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Current Status of the Research on Construction and Demolition Waste Management

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Abstract

Objectives: This paper aims to systematically review the current studies related to the field of construction and demolition waste (CDW) management by examining the main peer reviewed journals from the year 2000 to 2015. **Methods/Statistical Analysis:** Documents used for the purpose of this review were retrieved from the online database SCI-Expanded version called the Web of Science, Thomson Reuters. These journals will be analysed based on the number of annually published papers, the scholars and institutions who have contributed, the data analysis methods utilized in the researches, and the topics covered in the studies. **Findings:** The review reveals that most data collection was carried out using the survey and case study method on the field of CDW management and the analyses are mainly discussed using the descriptive analysis approach. The two main topics that were most researched out of the six research areas in the CDW management field include the management of CDW and the recycling of CDW. The findings highlight the growing interest in the research of CDW management over the past few years. There is also evidence that developing countries including Malaysia are making great attempts in the research of CDW management. **Application/Improvement:** This research presented some valuable information beneficial to both academicians and practitioners. This work would assist researchers in understanding the major trends in the development of research on CDW management.

Keywords: Bibliometric, Citation, Construction and Demolition Waste, Waste Management

1. Introduction

Reasons for publishing in academic journals have been highlighted by many researchers. Through publication, one can, on the one hand, gain recognition and personal satisfaction by contributions to the knowledge body, on the other hand, sustain his/her career progression – moving up to the next rung on the ladder[1,2]. In recent years, a great deal of publication has occurred in scholarly journals due to an increasing interest in dealing with construction and demolition issues around the globe. Being faced with so many studies, it is very difficult for readers to understand the research progress in this field quickly. This is often the case particularly for new researchers. In this regard, a systematic content analysis of publication in relation to CDW management in scholarly journals would be vital important for assisting researchers in understanding the latest progress, as well as serve as a vehicle for inspiring new research directions.

Generally speaking, content analysis of publication in particular research field could be typically classified into two categories. One is to summarize and critique current research based on a comprehensive review; typical example that fall into this category include an exploration of the key issues and debates surrounding the concept of partnering[3] and review on competitiveness in construction[4]. The order is to carry out systematic review of academic papers based on the number of papers published as well as topic areas in the chosen journals. Papers that match are representative of this category include the research carried out by[5] in which they analysed the topic of PFI/

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PPP in construction related journals and a content analysis of a paper related to scientific research carried out by[6]. Researchers can not only obtain a clear and thorough understanding of the present research status by utilizing the first type of examination and thereafter initializing their own study so as to prevent redundant research attempts[4], but they can also introduce new and beneficial directions for future research. The latter would be useful to researchers, as it would allow them to investigate the research trends in a specific research area. Undoubtedly, both types of analyses are critical to quickly grasp what the current research progress is, as well as what the potential research directions deserving further investigations are. The difference is that the former concentrates on examining the research content of publication carefully, while the latter focuses mainly on the research trend, such as the annual amount of published papers in selected journals, the author/institutes' contributions, the variation of research topics, etc.

[7]Produced a comprehensive research on the subject of CDW management by examining all the related journals in this area. Relying on the support of the Nvivo software, known as the software for Qualitative Social Research, scholars[7] introduced a careful, logical approach to identify the papers related to CDW management. This approach was proven effective in searching for current topics in a chosen discipline from the literatures; however, it was not able to introduce any new topic for future research. Therefore[8], study was the only ordered assessment that has been carried out in the area of CDW management. As such, this study aims to produce the current research focus in the area of CDW management as offered by journals by analysing the literature on CDW management from papers selected from the years 2000 to 2015. In order to achieve the main aim of this study, the study's objectives are to search for different contributions under the area of CDW management from researchers or institutions, varied topics of research spanning over fifteen years, and primary approach to collection of data and research analysis from 2000 to 1015.

This research is separated into four sections. The next part presents the principles and practices of CDW management. This is continued with the introduction of the methodology undertaken to select the targeted academic papers for data analysis. The last section explains the data analysis and discusses the findings while finishing off the research with the conclusion.

2. The Management of Construction and Demolition Waste

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 construction, renovation, as well as demolition involving works such as civil and building constructions, land formation or excavation, site clearances, demolition activities, building renovations, and road works[9]. A considerable amount of CDW is produced worldwide annually. Research work by[10], for example, reports that about 136 million tons of construction and demolition debris related to building 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[11], and the rate of wastage in the construction sector reaches up to 10-15% in the UK[12]. In Australia, the CDW adds up to almost 16-40% of the total generated solid waste[13]; meanwhile, the Environment Protection Department (EPD) of Hong Kong found that about 2900 tons of CDW ended up in landfills on a daily basis in 2007[14]. 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[15,16].

CDW generation results in multiple adverse impacts such as utilizing massive land space for the purpose of land fields to contain the waste[17], endangering the surrounding areas due to toxic pollution[18], 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 this 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 Figure 1, including reducing waste, reusing, recycling and disposing[19]. The impact of the utilization of these four strategies is based on an ascending order of low to high. The main principles for this hierarchy is to minimize the usage of resources and the elimination of environmental pollution, which happen to be the two main aspects of a sustainable construction sector[19,20]. Reduce, reuse, and recycle are the first three strategies of the waste management hierarchy and often called the 3Rs in the management of CDW. This

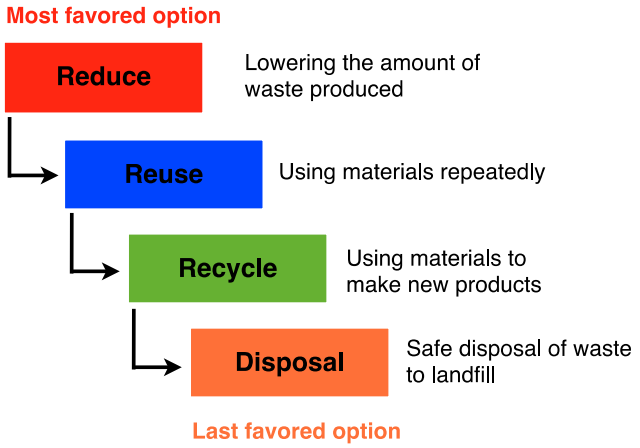

Figure 1. Hierarchy of waste management.

is utilized as the fundamental principles of carrying out various programs on the management of CDW.

According to[18,21], there are two advantages attached to 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 the most effective method to reduce the quantity of CDW and eliminating a majority of the challenges linked to the disposal of waste and the environment[18,19]. However, CDW cannot be totally eliminated; when the CDW is created, strategies dealing with reusing and recycling are optional approaches to lower the volume of CDW landing 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[22]. Several other methods for the reuse strategy are new life reuse where materials are reused as a new type of raw material and used for a new objective such as using the steel bars cut corners to make shelves and using concrete and bricks fractions to make materials for road works[23]. Wastes that are beyond 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[19]. The recycling strategy is considered if both the prior strategies are not viable. CDW can be formed into new materials using the recycling process. According to[24] and[25], the main advantages of recycling waste includes (i) decreasing demand for a new resource; (ii) reducing costs of transport and energy production; (iii) using waste that would otherwise land up in landfill sites; (iv) preserving land areas for urban development in the future; and (v) improving the environment in general[26,27]. When one is not able to reuse or recycle CDW, it must be disposed in a proper manner in landfills and/or for public filling, to eliminate the problem of polluting the surrounding areas.

In spite of the sound strategies developed for the area of CDW management, it is however noted that implementing these management approaches is far from perfect in reality[28-30]. 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[29]. Several studies have pointed out the hindrances caused by using technology with a low-waste count such as prefabrication that is utilized in the Hong Kong's construction industry[31,32]. Some studies point out that concerns dealing with additional extra costs of recycling and the recycled materials' quality are the main hindrance in promoting the practice of recycling in the construction sector[33,34]. These barriers need to be overcome and there is urgent need for solutions. Researchers suggest an international promotion for charging for CDW as it is carried out by the government of Hong Kong[33,35]. 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 landing in landfills. The second group consists of the main and subcontractors, and project clients who are mainly concerned about profits and advantages of performing CDW management and not as concerned about how the environment is affected by the 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 the management of CDW. Through a comprehensive and systematic analysis of the CDW management publication in renowned journals, this study be very timely and helpful for researchers to capture the latest research trends in the field of CDW management.

3. Research Methodology

3.1 Selecting Target Scholarly Journals

Documents used for the purpose of this review were retrieved from the online database SCI-Expanded version called the Web of Science, Thomson Reuters. The search

criteria used to locate the appropriate journals included the terminology "construction and demolition waste management" in the title, abstract, and author boxes from the year 2000 to 2015; the bibliometric technique was utilized to analyze the papers for this research. The items used for review for analysis included the quantity of citations, countries where studies took place, institutions that undertook the study, publication year, the study's topic and design, and the degree of evidence provided.

Approach herein for the identification of CDW management related papers is largely based on the results of the studies by[7] and[8]. Following a set of rigorous procedures[7], identified 109 published CDW and related management studies in peer reviewed journals from 1996 to 2010. These studies appear in four major journals including Construction Management and Economics, Waste Management and Research, Waste Management, and Resources, Conservation, and Recycling (RC&R). Each of these journals has approximately 10 papers in relation to the management of CDW. Moreover, seven other peer-reviewed journals from 2000 to 2010 that also contain about 2 related papers each include Building & Environment, Construction Engineering & Management, Construction & Architectural Management, Construction Innovation, Automation in Construction Engineering, and Management of Environmental Quality, and Industry Ecology.

As a result, through this manual research in Thomson Reuters Web of Science, it was found that twelve journals, namely Resource Conservation and Recycling, Constructing and Building Martials, Waste Management Research, Waste Management, Cleaner Production, Journal of Industrial Ecology, Building and Environment, Renewable Sustainable Energy Reviews, Engenharia Sanitaria E Ambiental, Journal of Material Cycles and Waste Management, Waste and Biomass Valorization, and Journal of Civil Engineering and Management, had about two papers related to the management of CDW from the year 2000-2015. Thus, finally, 12 of these peer-reviewed journals were chosen as the specific journals to find out about the research papers related to CDW management for this study.

3.2 Categories of the Selected Papers

The research papers from the chosen journals were classified specifically to gain a deep understanding of the level and trend of the CDW management research development. The main objective of this study is to gain a deep understanding of the methods of collection and analysis of data, which has been utilized before in the past studies. The subsequent objective includes identifying the quantity of studies that have been annually published in the CDW management related area from the year 2000 to 2015.

Based on the related literature, it has been found that methods used in the researches carried out in the area of CDW management vary greatly. Examining the identified papers for this study has enabled the identification of four types of research methods. The following are the research methods used and a brief description of each.

- Case Studies: The objective is to study actual projects carried out in the area of construction to gain insights[36];
- Reviews: This is carried out to gain a deep understanding of the critically done analysis of specific areas of interest from the obtained papers[33], or to gather information regarding the CDW management practices performed in other parts of the world[37];
- Surveys: This approach facilitates the distribution of questionnaires or conducting personal interviews with practitioners in the construction sector[38]; and
- Experiments: This approach is primarily utilized to study recycling in CDW management[39].

In addition, investigating the related journals papers revealed four main types of methods in data analysis that have been utilized in carrying out research on CDW management namely descriptive analysis, cost-benefit analysis, statistical analysis, and simulating/modelling.

- Descriptive analysis is carried out to analyse data by measuring the value of mean, standard deviation, as well as percentage, or by performing various types of statistical testing[40];
- Cost-benefit analysis helps to determine the costs as well as benefits related to the CDW management activities[41];
- Statistical analysis makes use of various methods including the regression analysis[42]; and
- Simulating/modelling can be defined as data analysis through the use of different mathematical modelling methods[35].

The related research analyses not only has the advantage of determining the topics that have been examined in the past hence preventing research redundancy, but it also points out how the topics have changed over the period of examination[8].

4. Results, Analysis and Discussion

4.1 Number of Published Papers

There were in total, 172 published CDW management related papers in the 12 peer reviewed journals from the year 2000 to 2015. Even though there was only about 2% of papers on CDW management from the total amount of papers on this field that were annually published, the figure showed a rapid increase, which means that CDW management has been attracting increasing attention from researchers around the world.

120 among 172 CDW management related papers were published in journals that were devoted to the presentation and discussion of new knowledge on different waste related topics such as Waste Management Research, Waste Management, and Resource Conservation and Recycling. The respective numbers of CDW management publications in each of the three journals were 49, 42 and 29. Constructing and Building Materials, and Journal of Cleaner Production published 12 and 11 papers respectively. The Journal of Industrial Ecology, and Building and Environment published closely by 5 articles each. Among the five journals, four journals published 4 related CDW management articles each, which are Renewable Sustainable Energy Reviews, Engenharia Sanitaria E Ambiental, Journal of Material Cycles and Waste Management, and Waste and Biomass Valorization. The other journal was Journal of Civil Engineering and Management by 3 published article. The six among 12 journals were Q1, two were Q2, two were Q3 and the rest were Q4. The highest impact factor was related to Renewable Sustainable Energy Reviews which was 5.901 and the lowest one was 0.95 that is related to Journal of Material Cycles and Waste Management by Journal Citation Report (JCR) Science Edition impact factor (Table 1).

The analysis of citations as mentioned before is an efficient method of reviewing the contributions of the journals. In Table 2, the findings of the analysis of the citations of the top seven journals among twelve selected target scholarly journals are presented. From the result of Table 2, it can be found that the most frequently cited journals, Resources, Conservation, and Recycling were cited 1008 times making it the highest number of citations. The next is Waste Managemet for 852, and Waste Management & Research for 216 times. The rest are

Table 1. Journal selected name, number of published articles and impact factor

No	Journal Name (2014 JCR Science Edition)	Science Edition impact factor	Number of articles
1	RESOURCE CONSERVATION AND RECYCLING	Q2–2.564	49
2	WASTE MANAGEMENT	Q1–3.22	42
3	WASTE MANAGEMENT RESEARCH	Q3–1.297	29
4	CONSTRUCTING AND BUILDING MARTIALS	Q1–2.29	12
5	JOURNAL OF CLEANER PRODUCTION	Q1–3.844	11
6	JOURNAL OF INDUSTRIAL ECOLOGY	Q1–3.227	5
7	BUILDING AND ENVIRONMENT	Q1–3.341	5
8	RENEWABLE SUSTAINABLE ENERGY REVIEWS	Q1–5.901	4
9	ENGENHARIA SANITARIA E AMBIENTAL	Q4–0.241	4
10	JOURNAL OF MATERIAL CYCLES AND WASTE MANAGEMENT	Q4–0.95	4
11	WASTE AND BIOMASS VALORIZATION	Q3–1.056	4
12	JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT	Q2–1.07	3

Table 2. Most frequently cited journals

Journal	Total cited times	Average Citations per Year
RESOURCES CONSERVATION AND RECYCLING	1008	67.20
WASTE MANAGEMENT	852	77.45
WASTE MANAGEMENT & RESEARCH	216	14.40
CONSTRUCTION AND BUILDING MATERIALS	90	18.00
JOURNAL OF CLEANER PRODUCTION	117	16.71
BUILDING AND ENVIRONMENT	152	15.20
JOURNAL OF INDUSTRIAL ECOLOGY	62	6.89

Construction and Building Materials, Cleaner Production, Industrial Ecology, and Building and Environment at 90, 117, 62, 152 times, respectively. These results demonstrate that Resources Conservation and Recycling performed well both in terms of total cited times and cited times per paper among twelve journals.

4.2 Author and Country's' Contribution to the Paper

Contribution in a research can be mainly evaluated in two ways. One is, as previously mentioned, by author/institute productivity analysis. The other is through calculating the total cited times after the publication of particular researches. A paper that is often cited indicates that the findings are relevant to researchers. It also shows that those who carried out the research have made an interesting contribution in increasing the body of knowledge regarding the particular field of study. This is the reason why it is important to carry out the citation analysis in identifying and acknowledging the journals, authors, and institutions.

It can be clearly seen from Table 3 that China is the highest contributor of papers related to the management of CDW from the year 2000 to 2015. In terms of regions or developed countries USA, England, Australia, China, Spain, and Brazil are the highest contributors of publications on the management of CDW, which shows the importance of the management of CDW in these places, are of a high priority compared to other developing countries. In addition, it should be noted that Malaysia is one of the top countries among the developing nations with a high interest in CDW research given its 4 published papers from the year 2000 to 2015. The lack of publications of the issue of CDW management in developing countries could be due to a few reasons such as the lack of strict environmental regulations, lack of awareness in the proper management of CDW among those in the construction industry, and more than enough land for land filling for CDW, among others.

Table 4 shows that 12 researchers have written about three published papers related to the management of CDW from 2000 to 2015. It shows that researcher, Tam Vivian W. Y., has the highest number of publications with 14 published papers. It is also revealed that four out of the top five scholars who contributed the most papers have

Table 3. Research origin of CDW management papers published

No	Institute/ University	Papers	No	Institute/ University	Papers
1	Peoples R China	41	22	Austria	2
2	Spain	23	23	Turkey	2
3	Australia	21	24	Thailand	2
4	Brazil	10	25	Nigeria	2
5	USA	12	26	Lebanon	2
6	England	12	27	Italy	2
7	Portugal	9	28	Iran	2
8	Germany	8	29	Denmark	2
9	Canada	6	30	Colombia	1
10	Sweden	5	31	Taiwan	1
11	Norway	5	32	Sri Lanka	1
12	Greece	5	33	South Africa	1
13	Switzerland	4	34	Scotland	1
14	Netherlands	4	35	Russia	1
15	Malaysia	4	36	New Zealand	1
16	Japan	3	37	Latvia	1
17	Israel	3	38	Kuwait	1
18	Ireland	3	39	India	1
19	France	2	40	Egypt	1
20	Finland	2	41	Cyprus	1
21	Belgium	2			

Table 4. Researchers who have contributed more than three published papers

No	Name of the author	First Author	Co-author	Last Author	Total
1	Tam Vivian W. Y.	10	1	3	14
2	Yuan Hongping	4	5	0	9
3	Shen Liyin	1	3	5	9
4	Lu Weisheng	6	1	1	8
5	De Brito, J	0	7		7
6	Wang Jiayuan	3	1	2	6
7	Villoria Saez Paola	4	2	0	6
8	Del Rio Merino Mercedes	1	3	2	6
9	Poon CS	2	1	2	5
10	Tam CM	0	3	1	4
11	Porras-Amores Cesar	0	1	3	4
12	Coelho Andre	4	0	0	4

concentrated their research on the issues dealing with the management of CDW in Hong Kong.

4.3 Research and Data Analysis Methods

In addition to examining the published journal papers and their contribution to the publication of CDW management, the following aim of this research is to offer an understanding into the methods used in the research and data analysis in these publications. A closer observation of the journal contents has availed the identification of four types of prevalent research methods. These research methods are described in detail in the following: i) Surveys: This approach facilitates the distribution of questionnaires or conducting personal interviews with practitioners in the construction sector[38]; ii) Reviews: This is carried out to gain a deep understanding of the critically done analysis of specific areas of interest from the obtained papers[33], or to gather information regarding the CDW management practices performed in other parts of the world[37]; (iii) Case studies: The objective is to study actual projects carried out in the area of construction to gain insights[36]; and (iv) Experiments: This approach is primarily utilized to study recycling in CDW management[39].

The reviewed papers reveal that surveys and cases studies are the main methods of data collection. As the management of CDW is closely connected to the practices of the construction sector, it would not be possible to offer constructive measures and proposals without thoroughly understanding the practices. Thus, reviews are also an essential research approach used in these papers from which various latest CDW management practices were identified from various regions/countries.

A detailed study of the contents of the 87 papers on CDW management also revealed four primary types of data analysis methods such as descriptive analysis, statistical analysis, cost benefit analysis, and simulating/modelling. The following provides a detailed description of the above mentioned methods: (i) Descriptive analysis is carried out to analyse data by measuring the value of mean, standard deviation, as well as percentage, or by performing various types of statistical testing[40]; (ii) Simulating/modelling can be defined as data analysis through the use of different mathematical modelling methods[35]; (iii) Statistical analysis makes use of various methods including the regression analysis[42]; and (iv) Cost-benefit analysis helps to determine the costs as well as benefits related to the CDW management activities[41].

4.4 Research Topics

Conducting an analysis on research topics has certain benefits not only in determining the topics that have been previously examined and hence, prevent the duplication of similar studies, but it also helps to understand the variations of the topics across the stipulated time period. Out of the 172 reviewed papers, six categories of topics were identified including (i) generation of CDW, (ii) reduction of CDW, (iii) reuse of CDW, (iv) recycling CDW, (v) general CDW management, and (vi) human factors related to CDW management. All the categories in turn contain sub-topics as follows:

(i) Generation of CDW: waste amounts, origins, causes, generation rates, and factors related to generation of waste; (ii) Reduction of CDW: benefits of waste reduction, technologies and measures of waste reduction, hindrances to the reduction of waste, and waste reduction efficacy; (iii) Reuse of CDW: hindrances to waste reuse and its practices; (iv) Recycling CDW: waste recycling practices, rates, benefits, and hindrances to utilizing recycled materials; (v) General CDW Management: different practices in waste management, environmental regulations of waste management, waste management systems, plans, and performance, cost-benefit analysis, incentives, and sustainable CDW management, (vi) Human Factors Linked to the Management of CDW: the effect of human factors, factors that reduce the effect of human factors, perceptions of various stakeholders, and difficulties in dealing with human factors related to the management of CDW.

The review shows that maximum effort has been applied to the research of CDW management, recycling, reduction, and generation, accordingly. It has also been observed that over time, the research interest in this area has been moving towards CDW reduction, recycling, general CDW management, and human factors related to CDW management.

5. Conclusion

Given that the large amount of CDW management related papers, it is essential analysis of the publication, as periodic analysis of published papers in a specific field is generally considered as vital important for researchers, particularly for new researchers, to understand the research and trends in the field. This research systematically analyses the publication regarding CDW management in twelve scholarly journals, namely Waste Management, Resource,

Constructing and Building Materials, Conservation and Recycling, Waste Management Research, Cleaner Production, Journal of Industrial Ecology, Building and Environment, Renewable Sustainable Energy Reviews, Engenharia Sanitaria E Ambiental, Journal of Material Cycles and Waste Management, Waste and Biomass Valorization, and Journal of Civil Engineering and Management, during the period of 2000 and 2015. Papers for analysis are identified through a careful issue-by-issue searching of the target journals to ensure comprehensiveness.

From 2000 to 2015, there were 172 papers pertaining to CDW management that have appeared in the chosen journal publications. Even though the total amount of papers related to CDW management published annually shows an increasing research in this field, it is not until 2002 that significant amount of CDW management related papers has been published in construction journals. It is worth nothing that more than half of the papers are published in journals that are devoted to the broad waste including CDW, rather than in construction journals.

In terms of total cited times, Resource Conservation and Recycling were cited 1008 times with Waste Management being cited 852 times, and Waste Management Research for 216 times. The result also reveal that Resource Conservation and Recycling performed well both in terms of total cited times and cited times per paper among twelve journals. The study's findings reveal that most data collection was carried out using the survey and case study method on the field of CDW management and the analyses are mainly discussed using the descriptive analysis approach. The detailed review of the 172 published papers establishes the fact that main topics of research in this field are the generation of CDW, minimization of CDW, reusing CDW, recycling CDW, overall management of CDW, and the human factors related to the management of CDW. Out of these, two topics including CDW management in general and CDW recycling will be attracted in future research.

This research presented some valuable information beneficial to both academicians and practitioners. This work would assist researchers in understanding the major trends in the development of research on CDW management. However, it is realized that the twelve journals reviewed for this study may not be sufficient in covering all of the published work in CDW management. These published journals acted as a representation of the overall trend in the management of CDW research.

6. References

1. Murray R. McGraw-Hill Education (UK): Writing for academic journals. 2013.
2. Henson KT. ERIC: Writing for Professional Publication. Keys to Academic and Business Success. 1999.
3. Bresnen M, Marshall N. Partnering in construction: a critical review of issues, problems and dilemmas. Construction Management & Economics 2000; 18(2):229–37.
4. Flanagan R, Lu W, Shen L, Jewell C. Competitiveness in construction: a critical review of research. Construction Management and Economics. 2007; 25(9):989–1000.
5. Al-Sharif F, Kaka A. PFI/PPP topic coverage in construction journals. USA: Proc., 20th Annual ARCOM Conf. 2004; p. 711–9.
6. Tsai CC, Lydia Wen M. Research and trends in science education from 1998 to 2002: A content analysis of publication in selected journals. International Journal of Science Education. 2005; 27(1):3–14.
7. Yuan H, Lu W, Hao J. A Framework for Integrating Construction and Demolition Waste Management Studies. 2009.
8. Yuan H, Shen L. Trend of the research on construction and demolition waste management. Waste Management. 2011; 31(4):670–9.
9. Shen LY, Tam VWY, Tam CM, Drew D. Mapping approach for examining waste management on construction sites. Journal of Construction Engineering and Management. 2004; 130(4):472–81.
10. Sandler K, Swingle P. OSWER Innovations Pilot: Building Deconstruction and Reuse. 2006.
11. Department of the Environment TtR. Building a Better Quality of Life-A Strategy for More Sustainable Construction. Department of the Environment, Transport and the Regions London, UK; 2000.
12. McGrath C, Anderson M. Waste minimizing on a construction site. Building Research Establishment Digest. 2000; p. 447.
13. Bell N. Waste minimization and resource recovery. The environmental design guide Gen 1998; p. 21.
14. Poon CS, Yu ATW, Wong A, Yip R. Quantifying the impact of construction waste charging scheme on construction waste management in Hong Kong. Journal of Construction Engineering and Management. 2013; 139(5):466–79.
15. Suocheng D, Tong KW, Yuping W. Municipal solid waste management in China: using commercial management to solve a growing problem. Utilities Policy. 2001; 10(1):7–11.
16. Wang JY, Kang XP, Tam VWY. An investigation of construction wastes: An empirical study in Shenzhen. Journal of Engineering, Design and Technology. 2008; 6(3):227–36.

17. Poon CS, Yu ATW, Ng LH. Comparison of low-waste building technologies adopted in public and private housing projects in Hong Kong. Engineering, Construction and Architectural Management 2003; 10(2):88–98.
18. Esin T, Cosgun N. A study conducted to reduce construction waste generation in Turkey. Building and Environment. 2007; 42(4):1667–74.
19. Peng C-L, Scorpio DE, Kibert CJ. Strategies for successful construction and demolition waste recycling operations. Construction Management & Economics. 1997; 15(1):49–58.
20. Zare R, Nouri J, Abdoli MA, Atabi F. Application Integrated Fuzzy TOPSIS based on LCA Results and the Nearest Weighted Approximation of FNs for Industrial Waste Management-Aluminum Industry: Arak-Iran. Indian Journal of Science and Technology. 2016; 9(2):1–11.
21. Poon CS. Management of construction and demolition waste. Waste Manag. 2007; 27(2):159–60.
22. Ling Y, Leo K. Reusing timber formwork: importance of workmen's efficiency and attitude. Building and Environment. 2000; 35(2):135–43.
23. Duran X, Lenihan H, O'Regan B. A model for assessing the economic viability of construction and demolition waste recycling - the case of Ireland. Resources, Conservation and Recycling 2006; 46(3):302–20.
24. Kartam N, Al-Mutairi N, Al-Ghusain I, Al-Humoud J. Environmental management of construction and demolition waste in Kuwait. Waste Manag. 2004; 24(10):1049–59.
25. Tam VWY. Economic comparison of concrete recycling: A case study approach. Resources, Conservation and Recycling. 2008; 52(5):821–8.
26. Bijay T, Kumar KA. Solid waste management at landfill sites of Nepal. Indian Journal of Science and Technology. 2011; 4(3):164–6.
27. Matrosova LE, Tremasov MY, Cherednichenko YV, Matveeva EL, Ivanov AA, Mukminov MN, et al. Efficiency of Specific Biopreparations in Organic Waste Management. Indian Journal of Science and Technology. 2016; 9(18):1–6.
28. Lingard H, Graham P, Smithers G. Employee perceptions of the solid waste management system operating in a large Australian contracting organization: Implications for company policy implementation. Construction Management and Economics. 2000; 18(4):383–93.
29. Osmani M, Glass J, Price AD. Architect and contractor attitudes to waste minimisation. 2006.
30. Kofoworola OF, Gheewala SH. Estimation of construction waste generation and management in Thailand. Waste Management. 2009; 29(2):731–8.
31. Tam VWY, Tam CM, Zeng SX, Ng WCY. Towards adoption of prefabrication in construction. Building and Environment. 2007; 42(10):3642–54.
32. Jaillon L, Poon CS, Chiang YH. Quantifying the waste reduction potential of using prefabrication in building construction in Hong Kong. Waste Management. 2009; 29(1):309–20.
33. Tam VWY, Tam CM. A review on the viable technology for construction waste recycling. Resources, Conservation and Recycling. 2006; 47(3):209–21.
34. Tam VWY, Kotrayothar D, Loo YC. On the prevailing construction waste recycling practices: A South East Queensland study. Waste Management and Research. 2009; 27(2):167–74.
35. Hao JL, Hill MJ, Shen LY. Managing construction waste on-site through system dynamics modelling: The case of Hong Kong. Engineering, Construction and Architectural Management. 2008; 15(2):103–13.
36. Roussat N, Dujet C, Mehu J. Choosing a sustainable demolition waste management strategy using multicriteria decision analysis. Waste Management. 2009; 29(1):12–20.
37. Fatta D, Papadopoulos A, Avramikos E, Sgourou E, Moustakas K, Kourmoussis F, et al. Generation and management of construction and demolition waste in Greece - an existing challenge. Resources, Conservation and Recycling. 2003; 40(1):81–91.
38. Begum RA, Siwar C, Pereira JJ, Jaafar AH. Factors and values of willingness to pay for improved construction waste management - A perspective of Malaysian contractors. Waste Management. 2007; 27(12):1902–9.
39. Correia SL, Souza FL, Dienstmann G, Segadaes AM. Assessment of the recycling potential of fresh concrete waste using a factorial design of experiments. Waste Management. 2009; 29(11):2886–91.
40. Teo M, Loosemore M. A theory of waste behaviour in the construction industry. Construction Management & Economics. 2001; 19(7):741–51.
41. Begum RA, Siwar C, Pereira JJ, Jaafar AH. A benefit-cost analysis on the economic feasibility of construction waste minimisation: The case of Malaysia. Resources, Conservation and Recycling. 2006; 48(1):86–98.
42. Begum RA, Siwar C, Pereira JJ, Jaafar AH. Attitude and behavioral factors in waste management in the construction industry of Malaysia. Resources, Conservation and Recycling. 2009; 53(6):321–8.