins in order to achieve maximum waste efficiency.

NISP

The NISP launched in 2005 was the world's first national industrial symbiosis programme. It is a free innovative business opportunity programme that brings environmental, economical and social benefits to businesses from all industries. The aim is to facilitate the exchanging of resources such as building materials, water, energy, logistics and expertise (NISP 2009).

An example of how NISP works within the construction industry is the Patton Groups involvement with Braidwater Ltd in a commercial building project in Ballymena. Braidwater required 10,000 tonnes of filled material in order to raise the levels on a site at Leighmore Avenue. NISP introduced Patton to them and together they figured out a solution. In the end, Patton transferred 2560 tonnes of excavated material to their site that would otherwise have been landfilled at a cost of approximately £14,000 and a new relationship was established.

METHODOLOGY

This paper examines an element of the quantitative findings emerging from a mixed-methods study conducted in 2011. 4 exploratory interviews were conducted with construction professionals in the UK. These interviews were mapped out in Decision Explorer and analysed using the same software for central themes and influential concepts. The qualitative findings were then utilised alongside existing knowledge based on previous literature to produce a questionnaire survey.

The questionnaire investigated the principal variables influencing SWMP implementation in the UK industry. It was conducted on a 5-point Likert scale and of 280 questionnaires distributed by email, 56 responses were received, for a 20% response rate. The findings from the qualitative and quantitative elements of the study

contributed to the development of a theoretical framework that will be disseminated in further publications.

FINDINGS

This paper presents a small subset of the results of the wider study, an exploratory factor analysis revealing four principal factors among the variables measured by the questionnaire. These have been interpreted and categorised accordingly:

- Factor 1 "Deconstruction/Suppliers" (39.70% of variance);
- Factor 2 "Challenges" (12.56% of variance);
- Factor 3 "Benefits" (8.47% of variance);
- Factor 4 "Future" (7.28% of variance);

Variables	Extracted factors	Eigen value	% of variance	Factor loading
F001	**Deconstruction/Suppliers**	5.557	39.70	
SWMP18	20. Suppliers should take back their own packaging and reimburse on unused materials			0.856
SWMP20	22. Clients should give more time for deconstruction			0.719
SWMP19	21. Deconstruction should be made as part of the architectural design			0.708
F002	**Challenges**	1.759	12.56	
SWMP16	18. Stricter targets should be set for waste contractors to recycle as much waste as possible in order to obtain approval			0.781
SWMP15	17. The SWMP Regulations should be more strictly enforced for those who do not comply			0.696
SWMP4	6. Private clients should focus on being more environmentally friendly rather than cheapest and quickest			0.694
F003	**Benefits**	1.186	8.47	
SWMP5	7. Cost saving is an incentive for you when choosing to implement a SWMP			0.832
SWMP2	4. SWMP should be made compulsory on all construction projects regardless of size			0.735
SWMP6	8. Environmental friendliness is an incentive for you when choosing to implement a SWMP			0.547
F004	**Future**	1.02	7.28	
SWMP14	16. The SWMP Regulations is another government initiative which will not work in the long-term			-0.76

SWMP1	3. SWMP Regulations should be made compulsory on all construction projects throughout the UK for both Public and Private sectors (currently in England only)			0.706

Table 1. Exploratory factor analysis results. Source: authors

The data suggests that 68% of variance in the dataset can be explained by the four factors specified. These factors will be further explored in the following discussion.

DISCUSSION

As shown above in table 1, "Deconstruction/Suppliers" is the most important factor emerging regarding implementation of SWMPs, with an eigenvalue of 5.557 and representing 40% of variance. This confirms that respondents are aware of the potential for SWMPs during the end of a buildings life cycle and that deconstruction should be made compulsory as part of a sustainable design package. Clients need to be prepared to implement such objectives throughout the duration of a project and therefore must allow time for contractors to carry out the deconstruction process at the start of a project, to utilise as much of the previous building and site as possible. This subsequently helps to reduce as much demolition waste as possible going to landfill.

Any suppliers to the construction industry by law must have a SWMP. This only applies during the suppliers manufacturing process but is not enforced once the product reaches its destination. Part of WRAP's take back scheme is to urge suppliers and manufacturers of the industry to take back materials and recycle them. Because suppliers and manufacturers know what is in their own products, they should be able to recycle them more effectively.

One interviewee during the qualitative data collection agreed verified this and stated that they have a policy with their pipe supplier to take back any offcuts so that it can be melted and reproduced into new pipes. Similarly, NISP assists organisations from different industries by identifying ways of transferring their waste to others who have potential for reusing or recycling this waste.

With any new idea, there are many "Challenges" associated with it. With an eigenvalue of 1.759 and representing 13% of variance, this is the second most important factor associated with SWMPs to emerge from this analysis. Private clients have been allowed to do the minimum in order to maximise their own profit for many years and this needs to change if the SWMP is to become successful.

The punishment for those not complying could be more severe and put onto a black list for all to see so that others do not even consider replicating such poor practice. Additional audits and inspections are required, and should be carried out not only when an accident has been reported, but as standard procedure.

Along with the standard criterion for waste contractors such as certificates and licenses etc, clients should have higher targets when choosing which waste contractor is selected. Better recycling facilities and higher recycling rate would favour certain

waste contractors to be chosen and influence those who do not offer such facilities to change and compete with the best.

The "Benefits" of SWMP is a similarly important area, with an eigenvalue of 1.186 and representing 8% of variance. The main benefit of implementing SWMPs is to reduce carbon emissions. The UK government was the first in the world to set its own legally binding law in October 2008, committing to 80% cuts in all UK carbon emissions by 2050, including aviation and shipping (Field 2009).

There is also the opportunity to reduce construction waste, driven by the government strategy for sustainable construction is to reduce levels of construction, excavation and demolition waste going to landfill. Making companies aware of the environmental and economical impacts and helping them reap the benefits of reducing waste is vital in order to achieve this strategy (YPTE 2010). This is the core benefit of implementing a SWMP; being able to sustainably enhance the environment whilst reducing the cost of waste disposal (and increasing profit margins).

The scope for reducing waste up to the £300k threshold for England is substantial according to one interviewee in this study. He even suggested that a SWMP could be implemented on projects of £50k or even less, to good effect. This is also proven by the number of respondents strongly agreeing with the statement that SWMPs should be implemented on projects irrespective of their cost and size.

The "Future" of SWMPs emerged as the final significant factor in this analysis (with an eigenvalue of 1.02 and representing 7% of variance in the data). It is interesting to consider the potential for positive change, achievable through SWMP adoption. The challenge will be packaging it is such a way as to make it economically advantageous to companies rather than another legislative hurdle to overcome. Most respondents to the survey did not believe that the government makes realistic targets for waste reduction, however, as we have seen among our European neighbours, a high level of waste to landfill does not need to continue.

CONCLUSIONS

The current SWMP Regulations primarily targets the public sector and only affects projects in England and NI above certain thresholds. If the government is to achieve waste reduction targets, this Regulation may need to be changed and implemented on all projects throughout the UK with no threshold. Alongside such policy change there needs to be a rethinking of waste enacted at company level through education and training, so that waste reduction does not become a goal only for government, but something that the industry can commit to in a situation where everyone benefits.

SWMPs are important to the environment as well as companies who wish to save costs on their waste disposal. Implementing from the top-down, client involvement is necessary if SWMPs are to be implemented on every project irrespective of size. Contractors and design teams must act upon the client's request and be totally committed to executing the SWMP and take responsibility for their own actions.

SWMPs should be driven like H&S if it's to make a real impact in the construction industry. Many SME still do not implement one and are unaware of the benefits this

has during the economic downturn. Once companies see the real benefits, it will become an essential requirement on all contracts.

REFERENCES

Contract Journal (2007), Waste management savings, *Contract Journal,* 440(6653), pp 15-17

CRW (2010), *Construction Resources and Waste Platform*, [Online]. Available: http://www.wrapni.org.uk/sites/files/wrap/Construction%20Resources%20and%20Waste%20Roadmap%20-%202010%20Update.pdf [accessed July 18 2013].

DEFRA (2008), *A cost benefit analysis of the introduction of site waste management plans for the construction and demolition industry*, Department for Environment, Food and Rural Affairs, London.

Dreschler, P. (2006), 27 July-last update, *The forgotten front in war on waste* [Homepage of BBC], [Online]. Available: http://news.bbc.co.uk/1/hi/sci/tech/5220220.stm [accessed July 18 2013].

European Parliament, C. (2008), "Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives", *19 November 2008,* [Online], vol. 312, no. 98, pp. 3-30. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT. [accessed July 18 2013].

Field, A. (2009), *Discovering statistics using SPSS,* 3rd edn, SAGE, London.

Gritten, T. (2007), *Survey of three stakeholder groups on Site Waste Management Plans*, AEA Energy & Environment, Didcot.

Jennings, P. (2006), 23 December 2006-last update, *Construction Industry Urged to Halve Construction Waste by 2012* [Homepage of WRAP], [Online]. Available: http://www.hub-4.com/news/364/construction-industry-urged-to-halve-construction-waste-by-2012 [accessed July 18 2013].

NetRegs (2011), *Site Waste - it's criminal, a simple guide to site waste management plans. Version 3*, NetRegs.gov.uk, Bristol.

NISP (2009), *The Pathway to a Low Carbon Sustainable Economy - Executive Summary*, International Synergies Ltd, Birmingham.

Ruddock, J. (2008), *The Site Waste Management Plans Regulations 2008*, The Stationery Office Limited, UK.

White, P. (2010), *Construction Division Plan of Work 2010/2011*, Health & Safety Executive, London.

WRAP (2008), *Halving construction waste to landfill by 2012*, WRAP, Oxon.

WRAP (2006), *Adoption of DTI Site Waste Management Plans*, WRAP, Banbury.

YPTE (2010), *Copenhagen Climate conference* [Homepage of YPTE], [Online]. Available: http://www.ypte.org.uk/environmental/copenhagen-climate-conference/87 [accessed July 18 2013].