Quantification of Construction and Demolition Wastes by Using Effective Modelling Software

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Abstract- ***Construction waste is generated throughout the construction process such as during site clearance, material use, materials damage, material non-use, excess procurement and human error. The lack of appropriate management of construction and demolition waste (CDW) is being increasingly associated with ecosystem damage and environmental impacts in the proximity of open dumping areas. Yet, the development and optimization of management models require accurate prediction of generation rates and waste composition , often lacking in developing countries .In this project the collection of construction waste is considered and recycling methods are stipulated by forming new stages of materials from CDW waste and create the strengthened composite for further process. This project may give a clear view on the CDW percentage, list of waste collected and recycled product of the waste, accordingly usage strength of the composite (recycled waste) effectively using computer aided Three dimensional Interactive Application (CATIA Designing) and ANSYS(Analyzing the strength of the new composite) respectively.***

Indexed Terms- ***C&D waste, recycling waste, composite material, waste quantification.***

I. INTRODUCTION

Construction waste minimization and its management has become a serious and challenging environmental issue in the developing cities all over the world day. Construction waste once generated is difficult to recycle and reuse due to high level of contamination and heterogeneity. Hence its prevention and minimization gets an importance in project management scope. Depleting natural recourses, increasing pollution, scarcity of dumping yards, destruction to the natural environment and habitat leading to ecological imbalance etc are some of the negative impacts of construction and demolition (C&D) waste. Failing to take immediate efforts in its reduction and management will lead to exhaust of the natural recourses and landfill spaces. Minimization of construction waste is important not only from the perspective of enhancing the project productivity but also from the environment considerations. Many times actual percentages of waste generation are much higher than those considered at initial project stage.

Worldwide the construction industry constitutes one of the largest industries and produces the bulkiest waste stream. Globally, construction waste is about 35% of the total industrial waste. Accordingly, managing and reducing CDW is becoming a crucial step to improve the sustainability of the construction industry. Several. However, to develop a systematic management model, the generation rate and composition of the waste need to be accurately calculated. Therefore, some numerical methods have been used to estimate current and future CDW rates. Most of these address cases of developed countries, where stringent regulations for CDW disposal are applied. On the contrary, generation data's limited in developing areas where current practices include random dumping in remote areas and uncontrolled discharge in waste streams, resulting indirect and indirect health impact.

II. SCOPE

To demonstrate the construction and demolition waste of the demolition site and recycling the waste to form a new composite product to reuse it again with effective demolition cost.

III. OBJECTIVES

This project deals with the effective modeling of construction and demolition waste from both the construction and demolition sites. The cost effectiveness and material re-usage is here considered at this project. Due to the effectiveness usage of the material from the waste that is produced from the site demolition and acquitted material formation is done by recycling of those materials collected. Thus, a new composite is formed by recycling. This recycled material is analysed with its strength and usage.

IV. LITERATURE REVIEW

The Report "An Optimization Model on Construction and Demolition Waste Quantification from Building" Sadhan K Ghosh., 2016.Construction and Demolition (C&D) waste, which constitutes more than 30% of the solid waste stream in India is not given proper attention and loses its recycling potential. The most appealing use of making users more aware of the need to recycle and can perform a cost benefit analysis that can be generated from proper optimization and reutilization of CD waste. Elements like Lead, Arsenic, Cadmium and Silica find their way into the soil and are then transported into the ground water. Therefore the objective is to propose a model which makes use of easily available data like transportation rates and resale value of recyclable materials which would provide an intuitive and simple optimization model while imbibing the basic principles of Reduce, Reuse and Recycle into action.

The Report "Quantification Methods for Construction Waste Qeneration at Construction Sites: a Review" Ahmand firman masudi.,2008. Estimation of construction and demolition (C&D) waste amount is crucial for implementing waste minimization program. The aim of this paper is to conduct a review on available construction waste quantification methods from previous studies, which have been utilized in certain countries, while attempting to choose the most suitable and applicable method, and to direct future studies for better quantification methods. It is believed that some combination of these quantification methods could make a good impact in accurate numerical estimation of construction waste amount generated in building construction projects. A strong and accurate database as presented by Soliz-Guzman, combined with effective, vital, and resourceful estimation suggested by Jalali's Global Index (GI).

The Report "Demolition Waste Generation for Development of a Regional Management Chain Model." Hendriks.C (et all.)2014. Even though construction and demolition waste (CDW) is the bulkiest waste stream, its estimation and composition in specific regions still faces major difficulties. Therefore new methods are required especially when it comes to make predictions limited to small areas, such as counties. This paper proposes one such method, which makes use of data collected from real demolition works and statistical information on the geographical area under study. Generation of demolition waste data at the county level is the basis of the design of a systemic model for CDW management in a region. Future developments proposed include a mixed-integer linear programming formulation of such recycling network.

The Report "Time- Based Construction Waste Management Planning Using Building Information Modeling (BIM)" . Jongsung Won and Jack C.P. Cheng. The amount of construction and demolition (C&D) waste is huge. Since building information modeling (BIM) can integrate relevant information, BIM can improve processes to quantify and manage construction waste. Therefore, this paper proposes a BIM-based framework to estimate the amount and timing of construction waste generation by materials through integration of quantity information of construction materials, project schedule, and waste factor. Using the proposed time-based framework, contractors can evaluate and compare various construction waste management alternatives and determine the most appropriate one by considering project characteristics.

The Report "Environmental Impacts of Construction and Demolition Waste Management Alternatives" Chooi Mei Mah.,2018**.** Construction and demolition waste (C&DW) arises mainly as by-products of rapid urbanisation activities. C&DW materials have high potential for recycling and reusing. Despite its

potential, landfilling is still the most common disposal method. The purpose of this study is to access the environmental impacts caused by landfilling and the alternatives especially in assessing the damages to human health, ecosystems, and to the resources in the future 10 year. It aims to identify the better alternatives in reducing the environmental impacts of landfilling C&DW. The environmental impact of landfilling C&DW is estimated to increase 20.2 %. Recycling will reduce 46.0 % of total damages and, the environmental damage is further reduced by 82.3 %. Applying industrial building system (IBS) to reduce waste generation at-site reduced 98.1 % impacts as compared to landfilling scenario. The negative impacts derived from landfilling activity is significantly reduced by 99.5 % (scenario 8) through shifting to IBS, recycling, and shorter the travel distance from construction sites to material recycling facilities (MRF).The outcome of this study is informative and useful to policymakers, particularly in defining the way forward of C&DW industry in Malaysia.

The Report "Optimization of the Waste Management for Construction Projects Using Simulation" .E.Yiicesan,C.-H. Chen., 2002. Growth in construction activities increases the amount of construction waste generated. Recycling of construction waste is an important component of environmentally responsible construction, as it reduces the amount of waste directed to landfills. A future advanced version of the model can be applied to any construction site to determine the amount of daily waste generation, resource and time requirement for sorting and transporting of recyclables. The model, therefore, is a valuable tool for construction managers interested in asserting the viability of recycling projects.

The Report "Waste Quantification Models for Estimation of Construction and Demolition Waste Generation: a Review" Che Rosamani Che Hassan.,2012. Quantification is crucial for construction and demolition waste management. Accurate estimation can be satisfied by developing waste quantification model that is applicable for regional or nation-wide C&D waste generation. This paper presents a review on quantification models for C&D waste from literatures and how they correlate. Studies found that waste generation factor will differs according to locations. Since volume and characteristic of waste are crucial for waste quantification, quantitative data record from waste audit findings could benefit the authorities for the annual estimates. National C&D waste reduction plan should start from well-established waste minimisation plan at project sites.

The Report "Current Status of the Research on Construction and Demolition Waste Management" Kambiz Ghafourian.,2016. 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. 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. 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

The Report "Evaluating the Transition Towards Cleaner Production in the Construction and Demolition Sector of China: a Review" Patrizia Ghisellini., The construction sector is one of the most impacting economic activities in the world. Its direct environmental impacts include a large use of non-renewable energy and mineral resources while its indirect impacts are related to the disposal of construction and demolition wastes (C&DW). To improve its environmental performances the sector is innovating in terms of cleaner materials, products and processes. In our study we carry out a narrative literature review to explore the alternative C&DW management (C&DWM) strategies beyond landfilling implemented in China for the purpose of evaluating the transition towards CP. The results show that CP for C&DWM has not been yet fully implemented in construction companies and industry mainly due to legislative and economic barriers

The Report "Assessing the Influence of Construction and Demolition Waste Materials on Workability and Mechanical Properties of Concrete Using Statistical Analysis" . Bahareth Hadavand.,2013.In recent decades, because of the massive destruction of old structures, a large amount of construction and demolition (C&D) waste has been produced. These waste materials have the greatest volume and weight among solid waste with many environmental problems. In this study, the effect of different concentrations of C&D waste (0%, 10%, 20%, 30%, and 50%) as coarse aggregates on workability, compressive, tensile, and flexural strengths was investigated at the water-to-cement (W/C) ratios of 0.40, 0.45 and 0.50. Thestrengths were measured at the ages of 7 and28 days. The results proved that C&D waste has no significant effect on compressive strength, while its negative impact on workability was palpable. With respect to tensile and flexural strength, just 50% of C&D waste led to significant reduction.

The Report "A Framework for Understanding Waste Management Studies in Construction" Weisheng Lu and Hongping Yuan.,2011. During the past decades, construction and demolition (C&D) waste issues have received increasing attention from both practitioners and researchers around the world. A plethora of research investigating a wide range of topics on C&D waste management (WM) has been published in scholarly journals. The aim of this paper is to develop an intuitive framework to help understand the state of the art of the C&D WM research. By following the framework, previous research on C&D WM is reviewed and research gaps are identified. Findings suggest that the development of effective C&D WM strategies should base upon the whole lifecycle thinking and motivate the participation of all project stakeholders involved. Meanwhile, future research should be conducted by envisaging the multidiscipline characteristic of C&D WM.

The Report "Construction Materials and C&D Waste in India" Sandeep shrivastava., 2011. Construction and demolition (C&D) waste generation and handling issues have been in focus to achievesustainable goals. Owing to growth in construction in India, it is appropriate to link generation of C&D wastewith the growth. If measures to minimize and handle the C&D waste are not developed and efficientlyadopted it may threat the environment as well as sustainable movement of Indian construction industry.C&D waste in India in 2010 may be estimated as 24 million tonnes. This paper provides an overview of theconstruction industry in India and gives some statistics about the volume of C&D waste.

The Report "Minimizing Construction Wastes by Efficient Site Practices"Abhijith Harikumar.,2014 . Construction waste consists of unwanted material produced directly or incidentally by the construction or industries. This includes building materials such as insulation, nails, electrical wiring, and rebar, as well as waste originating from site preparation such as dredging materials, tree stumps, and rubble. Construction waste may contain lead, asbestos, or other hazardous substances. This paper discusses about the commonly seen construction waste materials. A detailed study is made on the methods by which these construction waste materials can be recycled, reused or even disposed, so that proper management of construction materials is ensured. Proper construction waste management can help in prioritizing reduction of building-related wastes through efficient jobsite practices.

The Report "Review on the Current Construction and Demolition Waste Management Framework". Rema.R.,2018. Construction waste generation is recognized as one of the major issues in the construction firm due to its unambiguous effects on the environment in addition to the performance of the construction industry. These construction and demolition waste (C&DW) need to be controlled by employing effective waste disposal techniques. In India, Construction and demolition wastes management (C&DWM) is found to be still a problem. According to [Markandeya, Kameswari 2015] the construction firms in India generates about 10- 12 million tons of waste annually. This paper reviews the literature and analyzes from the C&DWM strategies in practice around the globe and the role of regulatory authorities in construction and demolition waste management.

The Report "BIM based 3D Model for Construction Waste Quantification"Varsha Ashokkumar., 2018.

There is a lively debate on the application of Building Information Modeling (BIM) to construction waste management (CWM). This paper aims to demystify BIM's computational application to CWM waste quantification. Based on a critical literature review, a prototypical framework of a computational BIM model for CWM waste quantification is developed in Revit environment, within which the waste generation level was introduced after a questionnaire survey. Then, the paper details the waste quantification of an ongoing construction project through a D BIM model. This thesis further presents a waste quantification method in comparison with the conventional estimation methods.

The Report "Study of Construction and Demolition Waste for Reuse and Recycle" Mr.A.R. Makegaonkar.,2018. The construction and demolition waste is the waste mainly generated from the two activities i.e. from the construction activity and demolition activity. So this paper is expected to reduce the landfill disposal of the construction anddemolition waste and to achieve the aim of reuse and recycle of that construction and demolition waste. The objective of this paper is to study the various strategies of the reusing and recycling of the C & D waste adopted bydifferent countries. The paper also focus on the recycling of the aggregate for its reutilization in the construction activities, so that by using the Recycled aggregate the cost of the project also gets down. By taking the sample tests inthe Pune region the recycling of the aggregate is done and which can be used for the pavement designs and other construction purposes.

The Report "A Dynamic Model For Construction And Demolition (C&D) Waste Management In Spain: Driving Policies Based On Economic Incentives And Tax Penalties" Nuria Calvo.,2014, According To The Recent Spanish Legislation, The Amount Of Non-Hazardous Construction and demolition waste (C&D waste) by weight must be reduced by at least 70% by 2020. However, the current behavior of the stakeholders involved in the waste management process make this goal difficult to achieve. In order to boost changes in their strategies, we firstly describe an Environmental Management System (EMS) based on regulation measures and economic incentives which incorporate universities as a key new actor in order to create a 3Rs model (Reduce, Reuse and Recycle) in the C&D waste management with costs savings. This paper finds a broader understanding of the socioeconomic implications of waste management over time and the positive effects of these policies in the recycled aggregates market in order to achieve the goal of 30% C&D waste aggregates in 12 years or less.

The Report "cost analysis of construction and demoilition waste management: case study of the Pearl River delta of china" Yousong Wang., 2013. Currently, Construction and Demolition waste (C&D waste) is a worldwide issue that concerns not only the construction management level of on-site managers but also the sustainable development of construction industry. In this paper, detailed formulas are listed for calculating the costs of three typical kinds of disposal routes of C&D waste. They are Landfill Disposal, Recycling and Reuse. Using the specific formulas, the costs of new construction project in the Pearl River Delta Region of China are also estimated. The results of this study can provide supportive data and theoretical basis for the C&D waste management decision-making in rapidly developing economies.

CONCLUSION

The composite models are designed in the CATIA software and it is exported to ANSYS software and the analysis is done by meshing, reprocessing, post processing and thus the results are obtained. The results obtained for the various properties of the composites are noted and the average values are tabulated. These composites are then applied for different construction purposes .The buying cost of the material can be reduced by using these recycled composite models and hence it plays great role in reduction of CDW waste. The pollution during burning of wastes can be reduced and this CDW modelling acts as an environmental one.

REFERENCES

[1] Ahmand firman masudi.,2008 "Quantification Methods for Construction Waste Qeneration at Construction Sites: a Review"

[2] Anna Bergek., 2014 "The Impact of Environmental Policy Instruments on

Innovation:A Review of Energy and Automotive Industry Studies"

[3] A. Papondopooulous.,2002 "Development of an Integrated Plan for Solid Waste Management in Cyprus"

[4] Amornchai Challcharoenwattana.,2015 "Co-benefits of HouseHold Waste Recycling for Local Community's Sustainable Waste Management in Thailand"

[5] Avindana John.,2017 "Applicability of Construction and Demolition Waste Concrete in Construction Sector- Review"

[6] 6. Abhijith Harikumar.,2014"Minimizing Construction Wastes by Efficient Site Practices"

[7] Bahareth Hadavand.,2013 "Assessing the Influence of Construction and Demolition Waste Materials on Workability and Mechanical Properties of Concrete Using Statistical Analysis"

[8] Chooi Mei Mah.,2016 "Construction and Demolition Waste Generation Rates for High-Rise Buildings in Malaysia"

[9] Che Rosamani Che Hassan.,2012 "Waste Quantification Models for Estimation of Construction and Demolition Waste Generation: a Review"

[10] Chooi Mei Mah.,2018 "Environmental Impacts of Construction and Demolition Waste Management Alternatives"

[11] Dzulkarnaen Ismail.,2017 " Analysis of Variance of the Effects of a Projects Location on Key Issues and Challenges in Post- Disaster Reconstruction Projects"

[12] Diana C. Tascon-Hoyos.,2012 "Dynamic Model for Comparing the Performance of Waste Management Strategies Over Sustainable Dimensions"

[13] E.Yiicesan,C.-H. Chen., 2002 "Optimization of the Waste Management for Construction Projects Using Simulation"

[14] G.G. Giwangkara.,2019 "recycled concrete arrogate as a road base material"

[15] Hendriks.C (et all.,)2014 "Demolition Waste Generation For Development Of a Regional Management Chain Model."

[16] Herlin Suciati.,2018 "A Dynamic Model for Assessing the Effects of Construction Workers' Waste Behaviour to Reduce Material Waste"

[17] Jongsung Won and Jack C.P. Cheng "Time-Based Construction Waste Management Planning Using Building Information Modeling (BIM)"

[18] Jiu Jingkuang., 2018 "A Model for Quantification of Construction Waste in New Residential Buildings in Pearl River of China."

[19] Jef Brigmans.,2007 "Recycling of Construction and Demolition Waste: Case Study in the Port of Antwerp"

[20] Jianguo Chen.,2006 "Managerial Areas of Construction and Demolition Waste: a Scientometric Review"

[21] Khalid lqbal.,2016 "Quantitative and Qualitative Estimation of Construction Waste Material in Punjab Province Pakistan

[22] Kambiz Ghafourian.,2016 "Current Status of the Research on Construction and Demolition Waste Management"

[23] Mr. Yunhui Yang.,2015 "Referring Sustainable Waste Management Strategy Drives Life-Cycle Sustainable Building Benefits of China"

[24] Mr.A.R. Makegaonkar.,2018 "Study of Construction and Demolition Waste for Reuse and Recycle"

[25] Nuria Calvo.,2014 " A Dynamic Model for Construction and Demolition (C&D) Waste Management in Spain: Driving Policies Based on Economic Incentives and Tax Penalties"

[26] O.E.K.Daoud.,2009 "Necessary Measures to Reduce Construction Waste in Egypt: a Model for Developing Countries"

[27] Oyeshola Femi Kofoworola.,2012 "Estimation of Construction Waste Generation and Management in Thailand."

[28] P.Dharani.,2018 "Utilization of Bakelite and Waste Plastic in Flexible Pavement Construction- a Review"

[29] Patrizia Ghisellini., "Evaluating the Transition Towards Cleaner Production in the Construction and Demolition Sector of China: a Review"

[30] Rosami Che Hassan.,2016 Rogerio Bonette Klepa.,2019 "Reuse of Construction Waste to Produce Sensor for the Use in Highway Traffic Control"

[31] Y.Ruwanpura.,2018 "Reuse of Construction Waste to Produce Thermoluminescent Sensor for use in Highway Control"

[32] Rawshan Aran Begum.,2009 "Attitude and Behavioural Factors in Waste Management in the Construction Industry of Malaysia"

[33] Rogerio Bonette Klepa.,2019 "Reuse of Construction Waste to Produce Thermoluminescent Sensor for the Use in Highway Traffic Control"

[34] Ruoyu Jin., 2019 "Science Mapping Approach to Assisting the Review of Construction and Demolition Waste Management Research Published Between 2009 and 2018"

[35] Robert H.Crawford.,2017 "Barriers to Improving the Environmental Performance of Construction Waste Management in Remote Communities"

[36] Rema.R.,2018 "Review on the Current Construction and Demolition Waste Management Framework"

[37] "Sandhan k ghosh,h.s. haldar.,(2016) 'an Optimization Model on Construction and Demolition Waste Quantification from Building."

[38] S.Agyeman.,(2019) 'Exploiting Recycled Plastic Waste as an Alternative Binder for Paving Blocks Production.

[39] Sandeep shrivastava.,2011 "Construction Materials and C&D Waste in India"

[40] Siti Akhtar Mahayuddin.,2013 "Quantification of Waste in Conventional Construction"

[41] Sadhan K Ghosh.,2016 "An Optimization Model on Construction and Demolition Waste Quantification from Building"

[42] Srujal Patal.,2016 " Cost Optimization of the Project by Construction Waste Management"

[43] S.Agyeman.,2019 "Exploiting Recycled Plastic Waste as an Alternative Binder for Paving Blocks Production"

[44] Siti Aminah Abd Kadar.,2017 "Stability and Volumetric Properties of Asphalt Mixture Containing Waste Plastic"

[45] T.Y. Hsiaso.,2002 "modeling materials flow of waste concrete from construction and demolition wastes in Taiwan"

[46] Varsha Ashokkumar.,2018 "BIM based 3D Model for Construction Waste Quantification"

[47] "Weisheng Lu and Hongping Yuan.,2011 "A Framework for Understanding Waste Management Studies in Construction"

[48] "Xuedong Guo.,2019 "Using Sustainable Oil Shale Waste Powder Treated with Silane Coupling Agent for Enriching the Performance of Asphalt and Asphalt Mixture"

[49] Yousong Wang.,2013 "cost analysis of construction and demoilition waste management: case study of the pearl river delta of china"

[50] zhikang bao, weisheng lu.,2019 "Procurement Innovation for a Circular Economy of Construction and Demolition Waste:Lessons Learnt from Suzhou,China."