

A RESEARCH ON CONCRETE WASTE MANAGEMENT IN A DEVELOPING COUNTRY

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Purpose:

The basic purpose of this research paper is to emphasize on the importance of using the waste cement concrete products, namely called as the Construction and Demolition waste (C& D). The paper mainly focuses on how this waste can be used as an aggregate in today's construction industry.

Abstract:

In the recent years, there has been a boom in the construction industry, thereby increasing the investment in the construction of new infrastructure and replacement of older infrastructure. Construction involves different materials like wood, steel, brick, stone, glass, clay, concrete, mud etc. Out of these, cement concrete form an integral part of this industry.

For its adaptability with respect to the changing environment, concrete must be such that it can conserve resources, protect the environment, economize and lead to proper utilization of energy. To achieve this, major emphasis must be laid on the use of wastes and by-products in cement and concrete used for new constructions.

More construction is directly proportional to more wastage of the raw materials used and therefore it is important to use them carefully and up to their fullest potential.

Not only is this a good way to reduce wastage, it also provides various advantages, namely:

Eco- friendly

Economical

Solves the waste management problem

Objectives of the study:

The main objective of this paper will be to state the importance of concrete waste management and based on few case studies, examples conclude that it is a feasible measure to undertake on a larger platform.

By concluding and proving these aspects, it will be easier to also consider the following objectives of managing the waste in construction filed:

- Minimising the risks which pose to the environment
- Reduce environmental foot-print by using the waste as an alternative to protect raw- material and sustainable development.
- Lowering the prices due to less importing materials from out of the country
- Increasing the job opportunities
- In small countries, lack of space to landfill

Introduction:

There has been rapid economic growth and urbanisation in Pune recently. This has led to greater environmental impacts from the Construction and Demolition waste (R&D) which is in turn becoming an issue in the urban solid waste management.

Environmental issues such as increase in flood levels due to illegal dumping of C&D waste into rivers, resource depletion, shortage of landfill and illegal dumping on hill slopes are evident in the city. The study is mostly restricted to residential and non-residential construction sites in the industry.

Literature Review

Digital marketing has permeated the real estate industry. With the ever-evolving innovation of marketing technology and digi-savvy buyers, it is imperative to have empirically based. Evidence to help determine which digital marketing efforts have a favourable impact on market outcomes, and thus justify the additional expenses and investment for sellers and agents. Gravit study investigates these digital marketing efforts on an academic level and also has pragmatic economic benefit: informing sellers about the effects of their decisions to allow thirdparty. comments and determining whether a virtual tour (particularly one that is of good quality) will affect their end goal of selling their largest financial asset for as close to their asking price as possible. **(Denise Hunter Gravatt,2018)**

A user-friendly Geographic Information Systems (GIS) program was developed to manipulate the property listing for sale geographically, to display the property listing in relation to other social and environmental features including topography, ways, types of unit, ways, gardens and/or shopping centres, and to provide tools for the houses buyers to search and inspect properties and make choices without the need of getting into the houses or without their need to travel to place of houses. This study combines four luminous areas Geographic Information Systems (GIS), Electronic business System, Management Information System (MIS) and Internet and applies the combined technology in the business of real state to make system this system called (GEMI). Developing a method and system for using maps of GIS system in Electronic Business System (EBS) have reduced time of selling and buying. Using a mixed model like object relation model have facilitated representing multimedia in the developed and make system to integrate the A Geographic Information Systems (GIS), Management Information System (MIS), Electronic business System and Internet this system called (GMEI) to choosing, selling and buying the Unit. Using the distributed systems concepts and technology we have the advantage to redistribute workload and resources system, taking in consideration the customer's satisfaction our system has achieved a good quality. **(Abdelmoty M.Ahmed, Reda Hussien Abo Alez , Bijoy Babu, 2015)**

'Des. Res.', 'rarely available', 'viewing essential'—these are all part of the peculiar parlance of housing advertisements which contain a heady mix of euphemism, hyperbole and superlative. Of interest is whether the selling agent's penchant for rhetoric is spatially uniform or whether there are variations across the urban system. According to **(Gwilym Pryce and Sarah Oates, 2008)** how the use of superlatives varies over the market cycle and over the selling season. The analysis opens up a new avenue of research into the use of real estate rhetoric and its interaction with agency behaviour and market dynamics.

Real estate is sometimes described as land and its fixtures **(Webb and Stephenson, 2009)**, its sale and lease is regulated by State and Federal law. The two major types of real estate are commercial (sale and lease of property of business property) and residential real estate (sale and rental of dwelling property). The marketing of real estate has been advancing to the amusement of the Property sector and customers with the introduction of computer based search, smart phone and apps. Marketing of real estate can boost sales depending on the medium used and the prospective clients targeted. The marketing is diverse in nature as it depends on word of mouth, print media, television, internet and mobile devices marketing. Of recent we have seen the emergence of email, Facebook, Twitter, Short Text Messaging (SMS) and other means of communication been used to court customers or advertise the real estate. It is now a question of being technology savvy or at least open for its use to be successful. The modern technology has not only affected real estate but trading in general and public access to things like

License and car registration renewal and lately online voting (Carter & Belanger, 2005) are just a few of the beneficiaries. **(CJ Setlhong, 2013)**. Digital marketing of advertisement and content offer a high level of engagement through the searchable and sharable nature of online community **(Wakefield, 2012)**.

Real Estate PR involves three key players – **the owner, the builder and the customer**. They are three equally important sides of the marketing triangle, and the PR activities directly concern their relationship in media channels – touching the business life and personal attitudes and behavior of each group. Satisfaction in a purchase deal for the customers, and therein profit for the owner and builders. PR is said to break down barriers and facilitate interaction and business if the three players communicate well with each other. PR in media and PR activities at the field level go a long way in helping achieve this. India's PR industry is growing. PR a misunderstood profession earlier today is far more professional – strategic and tactical – and poised to grow. According to a survey done by ASSOCHAM, it is growing at the rate of 25 to 30 percent per year. The value of PR as a strategic management tool is well understood and accepted in building image, relationships and business across the board. By taking advantage of PR and PR professional's skills as public advocates, businesses can better understand how decisions affect customers, maintain beneficial relationships between the organizations and the public on whom they depend for success and survival. This information during the decision making process in Real Estate marketing can prove most profitable. **(Sushil Bahl, 2012)**

Social Media is best defined in the context of the previous industrial media paradigm. Traditional media such as television, newspapers, radio and magazines are in one direction static show technologies. New web technology has made it simple for anyone to create and most highly, issue their own content. A blog position, tweet or YouTube video can be twisted and viewed by millions almost for free. Advertisers don't have to reimburse publishers or distributors huge sums of money to embed their messages and they can make their own interesting content that viewers will flock to. Social media comes in many forms and the eight most popular are: Blogs, Microblogs, Social Networks, Media-Sharing Sites, Social Bookmarking and selection Sites, analysis Sites, forum and effective Worlds. **(Saravanakumar and Suganthalakshmi, 2012)**.

Brands and customers are communicating with each other without any restriction in time, place, and medium so that old-fashioned one-way communication is changed to interactive two-way direct communication. In this way, brands and customers are working together to create new products, services, business models, and values. Meanwhile, brands can gain exposure and strengthen relationships with customers. Social media marketing is a two-way communication seeking empathy with young users, and even enforcing the familiar emotions associated with existing luxury

brands to a higher age group. In addition, social media activities of brands provide an opportunity to reduce misunderstanding and prejudice toward brands, and to elevate brand value by creating a platform to exchange ideas and information among people online **(Kim and Ko, 2012)**.

At present internet has already gained relevance amongst the mid and high income group of customers for buying, renting and selling real estate but with the growth of internet penetration it is going to find relevance amongst the masses also. Internet marketing helps to boost the sales and to improve the brand image and perception amongst potential clients. As per Google Rs 2,58,000 crore worth of real estate transactions are being directly influenced by the Internet in India i.e 53% of all internet transaction today are being influenced by the internet currently and this figure is all set to increase with the increase of internet penetration. As per Nitin Bawankule, Industry Director, Google India said, "It is estimated that the real estate industry will grow to become a 140 \$ billion by 2017 and the Internet audience base is expected to reach over 450 million by then. There is tremendous opportunity for online real estate aggregators, brokers and developers to engage the buyers online by providing rich, meaningful and immersive experience to buyers on the Internet. Internet helps to provide the maximum exposure a minimal cost and is going to be one of the main driving force for real estate sales in the near future. **(Mr. Bibek Singh Sandhu, Ms. Tamanna, 2016)**

Viral Shrivastava (2018) studied the different trends in online marketing in real estate. According to him consumers preferred using mobile devices rather than computers or laptops for their business deals or purchases. Also real estate companies can make more money by encompassing real estate apps. The inbound marketing is also drawing attention through regular posting on social media, sharing videos, photos and updating blogs. Apart from these online marketing of real estate Viral Shrivastava also focused on advantages and disadvantages in online marketing. According to him convenience can be considered as the major advantage of online marketing in real estate as it allows overcoming distance barrier that is it is easy to reach any part of the country without setting up local outlets thus widening the target market. Also online is frequently less expensive than most of the traditional marketing methods. On the other hand finding home is as much as an emotional decision as it is quantitative. A skilled broker can understand the needs of a customer and carefully re-evaluate the search during their interactions.

Harjot Kaur (2017) studied the digital marketing and its impulsiveness in real estate, according to her digital marketing and e-commerce is a bonus to the real estate industry but at the same time is negatively impacting the role of intermediators and agents and is intensely changing the traditional practices. The customers are finding the way on internet to save their time and has variety of opinions for comparing and choosing the products available. As the digital

marketing is comparatively new there are several loop holes in the rules and regulations of the system and the real estate companies are finding it difficult to incorporate technological changes as the demands of a customer are swiftly changing. The minimal cost web services is also a threat to the industry as it increases the competition in the market hence making it difficult to survive in the era of digital marketing.

Fang Fang (2015) focused on the problems in the marketing strategies of Real estate enterprises in three line cities. Lack of positioning of customers , Lack of brand awareness and poor marketing integrity with false advertising are the problems faced by digital marketing in the real estate industry . According to her implementation of the real estate enterprises in the three line cities must incorporate brand protection and brand creation to own advantage for obtaining good marketing effect. The primary aim of the marketing strategy is to include the cities own culture into the architectural style hence creating a community atmosphere.

S. Santhini (2016), she studied the ways in which the e-commerce is affecting the real estate industry. The real estate is considered to be information based business however it is being deeply affected by the information technology. The property developers are cutting back on expenditure that is being used by traditional methods like newspapers, banners, brochures etc. and shifting to newer technologies to enhance brand visibility and to lure potential customers. The analysis suggests that the E-commerce is eating away the long enjoyed information monopoly of real estate agents hence reducing their employability. Since real estate companies has always been into marketing, they never had a ROI approach, but the digital marketing is driven by ROI and can be more prominently seen in India as culturally Indians are believed to have more trust deficiency compared to the western countries.

P. Sathya (2017) carried out a research work in order to know the responses of the customers towards the digital marketing. She analysed the community with a sample size of 100 people.it was being found that digital marketing had a greater future in the present market as people find it safe and are satisfied through purchasing bu using digital marketing.it was being observed that the awareness about the online shopping was 100% amongst the respondents and the ratio of male customers was around 70 % in online shopping. Thus digital marketing has turned out to be crucial aspect of the business and is also an extremely inexpensive and competitive method. If the correct implementation of the feedback is being provided to the consumers in the right way of the digital marketing will be able to satisfy the consumer desires.

Piyush sharma(2016) stated that the biggest problem the real estate is facing is that it is very diverse, exact segregation of the information is impossible and there is no means to check whether the information is correct. After real estate bill 2016,

the small sets of optimistic developments gradually flowing into the economy have also started creating curiosity amongst customers also some giant developers like DLF, Sobha and Amrapali have recently observed an improving status in terms of demand of real estate estate in some selected cities. According to the recent audits a large scale buying tendency can be seen in the real estate in the next few years also the trends may encompass high percentage of buyers looking med-segment properties.

Saurabhi Singh ,studied the different marketing strategies in a real estate company .she concluded out that the real estate companies in India must improve their condition so that their market share can be improved in this huge competitive environment .The approach which is required is the insight of research into market demand, micro and macroeconomic market factors and the study of past sales of sites in a given location .These insights can give an accurate and predictive road map of what the market wants in the future. Morpheus group is following the same strategy. This study offered the implications of factors of marketing strategies on real estate company performance and throws light on the significance of marketing strategies for the same.

Research Methodology:

Data collection:

The main source of data to be used for the study will be secondary (Desk research) contrasted with the primary research used as a source of data for analysis

Opinions expressed in commercial journals, magazine, newspapers, accounting literature, various journals of cement via. Cement industry annuals review, world cement, cement abstracts etc. to be considered thoroughly.

Period of the study:

The data collected from either secondary or primary sources will be from the recent years, i.e, past two to three years span.

Tools and techniques to be included:

1. Statements
2. Trend analysis

3. Comparative statements if any
4. Diagrammatic and graphic analysis if any

CASE STUDIES:

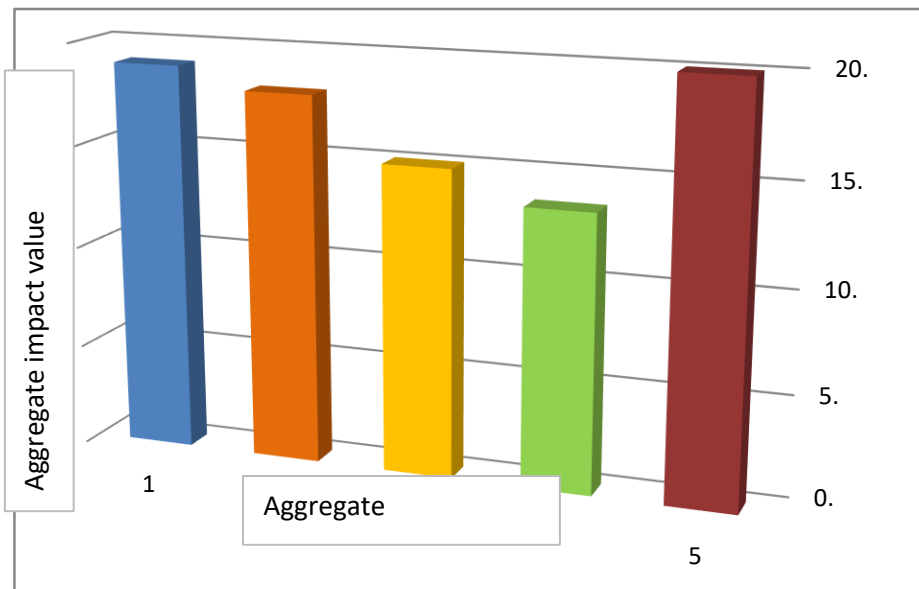
CASE 1-

Recycled aggregate was taken from the construction site of IL and FS Environmental Infrastructure and Services Ltd at Burari, New Delhi. On the basis of two concrete mixes, i.e. M20 and M25, the standard proportions are considered i.e. 1:1.5:3 and 1:1:2 respectively. The water-content of M20 and M25 is 0.5 and 0.45 respectively. The concrete mix design has been carried out using IS 456:2000. Recycled aggregate of 20 mm has been used. 43 grade Ordinary Portland cement (OPC) has been used. 3 different mixes of natural aggregate (NA) and recycled aggregate (RA) i.e. NA: RA have been considered for experimental purposes such as (NA: RA) 60:40, 70:30 and 80:20 respectively; which gives the composition as follows:

Material	M20 (in kg)	M25 (in kg)
Cement	4.19	5.77
Sand	7.96	9.23
Aggregate	15.95	14.62
Water	1.89	2.89

Aggregate Impact Value test:

The aggregate impact value test was performed according to the standard procedure and the following results were obtained.



■ NA:RA (60:40) ■ NA:RA (70:30) ■ NA:RA (80:20) ■ 100% NA ■ 100% RA

Recommended values:

Sr. No	Aggregate Impact Value	Classification
1	<20%	Exceptionally strong
2	10-20%	Strong
3	20-30%	Satisfactory for road surfacing
4	>35%	Weak for road surfacing

These values are decided by the Indian Road Congress, more value indicates lower impact strength. It can be observed that the natural aggregate is exceptionally strong and hence can be used for wearing course. Therefore, it can be concluded that:

Recycled aggregate is at the top with 21.27% impact value

60:40 and 70:30 mixtures are having values of 19.6% and 18% respectively, thereby being suitable for wearing course only

80:20 has the better result amongst all others, making it exceptionally strong

Conclusion:

The mixtures (NA:RA) of proportions 70:30 and 80:20 have shown better results as compared to the others and hence this mixture can be recommended for economic and sustainable development of concrete.

If not for construction of buildings, they can be used for other purposes like building the pavements, etc. The strength of these products can be increased by adding chemical admixtures and so on.

The case suggests that instead of dumping C&D waste, it can be processed to obtain recycled aggregate and used in the construction of pavements etc. This may turn out to be economical as it will save cost, help us manage this waste (reuse instead of landfilling) and lead to sustainable development in construction industry.

CASE 2

Scenario 1:

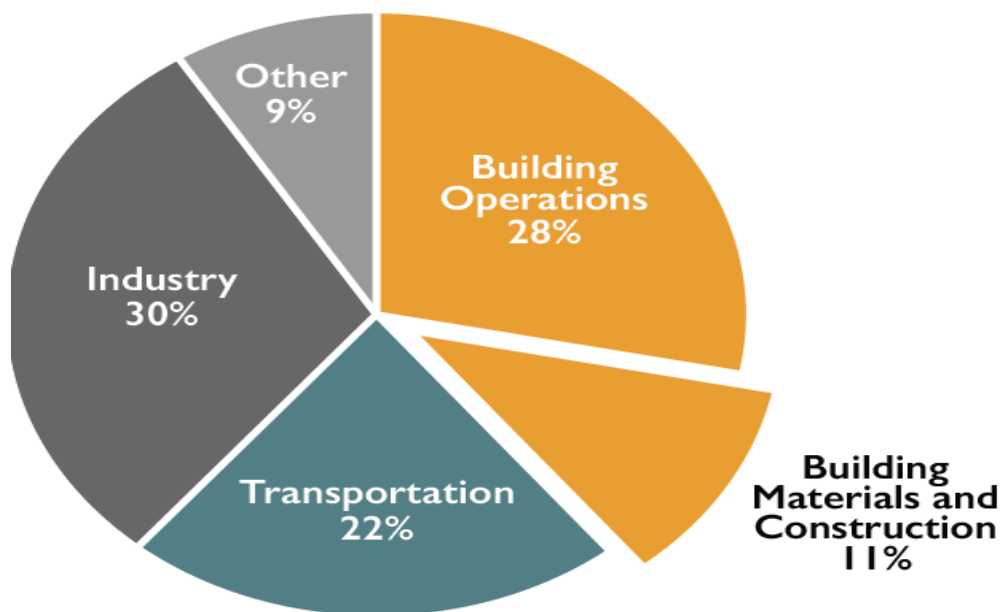
BaU is current waste management practise in the industry, where all the CW generated from the construction site (CS) is sent to the landfill without treatment. In general, landfilling is subjected to GHG emissions from transportation and machineries operation, landfill carbon storage, energy recovery, and CO₂ absorption in the CW in landfill. By adopting proper landfilling technique there will be 100 to 300 kg of CO₂ embodied for every cubic meter of concrete (170 to 500 lb per yd³) produced or approximately 5% to 13% of the weight of concrete produced, depending on the mix design.

Scenario 2

This is where CW is sent to the RP for recycling, produces CCA and to be reused as road base material in the RCS. CCA is the product output from RP and is produced through the processes of separation, crushing, and sieving of CW.

CCA is used to replace VA up to a certain percentage in RAC production. In scenario 2, it is assumed that 100 % of the CW is recyclable and reusable as road base material. Thus, the w amount of CW is assumed to have fulfilled the x amount of demand from the RCS ($w=x$). Recycling of CW diverted the CW from being dump to landfill. The replacement of VA with CCA as road base material likewise reduced the mining emissions of the x amount of VA needed in RCS. In this scenario, the AMQ supply only y amount of VA to the CBP, while the demand for RCS is fulfilled by recycling of CW.

Global CO₂ Emission by Sector



RESULTS:

From Scenario 1 and 2, it is observed that recycling process (scenario 2) is more efficient or reduces more amount of CO₂ than the landfilling (scenario 1) from the construction waste.

CONCLUSION:

The Pune City Council requires that construction waste be disposed of at legal landfills. However, very little construction waste was recorded there during the study. Illegal dumping was found to be a common practice. This scenario has the potential to cause significant health and environmental problems and decrease the value of nearby properties. The City Council faces many challenges to manage construction waste disposal. These include insufficiently stringent legislation, poor enforcement, inadequate facilities and collection network, low public awareness and lack of capacity. Improvements should begin with the revision of legislation to make it more stringent, with guidelines on safe disposal of construction waste.

LIMITATIONS:

The research is restricted to residential and non-residential sites mostly.

It is regional based on the usage within the country and considering the entire concrete usage scenario would be time-consuming.

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