A systematic review of construction material caused by demolition: A global Perspective.

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Abstract

The increased use of construction materials and waste, particularly waste from new construction and the destruction of worn-out fabric has caused a slew of issues. The most important of which are the problems of environmental pollution caused by the non-disposal or unprincipled and non-technical disposal of these materials. This paper reviews construction material caused by demolition from a global perspective. A comprehensive literature analysis on the subject has been done to guarantee that the most relevant studies have been taken into account. This type of review makes the selection criteria for the publications clear, allowing for an evaluation of the research conducted and its replication or expansion.

Keywords
Systematic review, Construction material, Demolition, Global perspective and Waste management.

1. Introduction
Nowadays recycling industry is one of Strategies to create value added solution and more efficiency in society. This industry annually consumes a large number of raw materials in each country and produces a large amount of waste. The rapid growth of the construction industry for reasons such as rising living standards, demands for infrastructure projects, the existence of worn-out structures and population growth, causes mass production of construction waste. Due to its pollution potential as one of the types of municipal waste, today the need for management of such wastes has been raised as one of the significant issues in urban management (especially metropolitan areas).

Due to the many resulting of problem is of great interest from unprincipled and non-technical disposal of construction waste, recycling of these materials.Also, in recent years, the increase in the price of construction materials and understanding the need to increase productivity in the construction industry in the country has led employers and contractors to look for a way to reduce their construction costs.

The principal waste stream of gross waste generation in contemporary society is construction and demolition waste (CDW). Along with the current global urbanization, CDW is increasing. China,European Union (EU) and the United States (US) are the top three CDW-generating economies (Kabirifar et al. 2020).

China's urban population expanded from 35.88% in 2000 to 61.43% in 2020, compared to the US's urban population rate of 82.67% and the EU28's urban population rate of 74.96%, respectively (The World Bank 2021).

Construction provides for one-third of all wastes and half of all resource extraction in Europe, making it the region's leading consumer of resources and producer of waste (EC, 2014). As a result, the EU identified CDW as the primary waste flow for waste management (VilloriaSaez, 2011). Actions inspired by the circular economy have been considered for CDW management to increase the flow of materials in the building sector (EEA 2020). The circular economy has been used extensively in research as the overarching paradigm for waste and resource management. However, there are few explorations of the waste in material. This study explore Systematic review of construction material caused by demolition in a global perspective. Therefore, in this chapter, first related work of construction waste management. Then research method and data base selection and finally discussion are mentioned.

2. Related work

A research has done by Zhang et al named "An overview of the waste hierarchy framework for analyzing the circularity in construction and demolition waste management in Europe". This study examines the management of construction and demolition waste (CDW) across Europe using the framework of the waste hierarchy. We investigate the development of the European trash hierarchy and how it contrasts with the circular economy. After that, we evaluate the effectiveness of CDW management in each EU member state using the framework. Investigated are novel CDW treatment techniques with an emphasis on leftover concrete.(zhang et al 2022)
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In a research titled "Environmental management of construction and demolition waste in Kuwait". The goal of this study is to reduce the amount of C&D waste currently landfilled in Kuwait through recycling activities. The current state of Kuwait's C&D waste disposal system is discussed in this essay, along with any prospective issues that could affect the environment, people, or economy. Then, it investigates other options for managing and controlling this significant sort of trash in a way that is both economically effective and environmentally safe. The viability of building a C&D waste recycling facility in Kuwait is then discussed in the study. It closes by outlining the key advantages and logistical challenges of such a recycling operation (NayefAl et al. 2004).

Another research was done in 2019 by named "A benefit–cost analysis on the economic feasibility of construction waste minimization: The case of Malaysia". This paper is based on a case study that examined how construction waste was generated, its composition, and how it was recycled and reused on the job site. By conducting a benefit-cost analysis, the case study also examined the economic viability of waste minimization measures such the reuse and recycling of construction waste materials. This study gives a general picture of how much waste is produced, its sources and compositions, as well as how much material is reused and recycled on building sites while taking the cost factor into consideration. The study demonstrates that waste minimization is both economically possible and crucial to enhancing environmental management. According to this perspective, economic tools for reducing construction waste can be utilized to collect funds for environmental legislation, promote prevention measures (RawshanAraBegum et al 2006).

In an article which was conducted in 2018 named "Estimation of construction waste generation and management in Thailand". This research aims at Thailand's production and handling of construction waste. According to reports, Thailand produced an average of 1.1 million tonnes of building waste annually between 2002 and 2005. This is approximately 7.7% of the total garbage disposed of annually during the same period in landfills and open dumpsites. Despite being a significant source of garbage in terms of volume and weight, Thailand has not yet developed an efficient system for managing and recycling building waste. Due to the rapidly growing unauthorized dumping of construction waste in undesignated places, the management of this garbage is receiving attention recently, and recycling is being pushed as a solution. Its potential economic and social benefits are enormous if successfully implemented (OyesholaFemi, et al 2009)

In an article entitled "Feasibility study on solid waste management in Port Harcourt metropolis: causes effect and possible solutions". This research looked into the causes, effects, and potential solutions related to waste generation, storage, segregation, collection, treatment, and disposal in the Port Harcourt Metropolis. The necessary data for the study was gathered using both primary and secondary sources of inquiry. The Port Harcourt Metropolitan Area's dump sites were also visited for proper appraisal and on-site assessment. It was noted that the conventional waste management system, rather than the integrated solid waste management system, is still in operation, and that roughly 75% of the city's storage facilities are inefficient, unhealthy, and lack color-coded bins for various types of waste. Results show that scrap, rubbish, and paper made up the majority (41%) of the waste produced (CF Ikebude, 2017).

Lu et al In research titled "a framework for understanding waste management studies in construction". The purpose of this article is to create a framework that will aid readers in evaluating the C&D WM research as it has been stored in particular journals. A series of exacting techniques are used to retrieve papers related to C&D WM. The Qualitative Social Research (QSR) software programmeNVivo is then used to examine the data from these papers. The analytic results are used to construct a framework for comprehending C&D WM research. Following the paradigm, an extensive literature analysis is provided after a bibliometric examination of research in C&D WM. It is discovered that the three main topics in the field of C&D WM are C&D generation, reduction, and recycling.
Kadir et al investigate a paper named "An Overview of Wastes Recycling in Fired Clay Bricks" (Lu et al,2011).

This essay examines the production of fired clay bricks from various waste materials. It has been discussed how a variety of successfully recycled materials affect the mechanical and physical characteristics of bricks. The majority of waste-based made bricks have produced lighter brick, enhanced porosity, and improved the thermal conductivities of burnt clay bricks. However, poorer performances in a number of cases were also shown in terms of mechanical attributes.

3.Research method

A technique for evaluating hypotheses, summarizing the findings of previous studies, or determining if studies have been conducted consistently is systematic literature review (Petticrew 2001). It offers a summary of primary research using a clear and testable methodology. This study presents a global perspective of construction material caused by demolition. A comprehensive database with a large number of articles and efficient search tools are typically employed in a systematic literature review, allowing for the use of sophisticated logical expressions. Literature review methodology shown in Figure 1.

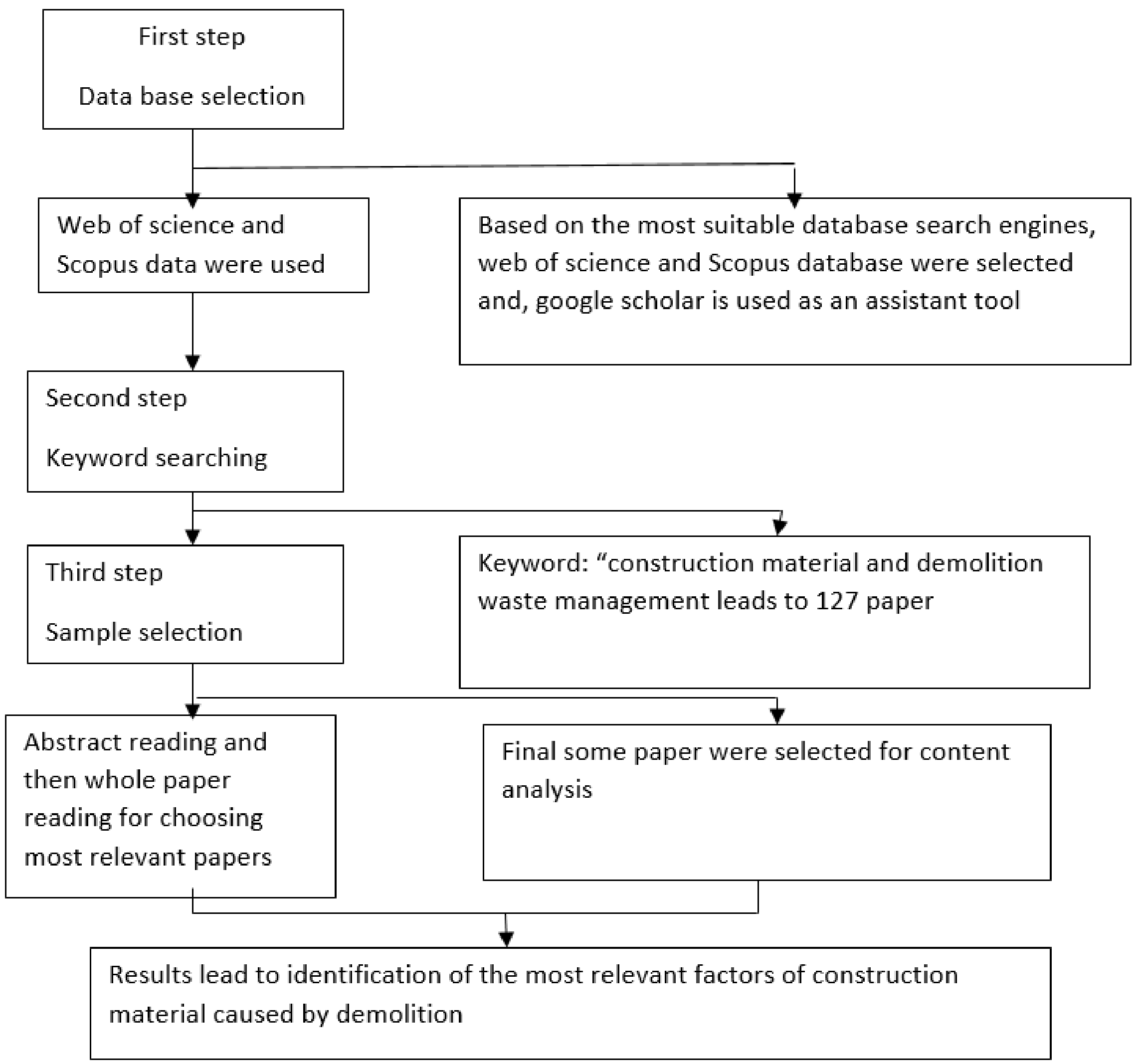

Figure 1. Literature review methodology

4. Data base selection

In order to select the best databases, the initial search was conducted in Google Scholar, Scopus, Web of Science and PubMed. A set of special publications with a significant impact on the construction management research community were found after a preliminary study of the findings. The choice was taken to work with each journal's unique database because none of the accessible databases had all journals. Additionally, there were very few resources available for using search phrases in each of these distinct databases. Because only one phrase could be used at a time, searching through publications in each journal took a long time.

5. Discussion

5.1 Reduce

This is a reference to resource optimization or source reduction. It is a preventative measure used to reduce waste produced at the source before it becomes a physical issue. Reducing the quantity of packaging that arrives on site, adopting effective framing methods, or altering design concepts and practices (such as designing structures on a modular basis) are some concrete examples (Vleck 2001).

5.2 Reuse

Reusing C&DW includes the activities or practice of using appropriate building materials more than once, regardless of whether they are used for their intended purpose or serve another purpose (Huang et al., 2018). The majority of C&DW is recyclable after demolition operations. The best methods for protecting the environment, conserving natural resources, and cutting costs are reduction and reuse. Reusing building wastes also helps protect the environment for future generations, reduce greenhouse gas emissions that contribute to climate change, and maximize the useful life of items (Oyenuga 2016; Park and Tucker 2017). Construction, repair, and demolition sites can be utilized to recover a variety of building materials, which can subsequently be sold, put away for future use, or utilized on the present project. However, some specific types of C&D products are thought to be poisonous and are categorized as hazardous waste, including substances like latex paint, adhesives, and chemical solvents that call for careful treatment (Oyenuga 2016). Additionally, the age of the structures involved in demolition projects is another important consideration when deciding whether to reuse C&DWs (Tam 2011b; Akinade et al. 2015). For instance, historical structures may contain asbestos or other elements that are no longer permitted in new construction. Effective methods of recycling construction and demolition waste include using trained labour to collect and sort the debris, providing incentives for reuse, using industry-standard building techniques and materials, and creating a market for recycled materials.

5.3 Recycle

C&DW recycling is the process of disassembling used building materials to create new ones; however, immature C&DW recycling management, inadequate recycling technology, and an immature market for recycled products are obstacles to C&DW recycling (Huang et al., 2018). Depending on the project's capacity and facilities, C&DW can be recycled either on-site or off-site at a C&DW processor. Materials including concrete, metal, asphalt, wood, roofing materials, plasterboard, and corrugated cardboard can all be recycled from construction sites. Finally, by recycling building materials, a significant quantity of $CO2$ is avoided, which would otherwise be emitted by removing waste and supplying natural building materials repeatedly over long distances (Oyenuga 2016).

C&DW recycling has a number of advantages, including reducing the generation of pollutants and greenhouse gas emissions by reducing the need to extract new raw materials. In addition, it preserves landfill capacity, reduces the need for new landfills and the expenses associated with their use, as well as energy savings and the lowering of unfavorable environmental effects (Ashe et al. 2003; Fraser et al. 2011; Li and Du 2015; Pickin et al. 2018). Additionally, recycling has a significant effect on generating employment and economic activity in connected industries. Recycled building materials with high quality assurance have a sizable market.

Construction waste production factors**.** Different groups producing soil and waste and construction waste in the country include citizens, builders, municipalities, The companies producing construction materials, telecommunication, gas, water, and sewage companies, which produce for the following reasons.

5.4 Repair of buildings

Deterioration of the building, problems with facilities such as water leakage, etc., cause the destruction of a part of the building that maintenance needs to be repaired. This causes destruction of the damaged part and the production of waste and scum. Repairing the damaged part with new materials also causes construction waste. This causes destruction of the damaged part and the production of waste, scum and repairing the damaged part with new materials also causes construction waste.

5.5 Demolition of dilapidated buildings

Increasing the added value of land, the advancement of engineering sciences in construction, luxury and modernity, and the necessity of constructing buildings On the one hand, the concentration of investment in this sector leads to an exponential increase in the destruction of old fabric and infrastructure. Big and small cities are worn out, which will lead to the production of a large amount of construction waste.

5.6 Waste during production

During the production of building materials, such as the production of building stones, ceramics, tiles, etc., part of the materials as Waste materials are produced, most of which can be recycled. This case is beyond the scope of this research.

5.7 Construction debris after natural disasters

Every year, natural disasters such as fires, floods, storms, earthquakes, tornadoes, etc., cause the production of large amounts of construction debris. They cause significant disposal problems for the authorities, so control and management of solid waste materials, especially sewage, is important. Buildings that are suddenly produced during disasters need special attention and control and should be considered as one of the the operational priorities of relief should be considered. Our country, Iran, with 6% of all natural disasters and adverse events, is one of the most accident-prone and very susceptible countries. The world is more sensitive to natural disasters, especially earthquakes and floods. Therefore, in order to deal with these unexpected events and reduce the losses and then the ever-increasing production losses.

Necessary training should be provided. In the world, a large amount of construction debris has been created due to unnatural disasters. It is caused by humans, among which war and destruction caused by it can be mentioned.

The path of debris for after natural and human disasters and the need to repair and rebuild the building, a massive amount of debris. It produces diverse waste that requires its own management, which is a model of management crisis. The Table 1 represents the construction waste classification.

Table 1. Construction waste classification

Construction waste classification	**Waste statues**
soil	In excavation operations, large amounts of natural materials are obtained, such as vegetable soil, clay, sand, stone, etc. In the construction sites, the resulting vegetable soil can be collected in the ears, and it can be used again in the same place or another place used by the contract
Concrete	Concrete is considered a material with high potential for processing and production of secondary stone chips. There are two forms: Reinforced concrete, which is used in the construction of columns, roofs, etc., and non-reinforced concrete, which is used in road construction, foundations, etc. It is used Reinforced concrete needs a special operation to remove the reinforcement as part of the recycling process. Unreinforced concrete resulting from destruction is usually mixed with natural materials, and its recycling is economically dependent on the amount of materials. It has non-recyclable content. Sometimes in the maintenance operation, concrete materials are obtained, such as paving stones.

Brick	Brick is one of the common materials used in buildings, and due to destruction, a large amount of it can be obtained, which can be used for new buildings.
Stone	Stone is obtained as a result of digging the ground and is very valuable for filling the ground.
Metals	In most cases, metals are recycled as valuable materials. For example, in England, one of the recycling centers for industrial waste materials and neutral materials collects about 16 tonnes of steel within a week, and by processing and selling it, it earns about 26,666 pounds in per year (Oycshols, 2009).
Glass, plaster, and other materials	Glass, plaster, and other materials: Glass and plaster are typically damaged during destruction and are therefore less recycled. Plastic materials whose recycling technology is advanced may be recycled.
Light steel	Light steel is used in the ventilation system, ventilation channels, water ducts, roof covering, etc. A large amount of copper is used in water and electricity distribution systems. Aluminum is used in coatings, and cast iron is used in sewage pipes.
Wooden beam and timber	In the destruction operation, the obtained timber and beams can be sold, although the major part of it is sent. Of course, the deterioration of wood due to opening, rotting of connections, nails and screws, etc., causes problems in its recycling and reuse.

5.8 Concrete recycled

Concrete recycling is essential because the following factors result in millions of tonnes of discarded concrete being produced annually throughout the world:

1. Demolition of an outdated building
2. Buildings and structures destroyed in earthquakes and conflicts,
3. Removing useless concrete from pavements, buildings, and other surfaces.
4. Concrete waste produced through damaging ways of testing existing structures, such as concrete cube and cylinder testing.

   The process of waste concrete recycling is shown in Figure 2.

Figure 2. Process of Waste Concrete Recycling

Architectural structures: architectural structures such as fireplaces, carved wooden pieces that are use Process of Waste Concrete Recycling in interior decorations, and also decorative tiles can be recycled and have a good market.

5.9 Counteraction & demolition generation worldwide

In different countries, depending on the type and way of life, industry, composition, and population structure, as well as the available local materials, the composition and percentage of these materials in the waste are different. On the other hand, the source of these materials is also effective in determining the composition of sewage (Figure 3).

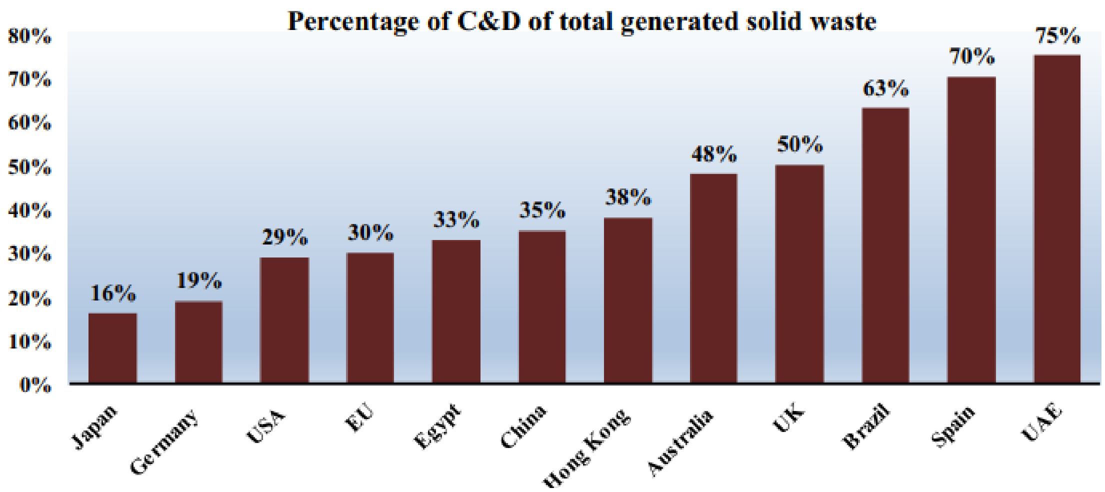

Figure 3. Percentage of C and D of Total Generated Solid Waste

5.10 England

Construction and demolition (C&D) waste is coming to be recognized as a valuable supply of engineering materials for the UK construction sector. Utilizing C&D wastes may lessen a construction project's dependency on primary aggregates and its environmental impact. According to the Environment Agency (England and Wales), the yearly production of building and demolition trash is now estimated to be at 53.5 million tonnes (Bell, 1997). Currently, C&D waste is disposed of in the following ways:

- Of the 27.4 million tonnes disposed of, 51.2% go straight to the landfill.
- 21.2 million tonnes (39.6%), which are mostly utilized for land modeling throughout the construction project, are free from licensed disposal.

British researchers estimated in 1931 that if these debris are recycled as sand, the amount of demand for using natural resources will decrease by 16%. In addition to increasing the life of reserves and mines, this issue also reduces the need for space to dispose of debris. Of course, previously in England, debris has been used to some extent to fill pits or prepare land for road construction. Debris reuse programs have a beneficial result for demolition contractors. In general, the practice of recycling is favored if the value of recycled materials apart from the cost of recycling steps is more than the price of debris disposal.

5.11 Japan

Only approximately 16 percent of all waste in Japan is produced by construction and demolition activities, with 0.75 million tons of waste produced annually. Construction and demolition waste from 1995, 2000, and 2003 are being recycled at increasing rates (see Figure 4)

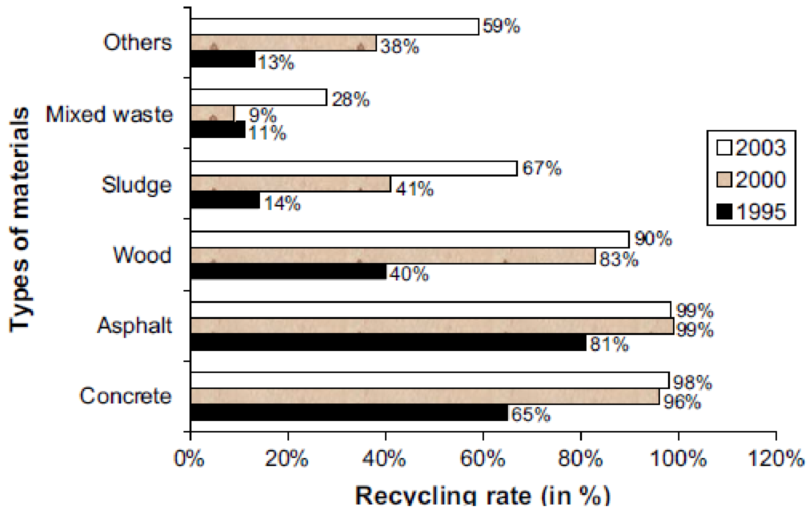

Figure 4. Construction waste recycling rate in Japan

5.12 China

With the rapid urbanization of China, its building industry has contributed to 26.7% of the national GDP. In addition, the building area under construction and completed building area has reached 12.4 billion m2 and 4 billion m2 respectively in 2015.

At present, the majority of C&D waste in China is disposed via landfilling or directly sent to dumping sites without any environmental protection measures. The recycling rate in China is relatively low compared to many developed economics countries.

5.13 Usa

More than 500 million tonnes of C&D waste are produced annually in the United States, one of the largest manufacturers in the world. The federal government agency known as the United States Environmental Protection Agency (USEPA) deals with issues relating to the environment, people's health, and their relationships. A recent thorough report on waste generation was created by the USEPA (USEPA, 2015a). Portland cement concrete, which ranged in volume from 348 to 352 million tonnes, made up the largest share of C&D waste in the years 2012–2013 (67%), followed by asphalt concrete (18%). Roads and bridges account for the majority (45.91%) of all construction and demolition (C&D) trash, with construction debris accounting for a very small fraction of waste (4.6%).

5.14 Canada

Canada generates around 33 million tonnes of municipal solid waste annually, with the majority going to landfills (roughly 74.75% in 2012 and 75.56% in 2010). (Statistics Canada, 2015a; 2015b). C&D waste is produced from a variety of sources and amounts to around 9 million tonnes, with a 7% recovery rate for other materials (Statistics Canada, 2015c). Even though Canada produces significantly less C&D trash than the US does, the recycling rate is extremely low, and the majority of the material ends up in landfills. However, it is evident that over 75 % of what the construction industry generates as waste has a residual value, and therefore could be recycled, salvaged and/or reused.

5.15 Austrial

In Australia, the amount of discarded construction and demolition waste is increasing year by year. For this reason, the country has also launched a lot of research work. Relevant tests show that commercial concrete prepared with 50% construction waste recycled materials has a strength value of B225 to B300, and its resistance to salt and corrosion is also improved. The use of recycled building materials from C&D waste can save waste costs on disposal, transportation, natural aggregate purchasing. The C&D waste industry still has a lot of room for development and feasibility in economic research.

5.16 Europe
Austria has one of the most extensive waste management systems in Europe with 2358 administrative entities (Federal Chancellery Austria, 2009). Austria places a great priority on waste management, and the country has one of the highest recycling and collection rates in all of Europe. Efficiency is not the sole benchmark in the world of waste management; adhering to stringent guidelines for processing waste is also crucial. The economy of Austria benefited from waste management to the tune of 1235 million euros (1455 million USD) and 14779 jobs were created (Mayr, 2014).

5.17 Germany
In the era of rapid economic growth, discarded commercial concrete is increasing every year. At present, recycled concrete aggregate is mainly used for road pavement. Germany is expected to use 80% of construction waste recycled materials in 10% to 15% of commercial concrete projects.

6. Construction and Demolition Waste Management Approaches
6.1 Zero waste approach
According to (Zaman, 2015), a variety of waste streams left stakeholders with no choice but to choose ineffective, environmentally damaging waste treatment methods like disposal. Due to the paucity of landfills in urban areas, authorities have been searching for alternative waste disposal methods. In recent decades, numerous cities, like Adelaide, San Francisco, and Vancouver, have implemented zero waste (ZW), a sensitive system of waste management, as an alternative to traditional waste disposal methods (Connett, 2013, Zaman and Lehmann, 2011, Zaman, 2015).

Since the ZW idea encourages sustainable consumption and production, optimises resource recovery and recycling, and prevents waste from being disposed of in landfills and incinerators, governments have also adopted it. Waste management agencies have used and interpreted the ZW idea in various ways (Li and Du, 2015). For instance, despite the fact that zero waste concepts exclude incineration and landfills, numerous studies claim that it is possible to accomplish zero waste goals while simultaneously using waste-to-energy technology, such as incineration, as a waste recovery technique (Abbasi et al., 2012; Premalatha et al., 2013; Björk, 2015). In general, the zero-waste concept still has to be developed in order to become more broadly applicable.

6.2 Site waste management plan
Site waste management plans (SWMPs) are becoming more and more well-liked as a useful strategy for aiding construction stakeholders in anticipating and formally noting the quantity and kind of C&DW and making the essential management decisions as necessary. This plan is concentrated on the lifecycle of the construction project, from the planning and designing stage through the demolition stage.

In many countries, the 626 SWMP is a prerequisite for building operations (Esa et al. 2017a; Esa et al. 2017b). For instance, the Site Waste Management Plan legislation, which is a legal framework, mandates that projects costing more than £300,000 prepare SWMPs prior to the start of the building phase. Another case of this is the 2003 adoption of the site waste plan in Hong Kong for the construction industry, which garnered criticism from certain C&DW professionals because it was thought to reduce productivity (Tam 2008).

6.3 Technologies of construction material caused by demolition
Gis & Gps
In order to reduce construction waste and assess the material arrangement of the construction site, several studies have also focused on GIS and GPS technologies (Li et al. 2005; Su et al. 2012; Li and Yang 2014). In order to plan a network for, (Paz et al. 2018) conducted study.

Geographic information system (GIS)-assisted C&DW management in Brazil reveals that the procedure is divided into three parts, including mapping C&D's illegal garbage dumping sites and classifying waste according to how easily it can be recycled.

Showing appropriate sites for trans-shipment installation areas and garbage sorting regions before installing voluntary delivery stations. A GIS-based system was suggested in another study by Madi and Srour (2019) to handle C&DW in emergency scenarios in Syria. The recommended framework aids in calculating C&DW quantities, automatically allotting suitable land for recycling facility construction, and, in the end, completing C&DW recycling economic assessments. In research conducted in Saudi Arabia, it was suggested that dumping trucks be controlled and checked using a global positioning system (Blaisi 2019). (GPS)

BIG data

Big Data is an amazing tool for collecting and processing huge amounts of data. Its use in C&DW data analysis and storage has been growing for years (Bilal et al. 2016). Waste production rate was utilised as a key performance metric to benchmark C&DW performance in a study by Lu et al. (Lu et al. 2015a).

BIM

Building Information Modelling (BIM) is a useful tool for the construction data management and is capable of information retrieval in a user-friendly visual format (Goedert and Meadati 2008). The concept of BIM is to build the project virtually so that all facets of the project can be properly planned before site construction begins.

7. Conclusion

This article presents the preliminary findings of a study that sought to pinpoint the most significant knowledge gaps about building waste. In comparison to what has been published in the field of construction management, the systematic literature review found that the number of publications devoted to preventing waste in construction is rather small.In reality, studies that have examined the sources of various types of waste in the construction industry were based on surveys.

The main contribution of this article is to point out gaps in the literature on waste in material construction. compare with other project has focused on global perspective. Further studies are to improve waste conceptualization and conduct in-depth analyses of its primary causes, the construction industry needs more research to expand the body of existing knowledge.

References

Abbasi, T., Premalatha, M. and Abbasi, S. J. C. S. Masdar City: A Zero Carbon, Zero 717 Waste Myth, 2012.

Akinade, O. O., Oyedele, L. O., Bilal, M., Ajayi, S. O., Owolabi, H. A., Alaka, H. A. & 740 Bello, S. A. 2015.

Waste minimisation through deconstruction: A BIM based Deconstruct ability Assessment Score (BIM-DAS). *Resources, Conservation and Recycling, vol.* 105, pp.742 167-176.

Bilal, M., Oyedele, L. O., Akinade, O. O., Ajayi, S. O., Alaka, H. A., Owolabi, H. A., 774 Qadir, J., Pasha, M. and Bello, S. A.. Big Data Architecture for Construction Waste 775 Analytics (Cwa): A Conceptual Framework. *Journal Of Building Engineering, vol.* 6, pp. 144-156, 2016.

Blaisi, N. I.. Construction And Demolition Waste Management in Saudi Arabia: Current Practice and Roadmap For Sustainable Management. *Journal Of Cleaner Production, vol.* 221, pp. 167-779, 2019.

Borghi, G., Pantini, S. and Rigamonti, L. Life Cycle Assessment of Non-Hazardous Construction and Demolition Waste (Cdw) Management in Lombardy Region (Italy), *Journal Of Cleaner Production,* vol. 184, pp. 815-825, 2018.

Connett, P. Zero Waste 2020: Sustainability in Our Hands. *Motivating Change: Sustainable Design and Behaviour In The Built Environment.* Routledge, 2013.

Esa, M. R., Halog, A. and Rigamonti, L. A. Developing Strategies for Managing Construction And Demolition Wastes In Malaysia Based On The Concept Of Circular Economy. *Journal Of Material Cycles and Waste Management,* vol. 19, no. 1, pp. 144-1154, 2017.

Esa, M. R., Halog, A. and Rigamonti, L. B. Strategies for Minimizing Construction And Demolition Wastes In Malaysia. *Resources, Conservation and Recycling,* vol. 120, pp. 219-229, 2017.

Fraser, P., Krummel, P., Dunse, B., Steele, P., Derek, N. & Allison, C. Dsewpac 868 Research Projects. Centre For Australian Weather and Climate Research, Aspendale, pp. 110-123, 2011.

Goedert, J. and Meadati, P. Integrating Construction Process Documentation into Building Information Modeling. Journal of Construction Engineering and Management (ASCE), vol. 134, pp. 509-516, 2018.

Guthrie P, Woolveridge AC, Patel VS. Waste minimisation in construction: site guide. London:Construction Industry Research andInformation Association, 1999.

Huang, B., Wang, X., Kua, H., Geng, Y., Bleischwitz, R., Ren, J., Construction and demolition, 2018.

Ikebude, CF, Feasibility study on solid waste management in Port Harcourt metropolis: causes effect and possible solutions, Agricultural, Bioresources, Biomedical, Food, Environmental & Water Resources Engineering, pp. 123-134, 2017.

KadirAeslina A , An Overview of Wastes Recycling in Fired Clay Bricks, *International Journal of Integrated Engineering,* vol. 4, no. 2, pp. 53-69, 2012.

Li, H., Chen, Z., Yong, L. & Kong, S. C. Application Of Integrated Gps and Gis Technology For Reducing Construction Waste And Improving Construction Efficiency. *Automation In Construction,* pp. 323-331, 2005.

Li, M. & Yang, J. Critical Factors for Waste Management in Office Building Retrofit 965 Projects In Australia. *Resources, Conservation And Recycling,,vol.* 93, pp. 85-98, 2005.

Li, M. & Yang, J. Critical Factors for Waste Management in Office Building Retrofit Projects In Australia. *Resources, Conservation and Recycling,* 93, 85-98, 2014.

Li, R. Y. M. & Du, H. Sustainable Construction Waste Management in Australia: A Motivation Perspective. *Construction Safety and Waste Management.* Springer, 2015.

Lu, W., Chen, X., Peng, Y. & Shen, L. A. Benchmarking Construction Waste Management Performance Using Big Data. *Resources, Conservation and Recycling, vol.* 105, pp. 49-99, 2015.

Mayr, J. Waste management in rural areas in Austria, in: Taking Waste Management into the Future. Brussels, 2014.

NabilKartam, AL, Mutairibrahim, S Environmental management of construction and demolition waste in Kuwait,WasteManagement, vol. 24, no. 10, pp. 1049-1059, 2004.

Oyenuga, A., *Economic and Environmental Impact Assessment of Construction and Demolition Waste Recycling And Reuse Using Lca And Mcda Management Tools.* London South Bank University, 2016.

Oyesholafemi, H. Gheewala, Estimation Of Construction Waste Generation And Management In Thailand,Waste management, vol. 29, no. 2, pp. 731-738, February 2009.

Petticrew, M., Systematic Reviews from Astronomy To Zoology: Myths And Misconceptions," *Bmj*, vol. 322, no. 7278, pp. 98-101, 2001.

Pickin, J., Randell, P., Trinh, J., Grant, B. J. D. O. T. E. andEnergy, M., Victoria, Australia National Waste Report 2018.

Premalatha, M., Tauseef, S., Abbasi, T. & Abbasi, S. The Promise and The Performance of The World's First Two Zero Carbon Eco-Cities, *Renewable And Sustainable* 1099 *Energy Reviews,* pp. 660-669, 2013.

Rawshan A, Chamhyri ,S, Jacqueline, P, A Benefit-Cost Analysis On The Economic Feasibility Of Construction Waste Minimization: The Case Of Malaysia, Resources, *Conservation and Recycling*, vol. 48, no. 1, pp. 86-98, 2006.

Statistics Canada, A. Table 153-0041 - Disposal of Waste, By Source, Canada, Provinces and Territories, Every 2 Years (Tonnes Cansim (Database), Url, 2015

Su, X., Rahman Andoh, A., Cai, H., Pan, J., Kandil, A. and Said, H. M. Gis- Based Dynamic Construction Site Material Layout Evaluation for Building Renovation Projects. *Automation In Construction,* vol. 27, pp. 40-49, 2004.

Tam, V. W., Rate of Reusable and Recyclable Waste in Construction. *The Open* 1156 *Waste Management Journal,* 4, 2011.

Tam, V. W. On The Effectiveness in Implementing A Waste-Management-Plan Method In Construction. *Waste Management,* vol. 28, pp. 1072-1080, 2008.

Usepa, A. Epa Advancing Sustainable Materials Management: Facts and Figures, pp. 28-39, 2013.

Waste Management in China Through The 3r Principle. Resour, Conserv Recycl, vol. 129, pp. 36–44, 2017.

Weishenglu, Hongpingyuans, A Framework for Understanding Waste Management Studies In Construction, Wastemanag, vol. 31, no. 6, pp. 1252-60, 2011.

Zaman, A. U. A Comprehensive Review of The Development of Zero Waste Management: Lessons Learned and Guidelines, *Journal Of Cleaner Production, vol.* 91, pp. 12-25, 2015.

Zhang H, Mingming U, Francesco D, An Overview Of The Waste Hierarchy Framework For Analyzing The Circularity In Construction And Demolition Waste Management In Europe, Science Of The Total Environment, vol. 803, 10 January 2022.

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