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Managing construction and demolition waste in Bangladesh: Obstacles and enduring remedies

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Abstract

Bangladesh has experienced a remarkable surge in urbanization and growth over the past few decades. The metropolis of Dhaka is home to 30% of the nation's urban population. The construction industry in and around Dhaka has accelerated in response to the growing need for housing facilities to meet the demands of shelter for this large influx of people. This increased building has many negative effects on the environment and society, including waste generation. A nation's balanced development depends on its use of competitive, environmentally friendly, and sustainable building practices. As a result, proper handling of construction wastes is becoming a crucial concern. Wastes from construction and demolition make up a sizable portion of the waste stream that is dumped in the city's landfills. The majority of the time, construction waste management practices are appalling. It is time to consider taking some prompt action to put various management strategies into practice. Reviews of construction wastes, their production, and current management techniques were taken into consideration in this study. Lastly, suggestions from Bangladesh's perspective is given.

Keywords: Construction and Demolition Waste; Reduce; Reuse; Environmental Issues; Existing Laws; Waste Management.

1. Introduction

Any material, matter, or object produced because of construction work that is abandoned—regardless of whether it has been processed or piled up beforehand—is referred to as construction waste [1]. Depending on the type of work, it may consist of a combination of numerous materials or, in certain situations, just a few. Waste from construction and demolition projects may result from clearing project sites, digging, building renovations or demolitions, and other activities. Wastes made of masonry can easily be confused with wastes made of wood or drywall. Lumber, drywall, metals, masonry (brick, concrete), carpet, plastic, pipe, rocks, dirt, paper, cardboard, or green waste associated with land development are some of the more typical wastes generated during construction and demolition [2]. Inert materials used in masonry construction, such as rock, concrete, and brick, are typically regarded as waste. That also includes dirt removed from a demolition site. Wood waste in construction sites includes waste products from new wood used for construction projects, such as plywood, chipwood, dimensional lumber, shavings, sawdust, and various demolition wood wastes. Metallic waste is defined as cut fragments of metallic materials, such as new metal studs, metal beams, and pipes. Aside from these, any construction site will contain plastic and various other waste materials.

Significant financial and human resource commitments are necessary for the waste management process related to construction and demolition. It entails setting up facilities for recycling, energy recovery, and waste disposal in larger landfills, in addition to specialized machinery for waste collection, sorting, and transportation [3]. The effective management of construction and demolition waste management practices is impacted by two major economic barriers:

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insufficient well-established markets for recycled products and a lack of financial incentives for stakeholders [4]. A number of social factors are included in the sustainable management of construction and demolition waste, such as the assessment of the short- and long-term health effects on employees involved in the handling and disposal of this waste.

Studies show that construction wastes account for a significant portion of municipal solid wastes—roughly 35% in developed nations and 50% in developing nations [5]. The generation of waste from construction and demolition is on the rise, and there is a shortage of land to dispose of it. These factors have made waste management more challenging and expensive. Setting up an optimal waste management system requires understanding the type and amount of waste generated, developing a modeling methodology, and applying it to additional construction projects. Land filling, recycling, reusing, and source reduction are the four strategies for managing waste from construction and demolition [6] [7]. Of the approaches discussed, source reduction is the most important and the top goal in the waste management hierarchy. Source reduction also boosts the economy by lowering expenses related to waste disposal, transportation, and recycling [8].

Construction waste is produced in greater quantities because of the expansion of construction activities brought on by developing nations' development. Construction waste is typically managed by burning, burying, or disposing of it at a disposal site on the construction site [9]. Trash from construction and demolition is not new to the world, but it is beginning to grow as more people live longer and more homes are developed [10]. Population growth, increased building, and urbanization in developing nations increase the need to manage the reuse and recycling of construction and demolition waste. On the other hand, a shortage of landfill space exacerbates this problem [11]. Waste management is an especially challenging task because of the various characteristics of waste products. Because construction and demolition waste have such detrimental effects on the environment, it is imperative that it be managed properly. Considerable research has been done to look at how waste from construction and demolition is managed in various economies [10].

According to Eurostat reports, the European Union produces about 2 billion waste items annually, of which 31% are construction waste [12]. China generates about 29% of the world's municipal solid waste, of which 40% is made up of construction waste [13]. According to a study, 3158 tons of material waste—or 23% of all the solid waste produced in Hong Kong—were disposed of in landfills each day [14]. Bangladesh, a nation with a high population density, cannot afford to manage its waste by land filling; hence, research is needed to find practical ways to reduce the amount of construction waste generated and how it is managed. The purpose of this study is to investigate efficient methods for classifying and/or minimizing waste production in Bangladeshi construction projects. According to a 2015 World Bank report, Bangladesh is urbanizing at the fastest rate among South Asian countries between 2000 and 2010, and by 2011, its rate had risen to 28% as a result of an increase in its economic development initiatives [15] [16]. Fast urbanization has led to the use of nonrenewable resources more frequently and with poorer management, the production of massive amounts of waste from construction and demolition, and related environmental issues [15]. Division-by-division breakdowns of the total waste stream data show that Dhaka, Chittagong, Khulna, Rajshahi, Barishal, and Sylhet contribute 69.7%, 17.1%, 6.7%, 2.2%, 1.6%, and 2.7% of the total. Therefore, in order to define practical strategies to reduce the generation and maintenance of construction waste, adequate research, proposals, and applications are required.

2. Types and Causes of Construction and Demolition Waste

According to estimates, architects' failure to incorporate waste reduction strategies during the design stages results in 33% of waste generated on-site. Construction waste can emerge at any stage of the project, and its causes can be found in design choices, construction techniques, or even individual attitudes, according to Kulatunga et al [17] . A lot of inefficient things can happen during the design and construction phases, wasting time and energy while not providing the client with any additional value. The majority of construction waste is made up of leftover materials from either new construction or demolition. Depending on the type of work, it may consist of a combination of numerous materials or, in certain situations, just a few. Waste from construction and demolition projects may result from clearing project sites, digging, building renovations or demolitions, and other activities. Wastes made of masonry can easily be confused with wastes made of wood or drywall.

Lumber, drywall, metals, masonry (brick, concrete), carpet, plastic, pipe, rocks, dirt, paper, cardboard, and green waste associated with land development are some of the more typical wastes encountered during construction and demolition. Inert materials used in masonry construction, such as rock, concrete, and brick, are typically regarded as waste. That also includes dirt removed from a demolition site. Wood waste in construction sites includes waste products from new wood used for construction projects, such as plywood, chipwood, dimensional lumber, shavings, sawdust, and various demolition wood wastes. Metallic waste is defined as cut fragments of metallic materials, such as new metal studs, metal beams, and pipes. Aside from these, any construction site will contain plastic and various other waste materials.

A variety of excess materials from site clearing, excavation, building, refurbishing, renovating, demolishing, and road work are regarded as construction waste. Waste management is a comprehensive, integrated, and logical system approach to achieving and maintaining an acceptable level of environmental quality and supporting sustainable development. It includes the collection, transportation, storage, treatment, recovery, and disposal of waste [18].

According to Yuan et al. [1], construction waste can be divided into four categories in terms of components;

- Domestic waste: Paper, plastics, aluminium bottles etc.
- Inert waste: Brick, masonry, concrete etc.
- Non-inert waste: Bamboo, timber, packaging waste and other organic materials.
- Chemical waste: Asbestos, lead paint, PCB caulking, lamp ballasts, mercury switches etc.

Poon et al. [19] has divided construction waste into main two categories;

- Structure waste: Concrete fragments, reinforcement bars, abandoned timber plates etc.
- Finishing waste: Surplus cement mortar, broken raw materials such as; mosaic, tiles, ceramics, paints etc.

Duan et al. [20] has pointed that construction waste can be divided into three categories according to their usability;

- Reusable: Doors, windows etc.
- Recyclable: Steel, aluminium scrap, copper from wire etc.
- Mixed C&D waste: Concrete debris, bricks etc.

The methodical removal of a building's materials, other subsystems, and structural systems, either completely or partially, is known as demolition. According to Eusuf et al. [21], there are three common methods used in building demolition: mechanical wrecking, explosive charge demolition, and manual wrecking. In Bangladesh, the most common method of wrecking is manual wrecking; mechanical wrecking is rarely used, and explosive charge demolition is never used. The benefit of using the manual wrecking method is that waste may be produced that has the highest potential for recovery and reclamation. Since the majority of the demolition requires tearing and cutting with tools and the hands, it is a very labor-intensive process. This technique breaks up concrete fragments and chips old plasters using conventional tools and equipment. Tools like hammer, chisel etc. are frequently used for this purpose.

The construction component and the demolition component are very distinct from one another. Most construction waste materials are easier to separate and recycle because they are more uniform (all new wood, all new drywall, etc.). It was often more difficult to separate and recover the waste materials from demolition projects because they were often mixed with different materials. There are two main types of demolition loads: debris and remodeling. New building materials were frequently mixed in with the remodeling loads. While commercial remodeling projects contained more metal, residential remodeling loads had a higher percentage of wood. The majority of remodeling loads were self-hauled in pick-up trucks or trailers, or they arrived in open top roll-off containers. In essence, debris loads were buildings that were brought to the landfill by heavy machinery after being brought down. Debris loads typically included small amounts of metal mixed in with wood, roofing, carpet, drywall, and masonry materials (dirt, rock, concrete, and brick). The materials were often broken, smashed, and shredded after being mixed together. Debris loads are therefore far harder to recover materials from. A debris load often contained rock, dirt, or masonry components. Due to their extreme weight, these masonry loads tended to distort the totals. The following materials—wood; drywall, roofing, and masonry—were noted and estimated to be included in the demolition waste. Table 1 represents the origin and causes of construction and demolition waste.

Table 1 Causes of construction and demolition waste

Origins of waste	**Causes of waste**
1.Contractual	Mistakes in the contract documents Incomplete contract documents when construction started
2.Design	Inaccurate blueprints

	Modifications to the design Errors in construction and design details A vague or inappropriate specification Ineffective communication and coordination
3.Procurement	Error in shipping Error in ordering Overallotments (difficulties placing orders for small amounts) Inaccurate supplier
4.Transportation	Damage sustained in transit Difficulties in getting delivery trucks to construction sites Inadequate safety measures when unloading Ineffective unloading techniques
5.On-site management & planning	Absence of plans for on-site waste management Poor planning for necessary amounts Information on the kinds and sizes of materials and components to be used is not passed along quickly enough Absence of material control on-site Insufficient oversight
6.Material storage	Improper sorting techniques Materials stored far from the point of application Inadequate site storage space causing damage or deterioration
7.Material handling	The materials are provided loose On-site techniques for moving cargo from storage to the application site Insufficient handling of materials
8.Site operation	Errors made by humans Negligence-related accidents Products and materials left unused Equipment failure Inadequate workmanship Using the incorrect materials, which leads to their disposal The pressure of time A lackluster work ethic Acts of God, such as weather, accidents, and catastrophes
9.Residual	Off-cuts from cutting materials to length Waste from cutting unfeasible shapes Waste from application processes Remaining scrap Non-consumables that are reclaimable
10.Others	Weather Vandalism Theft

3. Construction and Demolition Waste in Context of Bangladesh

Prior to beginning construction work in any region, waste generation and management become critical issues, as per earlier reviews. However, there is a very poor disregard for research and technical resources pertaining to Bangladesh's construction waste management scenario. Regarding the creation and handling of solid waste, certain data are accessible. However, there is insufficient data on construction and demolition wastes to forecast future conditions and implement preventive measures. [22]. The creation of construction waste and its management, which requires in-depth investigation and analysis, deserve serious consideration. A field survey can be a useful starting point strategy. Effective collaboration and communication are crucial across all stages of the construction process, from the client to the field workers. It is rare to find clients or consumers in Bangladesh who are concerned about construction waste management.

Over the past ten years, Bangladesh's environment has rapidly deteriorated. The state of affairs is especially bad in urban areas, where the urban population rate was 3% between 2010 and 2015. In the 1970s, there was a severe housing shortage due to the cities' expanding populations. For instance, between 1964 and 2007, the percentage of single-story buildings dropped from 72.8% to 7.9%. Consequently, there are an increasing number of multistory buildings. As per the 2006 Bangladesh National Building Code, there is an increase in Floor Area Ratio (FAR) in these areas, indicating a rise in the construction of 8-12 story buildings. Consequently, an increasing amount of building and demolition is occurring [23]. Bangladesh generated 10742 tons of solid waste per day in 1995, 17000 tons per day in 2001, and 47,000 tons per day on average in 2025. In addition, between 40 and 60 percent of waste goes unsorted because of a lack of funding, knowledge, awareness, and motivation [24]. Even though the building sector is a fantastic source of solid waste streams, Bangladesh's construction waste management situation pays very little attention to research and technical resources. There are still some statistics available regarding the creation and handling of solid waste. The majority of the specific data pertains to the entire nation or specifically to Dhaka. Every district's specific waste generation and management system are not available. Nevertheless, precise data regarding the production of construction waste is still lacking.

There is still no adequate waste management system in place for the building site. Appropriate research on Bangladesh's construction waste generation and management is lacking. Thirty percent of Bangladesh's urban population has lived in Dhaka, the country's capital, for the past few decades. In the meantime, the building industry has accelerated due to the large influx of people and the growing demand for housing facilities.

Bangladesh's capital city, Dhaka, is among the world's ninth-largest urban agglomerations. With an average annual growth rate of 5.6% from 1975 to 2007, it has the highest urban population growth rate [25]. Similar to other developing and least developed nations, Dhaka is experiencing a severe shortage of housing and physical infrastructure due to the city's rapid urbanization and growth. Since the 1970s, the city has had a severe housing shortage due to the inability of housing facilities to keep up with the population growth. Thus, multi-story buildings are essentially meeting the growing demand for housing. For example, between 1964 and 2007, the percentage of single-story buildings in Dhanmondi, a planned residential area in Dhaka, decreased from 72.8% to 7.9%. Six-story buildings, which currently account for 43.9% of all buildings, have replaced these structures during the interim period of real estate sector development. Furthermore, it is reasonable to assume that as floor area ratio (FAR) allows for buildings to have eight or twelve stories, the number of multistory buildings will rise more [26]. As a result, Dhaka's current built environment and the process of expanding it have a variety of negative effects on the environment and society, including the creation of waste from construction and demolition. Sand, lime, cement, bricks, ceramic tiles, timber, rubble, steel, cement blocks, paint, and PVC pipes are among the various waste materials found in Dhaka during construction and demolition projects.

4. Environmental Issues

The production of construction waste has grown to be a significant environmental concern due to its direct effects on the industry's efficiency. Air pollution, noise pollution, and water pollution are three major environmental effects of building activity. According to Kartam et al. [27], incineration has the most significant and unpleasant environmental impact since it releases pollutants into the atmosphere. Contractors must endure a loss of profit due to increased overhead expenses, delays, and decreased productivity from having to spend more time cleaning. Subcontractors are frequently held accountable for the creation of construction waste because they are required to estimate the cost and time commitment for waste generation during the bidding process. Construction companies prioritize profit maximization, so they will only suggest environmentally friendly waste management strategies if they are profitable [28].

The notable environmental effects caused by construction and demolition waste include decreased landfill space, resource exhaustion, ingestion of energy and non-energy resources, global warming, and increased air, water, soil, and noise pollution [29]. The direct effects of construction waste generation on the environment and the industry's efficiency have made it a major source of concern. Air and water pollution are two major environmental effects of building activity. The most significant and disagreeable impact on the environment comes from burning, which releases pollutants into the atmosphere [30]. Approximately 23% of air pollution, 50% of climate change, 40% of drinking water pollution, and 50% of landfill waste are caused by the construction industry [31]. Chemicals and other materials that pose a risk to human health and the environment can also be found in construction waste. They contaminate the soil and its subsoil. After that, precipitation might contaminate the groundwater. It should be mentioned that the environmental effects of construction can be both direct and indirect, resulting in the destruction of ecosystems and the extraction of natural resources as well as the production of raw materials used in construction. Harmful gases, noise, dust, chemicals, and different kinds of solid and liquid waste are the primary sources of pollution during the construction life cycle. These factors can result in air, water, noise, vibration, and soil and soil pollution, respectively [32].

According to Kumar & Kaushik's [33] study, approximately 50% of the nation's energy use is attributed to activities related to construction, both direct and indirect. The activities related to material transportation as well. The disposal of construction wastes into forests, streams, ravines, vacant land, etc., starts the detrimental effects of the wastes, causing erosion, contaminating wells, and affecting water tables and surface water [34]. The hydrological system can be influenced by the build environment and the natural environment working together in harmony [35].

Degradation of the environment is a result of improper construction and demolition waste disposal and dumping systems. The main obstacle to development in urban areas is increasingly environmental deterioration or its effects. Environmental issues are now a big deal when it comes to the environment. The environment in Dhaka is being negatively impacted by construction either directly or indirectly. Trash from construction and demolition causes resource depletion, scourges the banks, elevates river flood levels, and lets hazardous materials seep into the stream. The dumping system that encircles the roads clogs the surface drain and causes flooding on the pavement, all of which contribute to traffic congestion. The primary source of the issue with handling solid municipal waste is construction and demolition debris from small-scale home demolition [36]. The issue for the environment arises from the fact that these wastes are frequently buried on the site itself, creating an impermeable layer that inhibits the growth of vegetation and stops rainwater from penetrating the ground. Due to inappropriate building practices and the improper disposal of waste, Dhaka city's forests and land are negatively impacted. In addition, other environmental concerns related to construction sites include air pollution, noise pollution, dust generation, and vegetation removal.

5. Existing Laws

Some existing laws and legislations for overall waste management are National Environmental Management Action Plan 1995, The Dhaka Municipal Ordinance 1983, The Environment Policy Act 1992, Urban Management Policy Statement 1998, Environment Conservation Rule 1997, The Penal Code, The Factory Act 1965, and National Policy for Water Supply and Sanitation 1998. The Environment Policy Act of 1992 essentially forbids the discharge of municipal, commercial, or agricultural waste into any body of water. The Dhaka Municipal Ordinance permits the Dhaka City Corporation (DCC) to handle waste disposal exclusively in Dhaka. The Penal Code punishes anyone who causes a public disturbance due to dangerous chemicals with six months in jail, a Taka 2000 (BDT) fine, or both. Furthermore, the Factory Act primarily handles industrial waste. Therefore, it appears from this study of laws and regulations that there are no particular, sufficient laws or regulations for the management of construction waste. Table 2 represents some existing laws and legislations for overall waste management in Bangladesh.

Table 2 Some existing laws and legislations for overall waste management in Bangladesh

Legislation	Description
National Environmental Management Action plan (NEMAP), 1995	The Ministry of Environment and Forests (MoEF) developed this Act. Actions in the areas of water supply, solid waste management, sanitation, and environmental awareness, among others, have been recommended by NEMAP.
The Dhaka Municipal Ordinance 1983	This Act gives Dhaka City Corporation (DCC), which is in charge of Gather and dispose of waste.

The Environment Policy Act 1992	The Act prohibits the disposal of industrial and municipal wastes into rivers and ponds.
Urban Management Policy Statement 1998	This Act takes into account the need to provide affordable, effective, and dependable maintenance and waste disposal services.
The Penal Code	This Act spreads life-threatening infectious diseases and offers six months in prison or a Taka 2000(BDT) fine.
Environment Conservation Rule 1997	Every major landfill project must undergo an environmental impact assessment, according to this act.
The Factory Act 1965	This Act establishes guidelines for the management and disposal of dust and wastes released from factories.

6. **Recommendations to Reduce and Reuse of Construction and Demolition Waste**

It is widely acknowledged that the "3R" principles—reduce, reuse, and recycle—should serve as the foundation for waste management procedures related to construction and demolition. As a result, numerous studies have been conducted to determine its advantages and disadvantages [37]. According to Nasrin [38], the 5R policy outperforms the 3R policy in terms of sustainable waste management. Rethink, Reduce, Recycle, Recovery, and Reuse are all included in this 5R policy. Figure 1 depicts the hierarchy of disposal options that Peng et al. [39]developed.

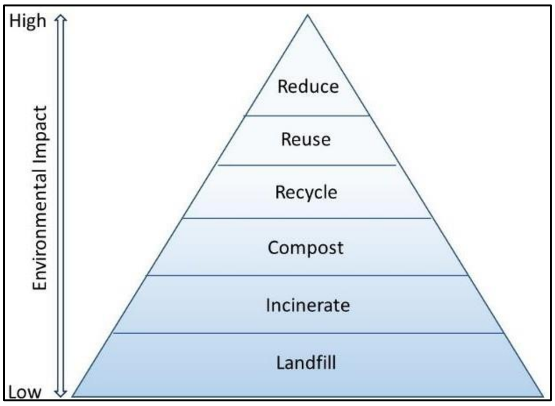

Figure 1 Hierarchy of construction and demolition waste materials disposals [39]

Figure 2 illustrates the construction and demolition waste management method hierarchy developed by Yuan & Shen [40], which consists of just four strategies: waste reduction, reuse, recycling, and disposal.

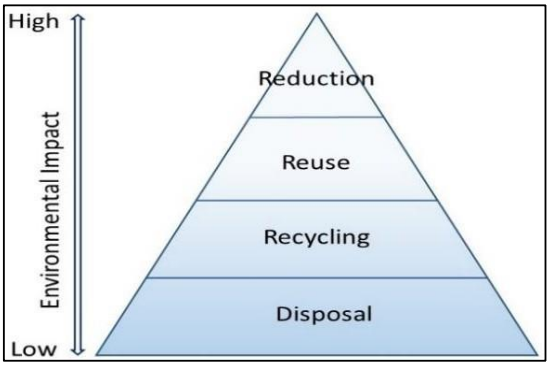

Figure 2 The construction and demolition waste management method hierarchy [40]

The author's recommended reuse practice for building demolition waste is shown in Table 4, while Table 3 shows the current practice.

Table 3 Current reuse practice of building demolition waste

Waste Material	**Source of Generation**	**Current Reuse Practice**
Electric wiring	Electric wiring	Recycle
Plumbing pipes	Drainage and water supply	Recycle
Timber	Panels for the door and windows	Reuse following repairs
Plaster & floor finish	Structure surface	Land filling, mostly; very little reuse
Concrete piece	RCC walls, slabs, beams, and columns	Land filling, mostly; very little reuse
MS rods	RCC walls, slabs, beams, and columns	Utilize recycled metal as scrap
Full brick	construction of partition walls and masonry	Reuse as brick chips and in masonry
Half brick	construction of partition walls and masonry	Most often as brick chips; very infrequently as land fill

Table 4 Recommended reuse practice of building demolition waste

Waste Material	**Recommended Reuse Practice**
Concrete	In 75% of cases, this waste can be recycled into aggregates for new concrete without compromising workability or strength.
Brick	Concrete Blocks can be made from broken bricks by mixing them with adhesive and cement. Broken bricks can be used as coarse aggregate also.
Mortar	Crushed waste mortar can be utilized in "green" concrete masonry blocks and concrete as an alternative to fine aggregate.
Timber	This can frequently be used again to produce chipboard and replace coal.
Metal	Because metal is expensive, contractors and the metal industry use distorted reinforcement bars.
Others	Recycled household goods made from waste plastic and cardboard are mostly purchased by local factories, businesses, and small rural market shops.

The author offers the following suggestions to lessen and reuse construction and demolition waste in Bangladesh:

- During the design phase, engineers and architects should adopt a whole-life perspective and take flexibility into account to allow for future growth or modifications.
- Building forms and shapes that minimize the use of surplus building materials should be taken into consideration during the pre-construction phase. Buildings and spaces should be sized to allow for the removal of superfluous components.
- By incorporating standard size supplies, prefabricated components into the design, and the specification of material and technique usage, waste can be minimized during the construction phase in a number of ways.
- Refrain from using designs that over specify or use more material than is necessary because they lead to waste.
- Need to motivate and inform the customer and other interested parties about the advantages of waste reduction and the tactics that will be used in the project to meet goals.

- Professionals in the construction sector and owners of buildings can receive education on topics like advantageous reuse, efficient methods for identifying and separating waste, and financially feasible ways to support socially and environmentally responsible ways to lower the overall amount of waste disposed of.
- Encouraging the use of products with recycled and environmentally friendly content.
- To enable the greatest amount of material reclamation, reuse, and recycling from the site, an early demolition plan should be created.
- Should review the existing structure to determine which furnishings and equipment are in good condition and could be reused to meet the planned program or could be salvaged for another project.
- Wherever feasible, should advise and instruct the client and other interested parties to select selective demolition over total demolition or structure removal.
- Using pre-cast panels: panelized building systems for roofing, basements, stairwells, etc.
- Using steel frames: these eliminate waste production and replace concrete.

7. Conclusion

Reusing and recycling the old building's debris would allow construction to take place rather than demolition, conserving as much energy as possible. Due to the country's extensive building and infrastructure development, as well as its anticipated continued growth, material waste generation will become a major issue for Bangladesh's construction industry. Better waste management plans have therefore been developed and put into action. A specific law should be put in place to handle waste from construction and demolition. The reduction of waste at the source and the underlying causes of construction waste are important considerations for architects and engineers. Through the selection of the structural system and materials, they must have an impact on the reusability and recyclable nature of building materials. They ought to rethink the way that buildings are built now in order to reduce waste production and promote sustainable building practices.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] H. Yuan, W. Lu and J. J. Hao, "The evolution of construction waste sorting on-site," Renewable and Sustainable Energy Reviews, vol. 20, pp. 483-490, 2013.

[2] AIA, "Construction Waste Management Strategies: Best Practices," The American Institute of Architects , 2008.

[3] H. Wu, J. Zuo, P. H. Yuan, G. Zillante and Y. J. Wang, "A review of performance assessment methods for construction and demolition," Resources, Conservation and Recycling, vol. 15, p. 150, 2019.

[4] H. Yuan, L. Shen and J. Wang, "Major obstacles to improving the performance of waste management in China's construction industry," Facilities, vol. 29, p. 224–242, 2011.

[5] W. Lu, H. Yuan, J. Li, J. Hao, X. Mi and Z. Ding, "An empirical investigation of construction and demolition waste generation rates in Shenzhen city, South China," Waste Managment, vol. 31, no. 4, pp. 680-7, 2011.

[6] G. Tchobanoglous and F. Kreith, Handbook of solid waste management, New York: McGraw-Hill, 2002.

[7] J. Wang, H. Yuan, X. Kang and W. Lu, "Critical success factors for on-site sorting of construction waste: a China study," Conservation and Recycling, vol. 54, no. 11, pp. 931-6, 2010.

[8] W. V. Tam, "On the effectiveness in implementing a waste-management-plan method in construction," Waste Managment, vol. 28, no. 6, pp. 1072-80, 2008.

[9] S. Ulubeyli, A. Kazaz and V. Arslan, "Construction and Demolition Waste Recycling Plants Revisited: Management Issues," Procedia Engineering, vol. 172, pp. 1190-1197, 2017.

[10] A. L. Hamid, A. D. Raval and J. R. Pitroda, "A Review Paper on Construction and Demolition Waste Management," International Journal of Engineering Research , vol. 8, no. 4, pp. 36-39 , 2019.

[11] J. A. Saju, S. N. Rubel, M. M. Rahman, S. B. Nayan and R. Bagchi, "Effectiveness of Manual Bar Screen in Separating Solid Waste from Municipal Sewers of Khulna City," Australlian Journal of Engineering and Innovative Technology, vol. 2, no. 3, pp. 31-41, 2020.

[12] DEFRA, "UK purchases and expenditure on food and drink and derived energy and nutrient intakes in 2005-06, 18 January 2007," DEFRA, London, 2007.

[13] J. Wang , H. Yuan, X. Kang and W. Lu, " Critical success factors for on-site sorting of construction waste: a China study," Resources, Conservation and Recycling, vol. 54, no. 11, pp. 931-936, 2010.

[14] EPD, "Environmental Protection Department, Environment Hong Kong annual report, Hong Kong Government," EPD, Hong Kong, 1999.

[15] R. Islam, H. T. Nazifa, A. Yuniarto, S. Uddin, M. A. Shanawaz Uddin, S. Salmiati and S. Shahid, "An empirical study of construction and demolition waste generation and implication of recycling," Waste Management, vol. 95, p. 10–21, 2019.

[16] World Bank, " Enhancing opportunities for clean and resilient growth in urban Bangladesh –country environmental analysis 2018," The World Bank, Washington, DC, 2018.

[17] U. Kulatunga, D. Amaratunga, R. Haigh and R. Rameezdeen, "Attitudes and perceptions of construction workforce on construction waste in Sri Lanka," Management of Environmental Quality: An International Journal, vol. 17, no. 1, pp. 57-72, 2006.

[18] G. B. Hwang and Z. Bao Yeo , " Perception on benefits of construction waste management in the Singapore construction industry," Engineering, Construction and Architectural Management, vol. 18, no. 4, pp. 394-406, 2011.

[19] S. C. Poon, W. A. Yu, W. S. Wong and E. Cheung, " Management of construction waste in public housing projects in Hong Kong," Construction Management & Economics, vol. 22, no. 7, pp. 675-689, 2004.

[20] H. Duan, J. Wang and Q. Huang, " Encouraging the environmentally sound management of C&D waste in China: an integrative review and research agenda," Renewable and Sustainable Energy Reviews, vol. 43, pp. 611-620, 2015.

[21] M. A. Eusuf, M. Ibrahim and R. Islam, "THE CONSTRUCTION AND DEMOLITION WASTES IN KLANG VALLEY, MALAYSIA," PLANNING MALAYSIA, vol. 10, 2012.

[22] M. K. Bahauddin and H. M. Uddin, "Prospect of solid waste situation and an approach of Environmental Management Measure (EMM) model for sustainable solid waste management: Case study of Dhaka city," Journal of Environmental Science and Natural Resources, vol. 5, no. 1, pp. 99-111, 2012.

[23] M. Zahur, "Solid waste Management of Dhaka City: Public Private Community Partnership," BRAC University Journal, vol. 5, no. 2, pp. 93-97, 2007.

[24] S. Yasmin and I. M. Rahman, "A review of solid waste management practice in Dhaka City, Bangladesh," International Journal of Environmental Protection and Policy, vol. 5, no. 211, pp. 19-25, 2017.

[25] N. Kumar, "Maintaining Growth Amid Global Uncertainty," Economic and Social Commission for Asia and the Pacific, 2010.

[26] BNBC, Bangladesh National Building Code, Dhaka: Housing and Building Research Institute , 2006.

[27] N. Kartam, N. Al-Mutairi, I. Al-Ghusain and J. Al-Humoud, " Environmental management of construction and demolition waste in Kuwait," Waste management, vol. 24, no. 10, pp. 1049-1059, 2004.

[28] J. Li Hao, J. M. Hill and L. Yin Shen, " Managing construction waste on-site through system dynamics modelling: the case of Hong Kong," Engineering, Construction and Architectural Management, vol. 15, no. 2, pp. 103-113, 2008.

[29] R. M. Hasan, I. M. Sagar and C. B. Ray, " Barriers to improving construction and demolition waste management in Bangladesh," International Journal of Construction Management, p. 1–15, 2022.

[30] H. F. Chowdhury, T. M. Raihan, S. G. Islam and F. Ramiz, "Construction Waste Management Practice: Bangladesh Perception. 3rd International Conference on Advances in Civil Engineering," in ICACE 2016, Dhaka, 2016.

[31] R. Hasan, M. H. Rakib and M. Rahman, " Quantification of Construction Waste," Journal of Technology Management and Business,, vol. 9, no. 1, 2022.

[32] T. Tambovceva, V. Urbane and J. Ievins, "Innovations in Construction Waste Management: Case of Latvia," Marketing and Management of Innovations, vol. 3, p. 234–248, 2020.

[33] R. Kumar and C. S. Kaushik, "Performance evaluation of green roof and shading for thermal protection of buildings," Building and Environment, vol. 40, no. 11, pp. 1505-1511, 2005.

[34] H. Arslan, B. Salgın and N. Coşgun, Construction and demolition waste management in Turkey, Construction and demolition waste management in Turkey, 2012.

[35] W. Dixon, The Impacts of Construction and the Built Environment, WILLMOTT DIXON, Perry Bar, 2010.

[36] M. R. Pulselli, E. Simoncini and S. Bastianoni, "Energy analysis of building manufacturing, maintenance and use: Embuilding indices to evaluate housing sustainability,energy build," Australian Journal of Engineering and Innovative Technology, vol. 39, no. 5, pp. 620-628, 2007.

[37] B. Huang, X. Wang, H. Kua, Y. Geng , R. Bleischwitz and J. Ren, "Construction and demolition waste management in China through the 3R principle," Resources,Conservation and Recycling, vol. 129, pp. 36-44, 2018.

[38] F. Nasrin, "Waste Management in Bangladesh: current situation and suggestions for action," International Research, pp. 36-42, 2016.

[39] L. C. Peng, E. D. Scorpio and J. C. Kibert, "Strategies for successful construction and demolition waste recycling operations," Construction Management & Economics, vol. 15, no. 1, pp. 49-58, 1997.

[40] H. Yuan and L. Shen, "Trend of the research on construction and demolition waste management," Waste management, vol. 31, no. 4, pp. 670-679, 2011.