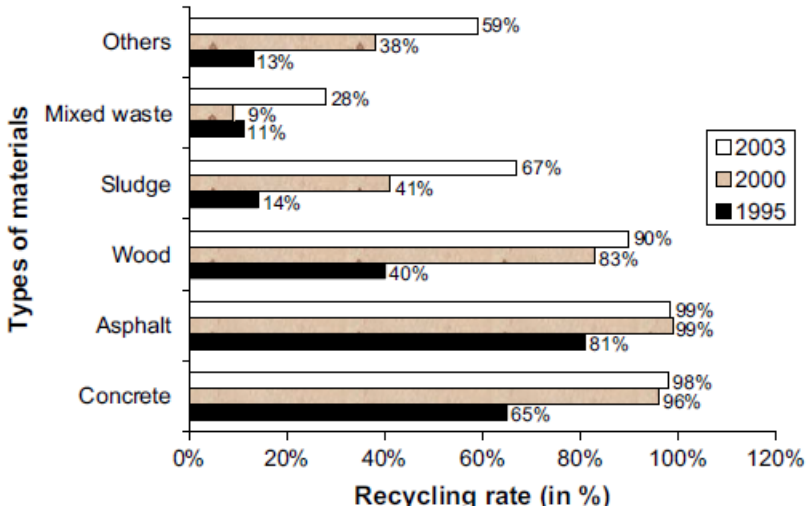

Figure 4. Construction waste recycling rate in Japan

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.

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