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Research Article

The 100 Most Cited Scientific Papers in Construction and Demolition Waste Management

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Abstract: The aim of this study is to identify the 100 most cited papers and their characteristics in the field of Construction and Demolition Waste (CDW) management, which were published in the Web of Knowledge database of the Institute for Science Information (ISI) from the period of 2000 until 28 February 2016. Citation analysis is the identification of literatures from peer-reviewed scholarly community, which is the most common approach in identifying major works. To date, this study is the first of its kind to cite studies related to CDW. This study was carried out by utilizing the Web of Science from the ISI for the most cited studies in each of the related journals in the area of CDW from the Journal Citation Report (JCR). The Cited Reference search tool of the ISI Web of Science database was utilized to analyse the chosen journals and the information was collected from the papers as follows: the type of study as well as the methodology, names and the number of authors and journal names and publication year. The findings from this analysis reveal that the number of citations in the 100 selected articles varies from 8 to 108; these articles have been published in 26 peer-reviewed journals under the classification of CDW. The frequency of citations does not represent the quality of the study; nevertheless, this study provides several guidelines in addressing the topics and authors who have contributed significantly to the body of knowledge in the area of CDW management.

Keywords: Construction and demolition waste management, impact factor, ISI web of knowledge, most cited papers

INTRODUCTION

According to Moed (2009), the significance of a journal research paper can be assessed by the number of times it has been cited by other researchers. This research demonstrates how the frequency of citations could project the value of the cited studies in imparting knowledge and prescribing changes in CDW management based on practices, debates, discussions and recommendations for future studies (Lefaivre *et al*., 2011). However, this approach of utilizing the rate of citations to assess the quality of cited studies or their applicability has been criticized (Cheek *et al*., 2006). The issue of temporal bias could be present in this type of analysis because some studies might have already been cited repeatedly over time. When the contents of these studies have been integrated into the current body of knowledge, the citation rate could begin to decrease. Newer works, on the other hand, could not have received as many citations. Citation analysis shows that other indices of scientific identification could also be a factor based on particular aspects of knowledge (Garfield, 1993). Thus, this specific resource has been highly acclaimed for the impact of citations of a journal, author, or a nation (Cheek *et al*., 2006; Basu, 2006; Ohba and Nakao, 2010).

Since 1945, the Institute for Scientific Information (ISI) has aimed to gather and store the most important bibliometric information in terms of scientific publications of peer-reviewed journals. However, it was not until 1962 that a special tool was introduced known as the Science Citation Index, which quantifies the citations. At present, this resource is called the Science Citation Expanded Index, which is the sub-section of the Web of Science. The bibliometric analysis performed on this platform was used to identify the journal papers that were cited the most under the heading of Construction and Demolition Waste (CDW) management. To the best of the researcher's knowledge, such citation analysis has never been performed in the area of CDW management.

Thus, the present study aims to use the bibliometric resource to identify 100 journal papers that have been cited the most in the arena of CDW management published from the year 2000 to February 2016.

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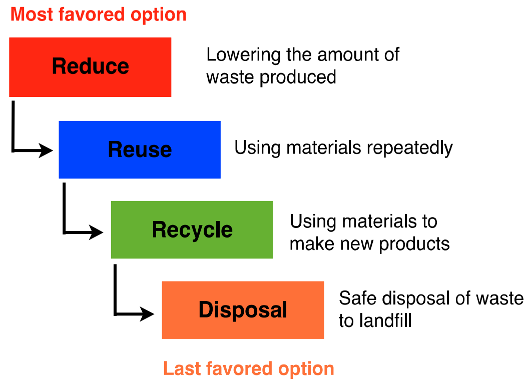

Fig. 1: Hierarchy of waste management

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

Generally, the term Construction and Demolition Waste (CDW) relates to solid waste generation that is prevalent in the construction and building sector. In particular, CDW refers to the waste derived from activities related to construction, renovation and demolition works such as civil and building constructions, land formation or excavation, site clearances, demolition activities, building renovations and road works (Shen *et al*., 2004). A considerable amount of CDW is produced worldwide annually. A research by Sandler and Swingle (2006), for example, reports that about 136 million tons of construction and demolition debris is generated annually in the USA and out of this amount only approximately 20-30% of the waste is recycled. Approximately 70 million tons of construction and demolition materials and soil are discarded as waste in the United Kingdom annually (Department of the Environment, Transport and the Regions (DETR), 2000) and the rate of wastage in the construction sector reaches up to 10-15% in the UK (McGrath and Anderson, 2000). In Australia, CDW adds up to almost 16-40% of the total generated solid waste (Bell, 1998). Meanwhile, the Environment Protection Department (EPD) of Hong Kong found that about 2,900 tons of CDW ended up in landfills on a daily basis in 2007 (Poon *et al*., 2013). China's Municipal Solid Waste (MSW) amounts to about 29% annually and about 40% of this amount is due to activities from the construction sector (Suocheng *et al*., 2001; Wang *et al*., 2008).

CDW generation results in multiple adverse impacts such as the utilization of massive land space for the purpose of land fields to contain the waste (Poon *et al*., 2003), endangerment of the surrounding areas due to toxic pollution (Esin and Cosgun, 2007), as well as natural resources waste. Since it is not possible to stop the generation of CDW and the concept of zero waste is one that is impractical, research into possible solutions that would be able to reduce CDW generation has been ongoing over the past several decades. According to the development of this research, the hierarchy to waste management has been set up, which consists of four strategies as shown in Fig. 1, including reducing waste, reusing, recycling and disposing (Peng *et al*., 1997). The impact of the utilization of these four strategies is based on an ascending order from low to high. The main principles of this hierarchy involve the minimization of resource usage and the elimination of environmental pollution, which happen to be the two main aspects of a sustainable construction sector (Peng *et al*., 1997). Reduce, reuse and recycle are the first three strategies in the waste management hierarchy and often called the 3Rs in the management of CDW. These are the fundamental principles in carrying out various programs in the management of CDW.

According to Poon (2007) and Esin and Cosgun (2007), there are two advantages of waste reduction namely minimization of CDW generation and reduction in costs related to the transport, recycling and disposal of waste. The strategy for waste reduction is considered to be the most effective method in reducing the quantity of CDW and eliminating a majority of the challenges linked to the disposal of waste and to the environment (Peng *et al*., 1997; Esin and Cosgun, 2007). However, CDW cannot be totally eliminated; when CDW is created, strategies dealing with reusing and recycling are optional approaches to lower the volume of CDW that ends up in landfills. Reuse is normally related to utilizing the same materials over again in construction, such as reutilizing the materials for similar functions (e.g., construction sector's timber formwork) as suggested by Ling and Leo (2000) and Duran *et al*. (2006). Wastes that are no longer fit for reuse are recycled to make new materials for construction or thrown out into the landfill. Following the strategy of reduction, reuse is the next best option as it uses minimum amounts of processes and energy (Peng *et al*., 1997). The recycling strategy is considered if both prior strategies are not viable. CDW can be formed into new materials using the recycling process. According to Kartam *et al*. (2004) and Tam (2008), the main advantages of recycling waste include:

- Decreasing demand for a new resource
- Reducing costs of transport and energy production
- Using waste that would otherwise end up in landfill sites
- Preserving land areas for urban development in the future
- Improving the environment in general

In instances where CDW cannot be reused or recycled, it must be disposed in a proper manner in landfills and/or for public filling, to eliminate the problem of polluting the surrounding areas.

Despite the sound strategies developed for the area of CDW management, it is however noted that the implementation of these management approaches is far from perfect in reality (Lingard *et al*., 2000; Osmani *et al*., 2006; Kofoworola and Gheewala, 2009). Many past studies have addressed the issues of barriers and complications in applying these approaches. One study reveals that CDW management is not given priority when developing a process design (Osmani *et al*., 2006). Several studies have pointed out the hindrances caused by using technology with a low-waste count such as prefabrication that is utilized in Hong Kong's construction industry (Tam *et al*., 2007; Jaillon *et al*., 2009). Some studies point out that concerns regarding additional costs of recycling and the quality of recycled materials are the main hindrances in promoting the practice of recycling in the construction sector (Tam and Tam, 2006; Tam *et al*., 2009). These barriers need to be overcome and there is urgent need for solutions. Researchers suggest an international promotion for charging for CDW as carried out by the government of Hong Kong (Tam and Tam, 2006; Hao *et al*., 2008). The typical reason for the limited success in the management of CDW is due to the differing concerns of the two main stakeholder groups in the process of CDW management. The first stakeholder group consists of authorities, NGOs and the public, who are mainly concerned about reducing the volume of CDW that ends up in landfills. The second group consists of the contractors and subcontractors as well as project clients who are mainly concerned about the profits and advantages of performing CDW management as opposed to how the environment is affected by CDW.

Researchers in the management of CDW have recently pointed out that those in the sector are finding it difficult to promote the efficacy of CDW management. Through a comprehensive and systematic analysis of the CDW management publication in renowned journals, this study could be very timely and helpful for researchers to capture the latest research trends in the field of CDW management.

MATERIALS AND METHODS

The Thomson Reuters Web of Science database was utilized to retrieve the documents to meet this study's objective. The Thomson Reuters Web of Science database is dependent on the online-based SCI-Expanded. This study had extracted documents published with the keywords 'construction and demolition waste management' in the title, abstract, author and keyword-plus search boxes from the year 2000 to February 2016 for the purpose of analysis using the bibliometric approach. The number of papers cited was discovered by utilizing the ISI Web of Knowledge and its search tool, Cited References. Following the identification and selection of the 100 most cited studies, an analysis was conducted to determine the number of citations, the countries and institutions of origin, the publication year, the study topic, design and evidence level. Two independent reviewers carried out the selection of the studies. In cases of disparity, a third reviewer was engaged to reach an agreement.

RESULTS

The amount of citations of the selected 100 papers varied from 8 to 111. Table 1 illustrates that the initial 10 papers had been cited more than 50 times. Although it would not be possible to comment specifically on each of the papers, we will discuss the top three most prominent ones. The paper entitled "Use of Aggregates from Recycled Construction and Demolition Waste in Concrete" had the most citations with 111 noted. This study investigated the many areas of the said issue beginning with a short review of the global condition of

Table 1: The top 100 cited articles about construction and demolition waste management

No	Article	No. of citation
1	Rao, A., K.N. Jha and S. Misra, 2007. Use of aggregates from recycled construction and demolition waste in concrete. Resour. Conserv. Recy., 50(1): 71-81.	111
2	Poon, C.S., A.T.W. Yu and L.H. Ng, 2001. On-site sorting of construction and demolition waste in Hong Kong. Resour. Conserv. Recy., 32(2): 157-172.	96
3	Bertram, M., T.E. Graedel, H. Rechberger and S. Spatari, 2002. The contemporary European copper cycle: Waste management subsystem. Ecol. Econ., 42(1-2): 43-57.	85
4	Muller, D.B., 2006. Stock dynamics for forecasting material flows-case study for housing in The Netherlands. Ecol. Econ., 59(1): 142-156.	83
5	Kartam, N., N. Al-Mutairi, I. Al-Ghusain and J. Al-Humoud, 2004. Environmental management of construction and demolition waste in Kuwait. Waste Manage., 24(10): 1049-1059.	70
6	Chen, G.Q., H. Chen, Z.M. Chen, B. Zhang, L. Shao, S. Guo, S.Y. Zhou and M.M. Jiang, 2011. Low-carbon building assessment and multi-scale input-output analysis. Commun. Nonlinear Sci., 16(1): 583-595.	56
7	Solis-Guzman, J., M. Marrero, M.V. Montes and A. Ramirez-de-Arellano, 2009. A Spanish model for quantification and management of construction waste. Waste Manage., 29(9): 2542-2548.	54
8	Fatta, D., A. Papadopoulos, E. Avramikos, E. Sgourou, K. Moustakas, F. Kourmoussis, A. Mentzis and M. Loizidou, 2003. Generation and management of construction and demolition waste in Greece-an existing challenge. Resour. Conserv. Recy., 40(1): 81-91.	53
9	Paranavithana, S. and A. Mohajerani, 2006. Effects of recycled concrete aggregates on properties of asphalt concrete. Resour. Conserv. Recy., 48(1): 1-12.	50
10	Townsend, T., T. Tolaymat, H. Solo-Gabriele, B. Dubey, K. Stook and L. Wadanambi, 2004. Leaching of CCA-treated wood: implications for waste disposal. J. Hazard. Mater., 114(1-3): 75-91.	50

Table 1: Continue

11	Tam, V.W.Y., C.M. Tam and K.N. Le, 2007. Removal of cement mortar remains from recycled aggregate using pre-soaking approaches. Resour. Conserv. Recy., 50(1): 82-101.	49
12	Huang, W.L., D.H. Lin, N.B. Chang and K.S. Lin, 2002. Recycling of construction and demolition waste via a mechanical sorting process. Resour. Conserv. Recy., 37(1): 23-37.	47
13	Duran, X., H. Lenihan and B. O'Regan, 2006. A model for assessing the economic viability of construction and demolition waste recycling-the case of Ireland. Resour. Conserv. Recy., 46(3): 302-320.	46
14	Chung, S.S. and C.W.H. Lo, 2003. Evaluating sustainability in waste management: The case of construction and demolition, chemical and clinical wastes in Hong Kong. Resour. Conserv. Recy., 37(2): 119-145.	46
15	Spatari, S., M. Bertram, K. Fuse, T.E. Graedel and E. Shelov, 2003. The contemporary European zinc cycle: 1-year stocks and flows. Resour. Conserv. Recy., 39(2): 137-160.	43
16	Yuan, H. and L. Shen, 2011. Trend of the research on construction and demolition waste management. Waste Manage., 31(4): 670-679.	42
17	Osmani, M., J. Glass and A.D.F. Price, 2008. Architects' perspectives on construction waste reduction by design. Waste Manage., 28(7): 1147-1158.	41
18	Lee, S., Q.Y. Xu, M. Booth, T.G. Townsend, P. Chadik and G. Bitton, 2006. Reduced sulfur compounds in gas from construction and demolition debris landfills. Waste Manage., 26(5): 526-533.	41
19	Wang, J., H. Yuan, X. Kang and W. Lu, 2010. Critical success factors for on-site sorting of construction waste: A china study. Resour. Conserv. Recy., 54(11): 931-936.	40
20	Tam, V.W.Y., 2008. On the effectiveness in implementing a waste-management-plan method in construction. Waste Manage., 28(6): 1072-1080.	40
21	Esin, T. and N. Cosgun, 2007. A study conducted to reduce construction waste generation in Turkey. Build. Environ., 42(4): 1667-1674.	39
22	Tolaymat, T.M., T.G. Townsend and H. Solo-Gabriele, 2000. Chromated copper arsenate-treated wood in recovered wood. Environ. Eng. Sci., 17(1): 19-28.	39
23	Bergsdal, H., R.A. Bohne and H. Brattebo, 2007. Projection of construction and demolition waste in Norway. J. Ind. Ecol., 11(3): 27-39.	38
24	Cuellar-Franca, R.M. and A. Azapagic, 2012. Environmental impacts of the UK residential sector: Life cycle assessment of houses. Build. Environ., 54: 86-99.	37
25	Staley, B.F. and M.A. Barlaz, 2009. Composition of municipal solid waste in the United States and implications for carbon sequestration and methane yield. J. Environ. Eng., 135(10): 901-909.	37
26	Tam, V.W.Y., 2009. Comparing the implementation of concrete recycling in the Australian and Japanese construction industries. J. Clean. Prod., 17(7): 688-702.	37
27	Tam, V.W.Y. and C.M. Tam, 2006. Evaluations of existing waste recycling methods: A Hong Kong study. Build. Environ., 41(12): 1649-1660.	37
28	Petkovic, G., C.J. Engelsen, A.O. Haoya and G. Breedveld, 2004. Environmental impact from the use of recycled materials in road construction: Method for decision-making in Norway. Resour. Conserv. Recy., 42(3): 249-264.	37
29	Wang, J.Y., A. Touran, C. Christoforou and H. Fadlalla, 2004. A systems analysis tool for construction and demolition wastes management. Waste Manage., 24(10): 989-997.	37
30	Matias, D., J. de Brito, A. Rosa and D. Pedro, 2013. Mechanical properties of concrete produced with recycled coarse aggregates–influence of the use of superplasticizers. Constr. Build. Mater., 44(0): 101-109.	36
31	Kofoworola, O.F. and S.H. Gheewala, 2009. Estimation of construction waste generation and management in Thailand. Waste Manage., 29(2): 731-738.	36
32	Bergsdal, H., H. Brattebo, R.A. Bohne and D.B. Mueller, 2007. Dynamic material flow analysis for Norway's dwelling stock. Build. Res. Inf., 35(5): 557-570.	36
33	Blengini, G.A. and E. Garbarino, 2010. Resources and waste management in Turin (Italy): The role of recycled aggregates in the sustainable supply mix. J. Clean. Prod., 18(10-11): 1021-1030.	35
34	Zhao, W., R.B. Leeftink and V.S. Rotter, 2010. Evaluation of the economic feasibility for the recycling of construction and demolition waste in China: The case of Chongqing. Resour. Conserv. Recy., 54(6): 377-389.	35
35	Laurent, A., J. Clavreul, A. Bernstad, I. Bakas, M. Niero, E. Gentil, T.H. Christensen and M.Z. Hauschild, 2014. Review of LCA studies of solid waste management systems–part II: Methodological guidance for a better practice. Waste Manage., 34(3): 589-606.	32
36	Cochran, K., T. Townsend, D. Reinhart and H. Heck, 2007. Estimation of regional building-related C&D debris generation and composition: Case study for Florida, US. Waste Manage., 27(7): 921-931.	32
37	Klang, A., P.Å. Vikman and H. Brattebø, 2003. Sustainable management of demolition waste: An integrated model for the evaluation of environmental, economic and social aspects. Resour. Conserv. Recy., 38(4): 317-334.	32
38	Krook, J., A. Mårtensson and M. Eklund, 2004. Metal contamination in recovered waste wood used as energy source in Sweden. Resour. Conserv. Recy., 41(1): 1-14.	31
39	Yeheyis, M., K. Hewage, M.S. Alam, C. Eskicioglu and R. Sadiq, 2013. An overview of construction and demolition waste management in Canada: A lifecycle analysis approach to sustainability. Clean Technol. Envir., 15(1): 81-91.	28
40	Lu, W. and H. Yuan, 2010. Exploring critical success factors for waste management in construction projects of China. Resour. Conserv. Recy., 55(2): 201-208.	28
41	Lu, W. and H. Yuan, 2011. A framework for understanding waste management studies in construction. Waste Manage., 31(6): 1252-60.	27
42	Lu, W., H. Yuan, J. Li, J.J.L. Hao, X. Mi and Z. Ding, 2011. An empirical investigation of construction and demolition waste generation rates in Shenzhen city, South China. Waste Manage., 31(4): 680-687.	27
43	Banias, G., C. Achillas, C. Vlachokostas, N. Moussiopoulos and S. Tarsenis, 2010. Assessing multiple criteria for the optimal location of a construction and demolition waste management facility. Build. Environ., 45(10): 2317-2326.	27

Table 1: Continue

44	Kourmpanis, B., A. Papadopoulos, K. Moustakas, M. Stylianou, K.J. Haralambous and M. Loizidou, 2008. Preliminary study for the management of construction and demolition waste. Waste Manage. Res., 26(3): 267-275.	27
45	Rodríguez, G., F.J. Alegre and G. Martínez, 2007. The contribution of environmental management systems to the management of construction and demolition waste: The case of the autonomous community of Madrid (Spain). Resour. Conserv. Recy., 50(3): 334-349.	27
46	Llatas, C., 2011. A model for quantifying construction waste in projects according to the European waste list. Waste Manage., 31(6): 1261-1276.	26
47	Delay, M., T. Lager, H.D. Schulz and F.H. Frimmel, 2007. Comparison of leaching tests to determine and quantify the release of inorganic contaminants in demolition waste. Waste Manage., 27(2): 248-255.	26
48	Nunes, K.R.A., C.F. Mahler, R. Valle and C. Neves, 2007. Evaluation of investments in recycling centres for construction and demolition wastes in Brazilian municipalities. Waste Manage., 27(11): 1531-1540.	26
49	Yuan, H.P., L.Y. Shen, J.J.L. Hao and W.S. Lu, 2011. A model for cost–benefit analysis of construction and demolition waste management throughout the waste chain. Resour. Conserv. Recy., 55(6): 604-612.	25
50	Spoerri, A., D.J. Lang, C.R. Binder and R.W. Scholz, 2009. Expert-based scenarios for strategic waste and resource management planning-C& D waste recycling in the Canton of Zurich, Switzerland. Resour. Conserv. Recy., 53(10): 592-600.	25
51	Gomes, C.F.S., K.R.A. Nunes, L.H. Xavier, R. Cardoso and R. Valle, 2008. Multicriteria decision making applied to waste recycling in Brazil. Omega-Int. J. Manage. S., 36(3): 395-404.	25
52	Coelho, A. and J. de Brito, 2013. Economic viability analysis of a construction and demolition waste recycling plant in Portugal–part II: economic sensitivity analysis. J. Clean. Prod., 39(0): 329-337.	23
53	Yuan, H., A.R. Chini, Y. Lu and L. Shen, 2012. A dynamic model for assessing the effects of management strategies on the reduction of construction and demolition waste. Waste Manage., 32(3): 521-531.	23
54	Jambeck, J., K. Weitz, H. Solo-Gabriele, T. Townsend and S. Thorneloe, 2007. CCA-treated wood disposed in landfills and life-cycle trade-offs with waste-to-energy and MSW landfill disposal. Waste Manage., 27(8): S21-S28.	23
55	Coelho, A. and J. De Brito, 2012. Influence of construction and demolition waste management on the environmental impact of buildings. Waste Manage., 32(3): 357-358.	22
56	Yu, D., H. Tan and Y. Ruan, 2011. A future bamboo-structure residential building prototype in China: Life cycle assessment of energy use and carbon emission. Energ. Buildings, 43(10): 2638-2646.	21
57	Hao, J.L., M.J. Hills and V.W.Y. Tam, 2008. The effectiveness of Hong Kong's construction waste disposal charging scheme. Waste Manage. Res., 26(6): 553-558.	21
58	Damghani, A.M., G. Savarypour, E. Zand and R. Deihimfard, 2008. Municipal solid waste management in Tehran: Current practices, opportunities and challenges. Waste Manag., 28(5): 929-934.	21
59	Brown, C., M. Milke and E. Seville, 2011. Disaster waste management: A review article. Waste Manage., 31(6): 1085-1098.	19
60	Zhang, H., P.J. He and L.M. Shao, 2008. Implication of heavy metals distribution for a municipal solid waste management system: A case study in Shanghai. Sci. Total Environ., 402(2-3): 257-267.	19
61	Dubey, B., H.M. Solo-Gabrille and T.G. Townsend, 2007. Quantities of arsenic-treated wood in demolition debris generated by hurricane katrina. Environ. Sci. Technol., 41(5): 1533-1536.	18
62	Schachermayer, E., T. Lahner and P.H. Brunner, 2000. Assessment of two different separation techniques for building wastes. Waste Manage. Res., 18(1): 16-24.	18
63	Courard, L., F. Michel and P. Delhez, 2010. Use of concrete road recycled aggregates for roller compacted concrete. Constr. Build. Mater., 24(3): 390-395.	17
64	Lampris, C., R. Lupo and C.R. Cheeseman, 2009. Geopolymerisation of silt generated from construction and demolition waste washing plants. Waste Manage., 29(1): 368-373.	17
65	Poon, C.S., 2007. Management of construction and demolition waste. Waste Manage., 27(2): 159-60.	16
66	Arulrajah, A., M.M. Disfani, S. Horpibulsuk, C. Suksiripattanapong and N. Prongmanee, 2014. Physical properties and shear strength responses of recycled construction and demolition materials in unbound pavement base/subbase applications. Constr. Build. Mater., 58: 245-257.	15
67	Katz, A. and H. Baum, 2011. A novel methodology to estimate the evolution of construction waste in construction sites. Waste Manage., 31(2): 353-358.	15
68	Hiete, M., J. Stengel, J. Ludwig and F. Schultmann, 2011. Matching construction and demolition waste supply to recycling demand: A regional management chain model. Build. Res. Inf., 39(4): 333-351.	15
69	del Rio Merino, M., P. IzquierdoGracia and I.S. Weis Azevedo, 2010. Sustainable construction: Construction and demolition waste reconsidered. Waste Manage. Res., 28(2): 118-129.	15
70	Jambeck, J.R., T.G. Townsend and H.M. Solo-Gabriele, 2008. Landfill disposal of CCA-treated wood with construction and demolition (C&D) debris: Arsenic, chromium and copper concentrations in leachate. Environ. Sci. Technol., 42(15): 5740-5745.	15
71	Hendriks, C.F. and G.M.T. Janssen, 2003. Use of recycled materials in constructions. Mater. Struct., 36(263): 604-608.	15
72	Yuan, H., 2012. A model for evaluating the social performance of construction waste management. Waste Manage., 32(6): 1218-28.	14
73	Zhao, W., H. Ren and V.S. Rotter, 2011. A system dynamics model for evaluating the alternative of type in construction and demolition waste recycling center: The case of Chongqing, China. Resour. Conserv. Recy., 55(11): 933-944.	14
74	Lu, W. and V.W.Y. Tam, 2013. Construction waste management policies and their effectiveness in Hong Kong: A longitudinal review. Renew. Sust. Energ. Rev., 23: 214-223.	13
75	Simion, I.M., C. Ghinea, S.G. Maxineasa, N. Taranu, A. Bonoli and M. Gavrilescu, 2013. Ecological footprint applied in the assessment of construction and demolition waste integrated management. Environ. Eng. Manag. J., 12(4): 779-788.	13

Table 1: Continue

76	Coelho, A. and J. De Brito, 2011. Generation of construction and demolition waste in Portugal. Waste Manage. Res., 29(7): 739-750.	13
77	Kourmpanis, B., A. Papadopoulos, K. Moustakas, F. Kourmoussis, M. Stylianou and M. Loizidou, 2008. An integrated approach for the management of demolition waste in Cyprus. Waste Manage. Res., 26(6): 573-581.	13
78	Dantata, N., A. Touran and J. Wang, 2005. An analysis of cost and duration for deconstruction and demolition of residential buildings in Massachusetts. Resour. Conserv. Recy., 44(1): 1-15.	13
79	Zhang, X., Y. Wu and L. Shen, 2012. Application of low waste technologies for design and construction: A case study in Hong Kong. Renew. Sust Energ. Rev., 16(5): 2973-2979.	12
80	VilloriaSaez, P., M. del Rio Merino and C. Porras-Amores, 2012. Estimation of construction and demolition waste volume generation in new residential buildings in Spain. Waste Manage. Res., 30(2): 137-146.	12
81	Martinez Lage, I., F. Martinez Abella, C. Vazquez Herrero and J.L. Perez Ordonez, 2010. Estimation of the annual production and composition of C&D Debris in Galicia (Spain). Waste Manage., 30(4): 636-645.	12
82	da Rocha, C.G. and M.A. Sattler, 2009. A discussion on the reuse of building components in Brazil: An analysis of major social, economical and legal factors. Resour. Conserv. Recy., 54(2): 104-112.	12
83	Malia, M., J. de Brito, M.D. Pinheiro and M. Bravo, 2013. Construction and demolition waste indicators. Waste Manage. Res., 31(3): 241-255.	11
84	Proietti, S., P. Sdringola, U. Desideri, F. Zepparelli, F. Masciarelli and F. Castellani, 2013. Life cycle assessment of a passive house in a seismic temperate zone. Energ. Buildings, 64: 463-472.	10
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90	Hu, Z.H. and J.B. Sheu, 2013. Post-disaster debris reverse logistics management under psychological cost minimization. Transport. Res. B-Meth., 55: 118-141.	9
91	Manowong, E., 2012. Investigating factors influencing construction waste management efforts in developing countries: an experience from Thailand. Waste Manage. Res., 30(1): 56-71.	9
92	Coronado, M., E. Dosal, A. Coz, J.R. Viguri and A. Andrés, 2011. Estimation of construction and demolition waste (C&DW) generation and multicriteria analysis of C&DW management alternatives: A case study in Spain. Waste Biomass Valorization, 2(2): 209-225.	9
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95	Agamuthu, P., 2008. Challenges in sustainable management of construction and demolition waste. Waste Manage. Res., 26(6): 491-492.	9
96	Abduli, M.A., R. Samieifard and G.Z.M. Jalili, 2008. Rural solid waste management. Int. J. Environ. Res., 2(4): 425-430.	9
97	Bohne, R.A., H. Brattebo and H. Bergsdal, 2008. Dynamic eco-efficiency projections for construction and demolition waste recycling strategies at the city level. J. Ind. Ecol., 12(1): 52-68.	9
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the generated CDW, CDW generated recycled aggregates and their use in government strategies on recycling CDW. This study was published in the Journal of Resources, Conservation and Recycling in the year 2007 and was authored by Rao *et al*. (2007) as shown in Table 1. The second most cited study with 96 citations was authored by Poon *et al*. (2001) from the same journal. This study includes a survey that was carried out to evaluate three different methods of sorting waste for constructions sites and compared them to a central off-site facility for sorting waste. The third study with a total of 85 citations overall was authored by Bertram *et al*. (2002) entitled 'The Contemporary European Copper: Waste Management Subsystem' from the Journal Ecological Economics as shown in Table 1. This is a comprehensive study on the waste management's copper mass balance in the European region, which include waste from construction and demolitions, electrical and electronic equipments, end-of-life vehicles and municipal solid waste.

In terms of authors, Yuan Hongping has the most number of papers cited with 8 studies out of the 100 chosen papers. This is followed by Townsend Timothoy and Tam Vivian W. Y. with 7 studies each, Lu

Table 2: Authors with the most number of papers included amongst the 100 most cited papers

	Author with more than 3 articles included in the top 100			
Name	First Author	Coauthor	Last Author	Total
Yuan Hongping	4	4	0	8
TamVivian W.Y.	5	1	1	7
Townsend Timothy	1	3	3	7
Brito Jorge	0	5	0	5
Lu Weisheng	4	0	1	5
Shen Liyin	0	3	2	5
Solo-Gabriele Helena M.	0	1	4	5
Brattebo Helge	0	2	2	4
Wang Jiayuan	2	0	2	4

Table 3: Journals in which the 100 most cited papers were published

No	Journal name	2014 JCR Science edition impact factor	Number of articles included in the top 100
1	Resources Conservation and Recycling	2.564	25
2	Waste Management	3.22	25
3	Waste Management & Research	1.297	9
4	Building and Environment	3.341	5
5	Building Research and Information	1.454	3
6	Construction and Building Materials	2.296	3
7	Journal of Industrial Ecology	3.226	3
8	Journal of Cleaner Production	3.844	3
9	International Journal of Life Cycle Assessment	3.988	2
10	Environmental Engineering and Management Journal	1.065	2
11	Ecological Economics	2.72	2
12	Renewable & Sustainable Energy Reviews	5.901	2
13	Environmental Science & Technology	5.33	2
14	Energy and Buildings	2.884	2
15	Science of The Total Environment	4.099	1
16	Journal of Hazardous Materials	4.529	1
17	Materials and Structures	1.714	1
18	Clean Technologies and Environmental Policy	1.934	1
19	Environmental Engineering Science	0.991	1
20	Journal of Environmental Engineering	1.267	1
21	International Journal of Environmental Research	1.1	1
22	Chemosphere	3.34	1
23	Transportation Research Part B-Methodological	2.952	1
24	Waste and Biomass Valorization	1.065	1
25	Journal of Environmental Management	2.723	1
26	Omega-International Journal of Management Science	4.376	1
27	Communications in Nonlinear Science and Numerical Simulation	2.866	1

Weisheng, Brito Jorge, Solo-Gabriele Helena M. and Shen Liyin with 5 studies each and Wang Jiayuan and Brattebo Helge with 4 studies each as shown in Table 2. When evaluated in terms of authors with more than one publication out of the first 25 studies in the ranking, Bertram *et al*. (2002), were in the 3rd and 16th position while Tolaymat, T, Townsend Timothy and Solo-Gabriele Helena M. who co-authored papers were at the 8th, 19th and 24th positions, respectively. Tam Vivian W. Y. ranked 2th, 10th and 20th and while Yuan Hongping who co-authored the papers was at the 15th and 18th positions. Fifty-seven papers were published between 2000 and 2009 whilst the remaining 43 were published from 2010 to February 2016.

The chosen 100 papers were found in publications from 27 peer-reviewed journals. The most number of studies cited was from the Journals of 'Resource Conservation and Recycling' as well as 'Waste Management', which had 25 cited studies followed by the Journal of 'Waste Management and Research' with 9 cited studies. According to the 2014 Journal Citation Report, the Impact Factor of each of these journals is 2.564, 3.22 and 1.297 respectively as demonstrated in Table 3.

DISCUSSION

This study as with all other citation analysis studies faced several limitations. The search tool for Cited Reference in the ISI Web of Knowledge caused the most inconvenience, as it does not automatically exclude self-citing (Dumont, 1989). This means that there is a possibility of biasness whereby authors are more likely to cite studies from journals where they can publish their own papers (Seglen, 1997). In addition, citations from books and journals of another language are not included in this database. Other bibliography resources such as Google Scholar have a higher register of captured citations.

Most of the highly cited studies emphasize the areas of general CDW management, recycling of CDW, reduction of CDW and generation of CDW as shown in Table 1. In general, the citations of the papers have been increasing for topics such as recycling of CDW and general CDW management. Studies in the area of general CDW management have the highest representation because this topic encompasses a comparatively wide variety of sub-headings including environment regulations in the management of CDW, cost-benefit analysis and waste management systems and plans. As noted in Table 1, studies in the general topic of CDW have increased from the year 2007. This shows that the areas under the topic of general CDW management will likely become a prominent area of research in the future. The topic of CDW recycling, which is linked to the challenges faced in CDW management from technical and managerial perspectives, is also an area of interest among researchers. It is claimed that this area would continue to receive a lot of attention. Studies in the area of CDW reduction has also witnessed a constant increase with keen attention from researchers; this shows that the reduction of CDW is the best approach in managing CDW by saving resources and eliminating pollution. Furthermore, three other related areas under the topic of CDW generation namely causes of waste, the rate of generating waste and factors that affect the generation of waste, have also received particular interest from researchers. In any related country, the understanding of how CDW is generated is of utmost importance prior to carrying out a thorough study of alternative approaches to waste management. The analysis reveals that developing countries such as Malaysia and China are increasingly focusing on this holistic research area (Yuan and Shen, 2011). It should be noted that overall, these developing countries have also increased their emphasis on the management of CDW.

Surprisingly, studies in the area of reusing CDW have been low as compared to the areas of recycling and reducing waste, although these three dimensions are regarded as the fundamental pillars in the management of CDW. A thorough review of previous literature shows that this is probably due to the existing awareness amongst contractors regarding the benefits of actively re-using waste materials (Yuan and Shen, 2011).

CONCLUSION

To date, based on available resources, this study is the first reportage on the most cited papers dealing with Construction and Demolition waste Management (CDW) in the construction industry. One method of gauging the progress and significant areas of interest in the management of CDW is by identifying the 100 most cited papers in the area of CDW management to investigate the current and future trends of the industry. The evaluation of the most cited studies is important as it acknowledges the quality of the studies that have been carried out thus far, identifies new discoveries and steers CDW management in the right direction based on the findings.

A number of 384 CDW management-related papers from the construction industry published from the year 2000 to February 2016 were evaluated using the Web of Science. Out of this figure, the top 100 most cited papers were chosen according to the JCR Science Edition. Hong Kong as well as the USA ranked number one in terms of quantity of publications. However, the study with the most citations was authored by Rao Akash, Jha Kumar N and MisraSudhir from the Indian Institute of Technology in India. More than half of the 100 cited studies were published in the ‘Research Conservation and Recycling’ and ‘Waste Management’ journals. Author, Yuan Hongping of the Hong Kong Polytech University is the first author and the corresponding author of 8 studies, which making him the most active researcher in the top 100 cited studies.

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