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# Construction & Demolition waste The Way Forward

**India needs urgent intervention to protect its land, water, public space and environment from the egregious construction expected to explode with the urban boom**

### The Event

Construction and demolition – be it building materials, debris and rubble from construction, re-modelling, repair and demolition operation and disaster is dumped in our rivers, water bodies and open green spaces. Construction waste destroys recharge zone, fish habitat etc. About 70 per cent of the buildings that will stand in India in 2030 are yet to be built, this environmental cost will only compound with the anticipated

construction boom unless immediate steps are taken to recycle and reuse construction waste and turn it into a resource.

This came out strongly at the daylong conference on “Waste to Resource Addressing Construction and Demolition Waste in Cities” jointly organised by the Environment Pollution (Prevention and Control) Authority (EPCA) and Centre for Science and Environment (CSE) at India Habitat Centre in New Delhi

on 23rd December 2013. Key stakeholders include Union Urban Development Ministry, Bureau of Indian Standards (BIS), Central Building Research Institute, National Council for Cement and Building Materials, Building Materials and Technology Promotion Council, leading municipalities from Chandigarh, Vijayawada and East Delhi, experts and members of civil society.

According to CSE’s analysis, the generation of Construction and Demolition waste is grossly underestimated. In 2000, the Urban Development ministry had estimated that India generates about 10 to 12 million tonnes of Construction and Demolition waste annually. This was also mentioned in the environment ministry’s 2010 report. But CSE’s recent analysis of the new construction data puts the figure at a staggering 287 million tonnes of Construction and Demolition waste over the past eight years.

“India needs urgent intervention to protect its land, water, public space and environment from the egregious construction expected to explode with the urban boom,” said Sunita Narain, Director General of the Centre for Science and Environment (CSE).

“The country is running out of natural sand, which is used in construction, but we have to keep on with our building activity and for that a very good option would be using construction and demolition waste material,” Narain said.



### Step Towards Right Direction

- First, illegal mining must be stopped.
- Second, rules for legal and regulated mining of such minerals should be treated as critical. Plan the mining areas as clusters. Give clearance to certain minimum plot sizes and, most importantly, do cumulative and regional-level environmental impact assessments to estimate the hydro-geology of the stretch and the amount of sand that can be extracted from it sustainably. These extraction zones should be geo-referenced and carefully monitored.
- Thirdly, we need alternatives for sand and other natural aggregates in construction. If concrete is the second most consumed material after water as is said and Indians still use much less than global average, then we will only need more. We need new solutions.



Expressing concern over city dwellers' reluctance to have waste disposal plants near their houses, she said: "As cities are fast expanding, we would be confronted with a situation where there would be no outskirts where waste material can be dumped. People living in down market areas will start complaining about why people living in rich localities cannot take care of their waste material. Why can't we have well managed waste management plants, which can collect, store and dispose waste? In the new Master Plan, all zonal plans need to be revised."

Sunil Soni, Director General, Bureau of Indian Standard (BIS)

said, "Standards are not with us, it's only a conduit to those who are putting standards. Way back in 1999, a decentralised solution for debris management was promoted by the Youth for Unity and Voluntary Action (YUVA) in Navi Mumbai and was support by City and Industrial Development Corporation (CIDCO). The collaboration led to the recycling of over 1,500 tonnes of waste during 2002-06. But the CIDCO- YUVA Building Centre (CYBC) was forced to shut down in 2012 as it failed to receive policy or market support. This initiative was into making building blocks, which were only recycled materials, which lacked properties."

While making a presentation, VV Arora, Joint Director, National Council for Cement & Building Materials, explained, "Construction and Demolition (C&D) waste can be recycled to make coarse and fine aggregate (sand) for selective use in concrete. Air voids and Water absorption is high in recycled C&D waste aggregates. Large variations in this type of wastes, needs to be carefully segregated before processing for effective utilisation."

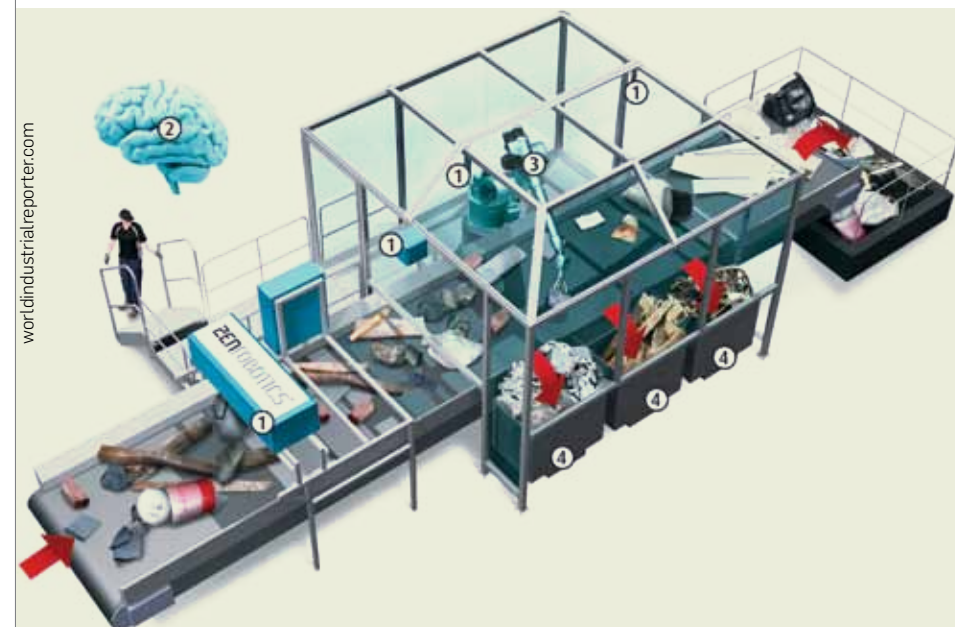
Most municipalities are overwhelmed by the crisis. "The municipality in Vijayawada, for instance, may not have a high burden but has still imposed a "debris charge" on builders to minimise the debris produced," said C Hari Kiran, Commissioner, Vijayawada Municipal Corporation." Whereas in Chandigarh people living in the city were conscious to make judicious use of the waste as Rock Garden in the city was created out of the waste. The construction & demolition waste generated out of it is taken away by the 'rehriwallas' (peddler) and dumped on the roadside. CPWD needs to take initiative for stopping the dumping of the cities, said Vivek Pratap Singh, Commissioner, Municipal Corporation Chandigarh.

Pradeep Khandelwal, superintending engineer, East Delhi Municipal Corporation, says they were initially trying to collect the waste and dump it in landfills. "The quantity exceeded their capacity and people started using low-lying areas and the roadside as dumping grounds. The waste has to be segregated and crushed for reuse. Collection centres are needed in every ward. Even so, there are no provisions for Construction and Demolition waste management in the municipal solid waste management rules, which makes it difficult for municipalities to take any measures

Also, there is no standard for the quality of waste that can be used safely for new constructions. Only a few experimental projects in different



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**“Houses which have rainwater harvesting save the cost for municipalities. Similarly, we need to have a methodology for identifying a green building. The green certificate should be given after people have started residing in these building. The certificate would point how much electricity and water is being used in the building.”**

parts of the country indicate that such reuse can be scaled up. Architect Surya Kakani has built a school in Rajkot by reusing rubble, flyash from a thermal plant as well as the thermocol discarded by industry. He has also used burnt rice husk along with fly ash and cement in another building. “Such combinations make the material very light and provide great insulation. The structures are strong as well,” said Kakani.

In Delhi, the corporation, along with, IL & FS Environment Infrastructure and Services, a leading company in waste management has taken up a project at Burari to demonstrate the potential of recycling Construction and Demolition waste. It’s collecting 500 tonnes every day from three locations, including Karol Bagh and Sadar Paharganj, and recycling it into pavement blocks, kerb stones and concrete bricks. Said N.B. Mazumdar, Chief Technical Advisor, IL and FS Environment Infrastructure and Services, “Standards (for building)

should be changed with time as new building norms are coming up.”

CSE head Sunita Narain pointed that a huge amount of waste from natural disasters like Uttarakhand floods and Bhuj earthquake is lying unused. Experts at the meeting suggested that the government notify standards for C and D waste immediately, implement onsite waste segregation, impose waste tax or charge for minimizing waste generation, and make provisions in Municipal Solid Waste (Management and Handling) Rules (MSW rules) 2013 for reuse and management of C and D waste.

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started residing in these building. The certificate would point how much electricity and water is being used in the building.”

Pointing out that natural resources are limited, Environment Pollution (Prevention and Control) Authority chairman Bhure Lal said builders need to realise that land cannot be created and they need to ponder from where they would “procure resources for building residential complexes”.

### Waste Choking Indian Cities

Centre for Science & Environment (CSE) analysis states that there is global evidence that Construction & Demolition (C&D) waste can be recycled and reused to large extent in the construction process itself and environmental degradation and pressure on land can be minimised.

Mature technologies are also available. Even in India, small steps have been taken to start this process but on a very limited scale in Delhi and Mumbai.

Delhi is estimated to generate about 4600 tonnes per day (TPD) of C&D waste. In collaboration with the Municipal Corporation of Delhi (MCD), a pilot project has been developed by IL&FS Environmental Infrastructure & Services Ltd (IEISL) to demonstrate the potential of collection and recycling of C&D waste at Burari in Delhi.

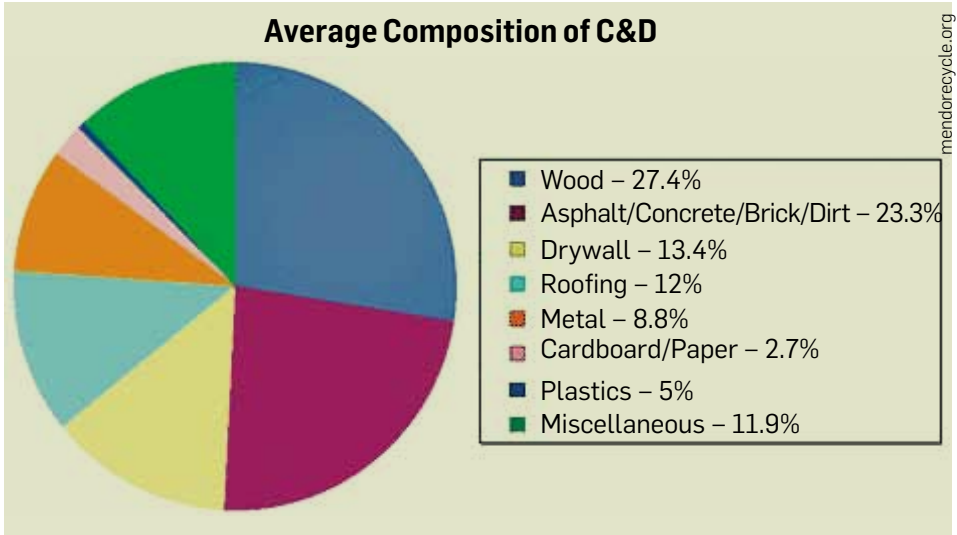
IEISL is collecting 500 TPD of C&D waste from three designated zones of the Delhi such as Karol Bagh, Sadar Paharganj Zone and City. This is recycled into aggregates which are converted to Ready Mix Concrete (RMC), pavement blocks, kerb stones and concrete bricks. The products have been tested in various laboratories and found to be suitable for the specific purposes. These products are being sold. Due to the heterogeneous nature of the incoming C&D waste, IEISL had to constantly fine tune the production process as well as the technology adopted for recycling. IEISL collected approximately 4.5 lakhs tonnes of C&D waste during 2010-12.

However, the products manufactured by the recycling plant are finding no takers due to lack of information and the absence of Indian Standards.

### Policy Roadblocks

Recycling and reuse of C&D waste has remained limited in scope and economically nonviable in India because of a policy muddle.

There are extremely weak national laws on C&D waste. C&D waste finds a brief mention in the Schedule III of the rule for separate collection in the Municipal Solid Waste (Management and Handling) (MSWM) Rules, 2000. This is extremely inadequate and needs immediate amendment.



Additionally there is only a “Manual on Municipal Solid Waste Management” of the Union Ministry of Urban Development, 2000 that includes a chapter on C&D waste, that gives basic guideline on its handling

The Working Sub-Group on Construction & Demolition Waste was constituted by the Union Ministry of Environment & Forests (MoEF) committee to evolve a roadmap for management of solid waste. It recommended in 2010 it is necessary to generate data on C&D Waste, segregate C&D waste at source, develop institutional mechanisms for waste collection, reuse and reprocess, impose charges on C&D waste generators, formulate standards for C&D waste, amend Municipal Solid Waste Management Rules (MSWM) Rules, 2000 to address the C&D waste for its

collection, utilisation and safe disposal. However, these recommendations are ignored in the draft Municipal Solid Waste Management Rules of 2013 by the MoEF.

There is no legal framework for reuse of C&D waste. Though a number of innovative cost-effective recycled building materials, components and construction techniques have been developed through extensive research and are available in market, the Indian housing and building agencies have not adopted them in their construction practices because of policy hurdles. Lack of standardisation, not listing these techniques and material in Indian Standard Codes and/or Schedule of Rates, poor policy push and lack of awareness are the key barriers.

Indian laws permit use of only “naturally sourced” building material.



The IS: 323-1970, Indian standard specification related to aggregates for concrete states that these should be from natural sources or as it states “naturally sourced”. Thus only virgin materials (sand, aggregate) mined directly from nature can be used. This does not allow the use of recycled or reused components. Thus, any use of recycled aggregate becomes illegal’. The daylong conference called for urgent amendment of the standard.

Use of alternative material is possible based on studies by designated authorities. There are other avenues to absorb these alternative products. For instance, the BMTPC, an apex body that promotes development and use of innovative building materials and technologies, has an innovative scheme called Performance Appraisal Certification Scheme (PACS). The products manufactured using recycled waste can be certified for use under this scheme. . The notification by the Union Ministry of urban development & poverty alleviation under PACS notes that any new product, system or technique not covered so far by BIS Code may be certified after detailed evaluation. It has used its power to certify new construction material based on scientific studies, as in the case of products made out of bamboo.

Leverage technical studies of designated agencies need to be speed up certification. For standardisation of alternative material, BIS requires designated agencies like CBRI, Central Road Research Institute (CRRI), NCCBM, etc to carry out studies according to their criteria to assess suitability of the material. Such studies have been carried out but these have not yet led to policy action. For instance, CBRI research has advanced to establish compliance with the IS codes. Other premium institutions like IITs have also carried our research and found recycled material fall within the range of IS norms. According to CSE experts, it is

important to leverage these findings quickly and develop a roadmap for use of recycled material.

Exploring revision of schedule of rates of material for procurement by state construction agencies for facilitate the uptake of recycled material. There is precedence of use of alternative new material like insulation products, by including them in the schedule of rates of products of the user agencies, based on the available test studies of other non-government agencies. In this manner Central Public Works Department (CPWD) has adopted new insulation material based on an available study. This was done as no BIS standard was available. It is important to explore to what extent it is possible to adopt such a mechanism for recycled material for non- structural construction.

There is a precedent set by the induction of exception clauses for the use of fly ash during the manufacturing

of building materials. Though this process took almost 30 years, it has greatly benefited the environment. According to CSE, adoption for recycled C&D waste will have to be done quicker and it is essential to find a quick legal solution.

There is a need for proactive municipal action in cities. There is enormous scope for the municipalities to play a proactive role. For instance, the Solid Waste management cell of Government of Maharashtra has included C&D waste in their action plan. The plan includes a provision on separate collection of debris and bulk waste.

Each city needs to have its own system for collection and disposal of waste from bulk waste producers and construction debris.

### Global Practices

Globally cities have employed the legal process to maximise reuse of

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WASHED RECYCLED 10mm WASHED RECYCLED 20mm WASHED RECYCLED 40mm WASHED RECYCLED Sand

C&D waste in construction.

- Hong Kong which has serious land constraints and therefore cannot afford landfills has very stringent controls over C&D waste. Hong Kong imposes construction waste charge on developers. The system has lowered the quantity of C&D waste needing disposal at landfill by 60 per cent.
- Rates have been structured to incentivise on-site recycling and reuse. 100 per cent waste utilisation is charged at \$27 (HKD) per tonne while more than 50 per cent waste needing landfill disposal is charged at \$125 per tonne. Revenue generated is used to maintain and subsidise C&D waste recycling centres. This has created incentives for reuse and also for very efficient construction practices that minimise the generation of construction debris. Instead of demolishing structures, they dismantle systematically.

It also offers tax concession to the C&D recycling centres.

- Singapore yet another land constrained country that recycles 98 per cent of its C&D waste.
- South Korea has one of the most extensive and the oldest recycling policy for C&D waste. C&D waste management is part of their Low Carbon Green Growth strategies. The country has a law on Acceleration of C&D waste reuse/recycling 2005 that provides for step-by-step demolition, utilisation of recycled aggregates. They have adopted separate building codes for recycled asphalt concrete aggregates, recycled concrete aggregates, and road pavements. The Architectural Institute of Korea Standard Building Construction Specifications recommends increased use of recycled C&D material. Effective recycling rate in Korea is 36 per cent with a target of increasing this to 45 per cent by 2016.

- In the European Union there are clear rules regarding the use of recycled material in buildings. EU 2004 regulations in the form of European Standards for Aggregates explicitly provides for “aggregates from natural, recycled, and manufactured material”. It focuses on fitness of use and does not discriminate between resources. While it is not used in the structural and foundation frame, but are extensively used in non-structural frameworks. Some member countries have reported that over 20 per cent of their national consumption is from recycled material.
- United Kingdom: The Northern Ireland Environment Agency has published “The Quality Protocol for the Production of Aggregates from Inert Waste in 2004”. This helped promote use of recycled and secondary aggregates. Almost 280 million tonnes of aggregates are used every year which is 28 per cent of the C&D waste.
- In the US, New York City has stringent measures for C&D waste as it is land locked and has limited space for its disposal. Its disposal practices are more efficient than the rest of the US. It forces the developers to segregate waste at site, dismantle and not demolish in addition to other measures.

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In fact the review of the global best practice by the MoEF appointed committee in 2010 shows that in Scotland about 63 per cent was recycled in 2000. Denmark and Netherlands have an aggressive strategy to reuse C&D waste. The Netherlands has found that 80 per cent of its C&D waste is bricks and concrete that can be recycled to minimise pressure on land.

In Japan, way back in 2000, about 95 per cent of waste concrete was crushed and reused as roadbed and backfilling material, 98 per cent of asphalt and concrete and 35 per cent of sludge was recycled.

Even though legal reform is taking long in India, several creative architects have taken steps to reuse waste in their buildings. For instance, there is the example of a school building in Rajkot designed by Ahmedabad based architect Surya Kakani that has been built from the debris of Bhuj earthquake. The Institute of Rural Research and Development (IRRAD) building in Gurgaon has innovatively recycled and utilised its own construction waste in the building itself. But these are limited steps and CSE recommends that they will have to be encouraged with policy and fiscal support.

This is particularly relevant for the infrastructure necessary for development like roads, flyovers, pavements, etc. In fact, the attempt to use recycled material from the Burari centre in New Delhi during the Commonwealth Games faced opposition as these materials are not backed by standards as yet. This mindset will have to change urgently. Globally, the strength these materials has been proven, it meets other requirements and is being used extensively. There is no reason why India cannot follow suit.

### The Sand Saga

The rampant illegal sand mining has to be curtailed and a strong Regulation must be in place. Sand removal has always been done to de-silt rivers and channelize the flow. But never in this rapacious manner is the river literally wiped clean from the bottom. As a result, the crucial recharge zone think of it as a sponge that holds water and slowly seeps it out into the surrounding for use is destroyed. The river is hollowed out, its ecology disturbed and fish habitats damaged. Removal of sand, therefore, needs to be assessed for environmental damage, restricted and carefully regulated. **BE**

Tarun Kanti Bose

### Way Forward in India

- Bureau of Indian Standard code to include both “naturally sourced” as well as recycled material has to be amended. The terminology “naturally sourced” needs to change to include recycled material as well. The precedent has already been set up by induction of exception clauses for fly ash usage into manufacturing of building materials. Research and development is already in advanced stages in nation's premier institutes. These researches should be leveraged quickly to formulate standards and hasten the process.
- Alternative materials in buildings need to be promoted. In the interim, devise BMTPC's innovative scheme such as PACS that allows new product, system or technique related to housing/building not covered so far by BIS to be certified after detailed evaluation. Construction agency or authority may include a material in their schedule of rates if backed by a test study based on BIS criteria. Promote alternative material for non structural use as an interim measure till the time standards are in place.
- CPWD SOR to include products made out of recycled C&D waste need to be revised. Using publicly available scientific study by premium institutes like Indian Institute of Technology - Kanpur CPWD should revise its SOR to allow use of products like paver blocks and flooring tiles made out of recycled C&D waste immediately. This will ensure market development for the recycled products making it economically viable for recyclers and reduce subsidy burden on civic bodies.
- There has to be explicit provision on collection, disposal, and reuse of C&D waste in the draft Municipal Solid Waste and Management Rules of 2013, which need to be included.
- Efficient construction management practices to minimise waste needs to be promoted. National regulations and municipal rules need to push for optimised use of building space and materials, waste prevention, use of recycled content, on-site segregation, collection and disposal system. BIS is currently developing Indian Standard Guidelines for Construction Project Management. The process for implementation needs to be expedited.
- Using alternative material in other infrastructure has to be promoted. Experiments by CRRI have shown that it is possible to use C&D waste for road and embankment construction and pavements. This must be included in the roadmap of all infrastructure construction agencies.
- The system and infrastructure for collection and disposal of C&D waste and recycling centres with appropriate technologies has to be put in place.
- There is need for tax policies for waste generation and reuse to minimise waste and prevent unsafe disposal. Introduce taxation for waste generation to create incentive for waste minimisation.

India needs urgent intervention to protect its land, water, public space and environment from the egregious construction expected to explode with the urban boom. Policy delay is no longer an option.