Air Quality Management: Building Strategies for Clean Air for Andhra Pradesh Cities
C&D Waste and **Construction Dust**
June 11, 2019

Procedures and approaches to minimize emissions from construction

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Centre for Science and Environment

https://timesofindia.indiatimes.com/photo/msid-58038310/58038310.jpg?772187

Construction & Demolition (C&D) waste means "the waste comprising of building material, debris and rubble resulting construction, re-modeling, repair and demolition of any civil structure"

Construction and Demolition Waste Management Rules, 2016

Why is this a concern?

CONCERNS

- C&D waste is routinely dumped in open drains and water channels, clogging them and leading to urban flooding during rains.
- Dumping of C&D waste in wetlands, water channels and riverbeds disrupts the hydrology and destroys the aquatic ecosystem.
- Leachate and fine chemical particles from C&D waste degrade the soil, leading to land and groundwater pollution. Especially hazardous components include paints, oil and asbestos sheets.
- C&D waste is filling up existing landfills and dump-yards, resulting in the need for more landfills or alternative dumpsites.
- C&D waste usually gets mixed up with other municipal solid waste during the process of transfer or at the collection site. Once mixed, it makes composting and/or recycling of MSW highly difficult.
- C&D waste includes hazardous substances such as sharps, broken glass, boulders, broken wooden logs, rusted metal, broken ceramics, etc., which create a hazardous environment when dumped on unfenced open places.
- C&D waste dumped on streets and footpaths blocks traffic and pedestrians, frequently contributing to traffic congestion and even accidents.
- C&D waste is one of the primary sources of fugitive dust pollution.

Severing our water bodies

1. Pattinapakkam Beach

2. Yamuna, Delhi

6. Keelkattalai Lake, Chennai

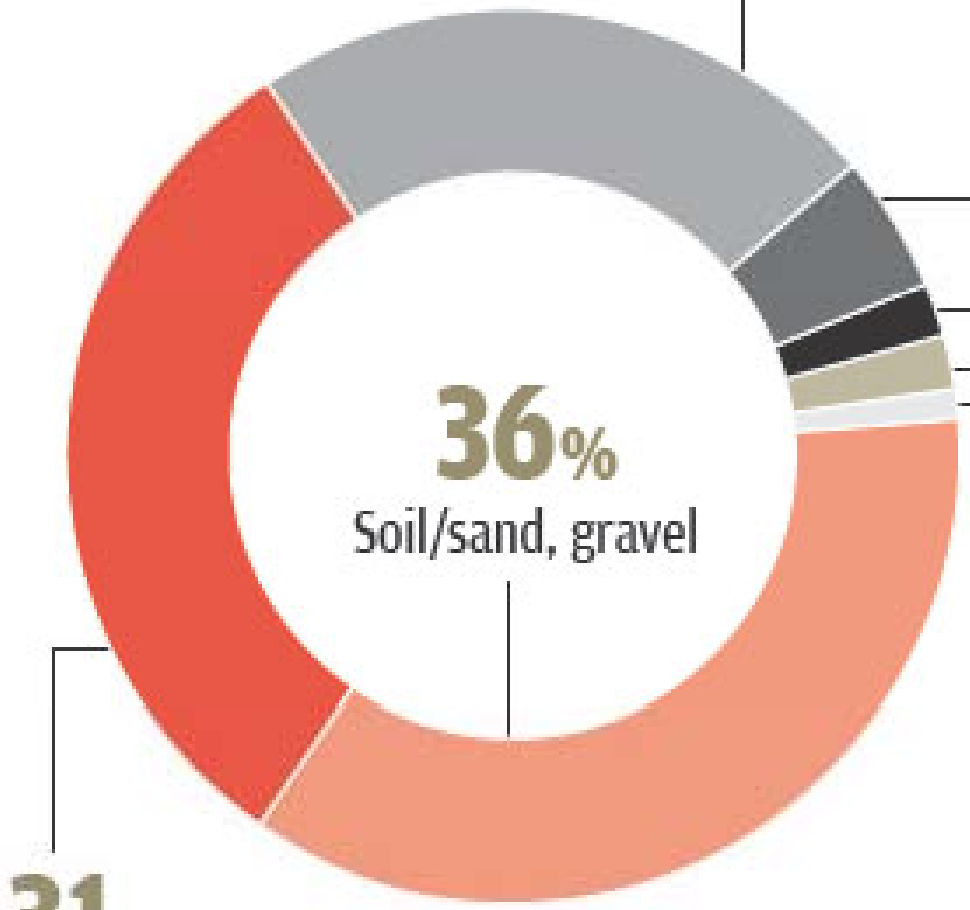
3. Ram Nadi, Pune

4. Mangroves, Navi Mumbai

7. Coimbatore

5. NRI Complex, Mumbai

Composition of construction and demolition waste in India as per Technology Information, Forecasting and Assessment Council



23%
Concrete

5%
Metals

2%
Bitumen

2%
Wood

1%
Others

36%
Soil/sand, gravel

31%
Masonry/brick

Sand Mining
It is killing our rivers twice

As waste lies waste...
nature is devasted to support urban boom

Sand mining triggers debate

2012:Supreme Court order on stronger regulations for minor minerals

2013: National Green Tribunal declared sand mining with environmental clearance illegal.

Union Ministry of Housing and Urban poverty alleviation alerted
Rajya Sabha in 2012 about the shortage of building material especially aggregates. Holding up housing and civic infrastructure projects…

Need substitutes and strategies to reduce stress on naturally sourced material

But,
How big is the waste problem?

“No estimates or even guesstimates exist for construction and demolition waste” in the country

Comptroller and Auditor General of India 2008

No one really knows

Year	Authority/Institute	Estimate (million tonnes)
2000	Ministry of Urban Development	10-12
2001	Technology Information, Forecasting and Assessment Council , Department of Science and Technology	12-15
2010	Ministry of Environment and Forest	10-12
2013	Centre for Science and Environment	530
2014	Ministry of Urban Development	No estimates exist
2015	Ministry of Urban Development	10-12
2015	Development Alternative and GIZ	750
2016	Ministry of Environment, Forest and Climate Change	530
2017	Building Material and Technology Promotion Council	150

GUESSING the ESTIMATES

According to TIFAC estimates:
New construction generates about 40-60 kg per sqm of build up area

Repair and renovation of existing buildings generates 40-50 kg per sqm

Demolition of buildings generate 300-500 kg per sqm

Mckinsey estimates for trend in built up area in India

Based on these CSE guesstimated:

Indian buildings in 2013 have generated more than **530 million tonnes** – 44 times more than official estimates. More than other solid wastes

Additionally astounding amount of waste is generated from infrastructure projects – roads, flyovers, bridges etc

Small steps to make resource from waste

C&D waste can be recycled and reused in construction and minimize environmental degradation and pressure on land. Matured technologies are available.

Small steps in Delhi and Mumbai:

MCD-ILFS-IEISL initiative in Delhi

C&D waste is being recycled into aggregates which are converted to Ready Mix Concrete, pavement blocks, kerb stones and concrete bricks.

YUVA and CIDCO initiative in Navi Mumbai

This has recycled 1500 tonnes of C&D waste between 2002-06. But operations shut down as no policy and market support

Types of recycling plants

In **the Mobile C&D waste recycling plant** , the material is crushed and screened and ferrous impurities are separated through magnetic separation. The plant is transported to the demolition site itself and is suited to process only non contaminated concrete or masonry waste.

In **the semi-mobile C&D waste recycling plant**, removal of contaminants is carried out manually and the end product is also screened. Magnetic separation for removal of ferrous material is carried out. End product quality is better than that of a Mobile unit. These plants are not capable to process a of mixed demolition waste containing matter like metal, wood, plastic, etc.

Stationary C&D waste recycling plants are equipped for carrying out crushing, screening as well as purification to separate the contaminants. (ex. the 1st C&D waste processing facility commissioned in Delhi in Burari and operated by IL&FS)

Materials recovered from C&D

Mixed Waste

Concrete Waste

Recycled Aggregate (RA)

Sand Substitute Aggregate -3mm

Recycled Concrete Aggregate (RCA)

Aggregate 10-20 mm

Aggregate 3-10 mm

Aggregate 3-10 mm

Aggregate 10-20 mm


Pavement Blocks and Kerbstones
CSE
No takers

What was coming in the way?

Indian standards used to permit only 'naturally sourced' material

No legal framework

Municipal Solid Waste (Management and Handling) Rules 2000 only made a brief mention of C&D waste without laying down any guidelines for its management.

No standards for recycled products

The BIS allows use of non-natural materials to be used for construction but doesn't have any specific standard for recycled material, leading to major confusion among various agencies and developers. Most are abstaining from using recycled waste citing Indian standard specification related to aggregates for concrete state that these should be '*naturally sourced*'.

-- Only virgin materials (sand, aggregate) mined directly from nature can be used. This does not allow recycled or reused components

-- Any use of recycled aggregate become 'illegal'

State construction agencies could not include these material in their Schedule of Rates

2016 Amendment of IS:383

Coarse and Fine Aggregate for Concrete

(*Clause* 4.2.1)

		Maximum utilization in		
		Plain Concrete	Reinforced Concrete	Lean Concrete (less than M15 grade)
1) Coarse Aggregate				
i)	Iron slag aggregate	50%	25%	100%
ii)	Steel slag aggregate	25%	Nil	100%
iii)	Recycled concrete aggregate (RCA) (See Note 1)	25%	20% (only upto M20 grade)	100%
iv)	Recycled aggregate (RA)	nil	nil	100%
2) Fine Aggregate				
i)	Iron slag aggregate	50%	25%	100%
ii)	Steel slag aggregate	25%	nil	100%
iii)	Copper slag aggregate	40%	25%	50%
iv)	Recycled concrete aggregate (RCA) (See Note 1)	25%	20% (only upto M20 grade)	100%

National Building Code of India 2016

Part 11 of NBC 2016 on 'Approach to Sustainability', states that :

a. Recycled Coarse Aggregate may be used in concrete for bulk fills, bank protection, base/fill of drainage structures, pavements, sidewalks, kerbs and gutters etc.

b. Up to 30 percent of natural crushed coarse aggregate can be replaced by the recycled concrete aggregate

c. This percentage can be increased up to 50 percent for pavements and other areas which are under pure compression

Further support

Exemption from the compliance of norms (Schedule I (14))

The following are exempted from the norms of pollution from dust and noise as mentioned above:

a. For construction work, where at least 80 percent construction and demolition waste is recycled or

b. reused in-situ and sufficient buffer area is available to protect the surrounding habitation from any adverse impact.

Construction and Demolition Waste Management Rules, 2016

This was urgently needed as cities are choking on construction and demolition waste with serious environmental and public health consequences

The next step is to create a clear mechanism for stringent and scaled-up implementation in cities for improved collection, segregation and handling of waste; decentralised collection and recycling centres; penalty for littering; lower taxes on recycled products and public awareness

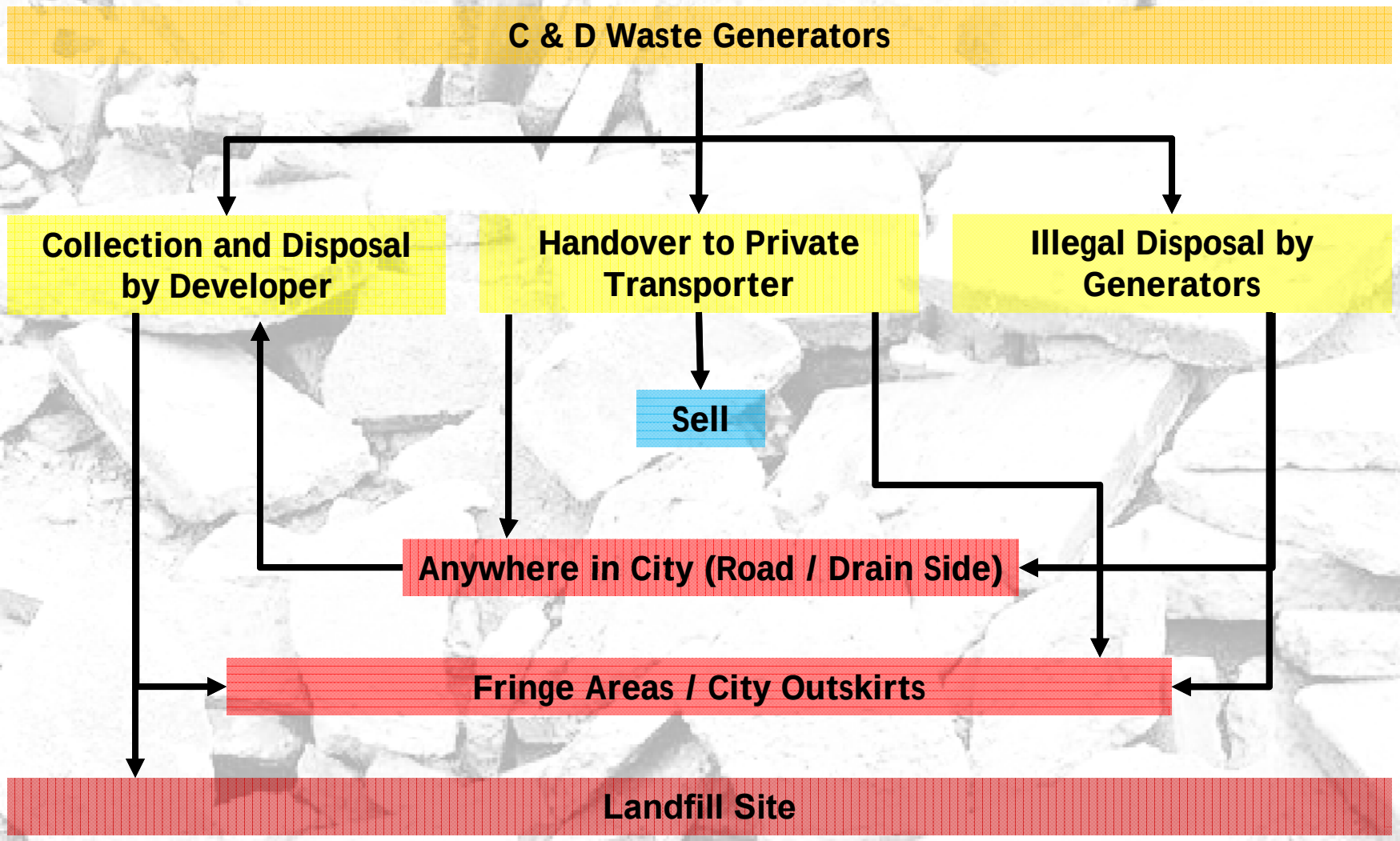
Make developers responsible and accountable for good construction practices, onsite segregation of waste, reuse and disposal; and impose waste tax to minimize waste-generation.

The key highlights of the new C&D Rules

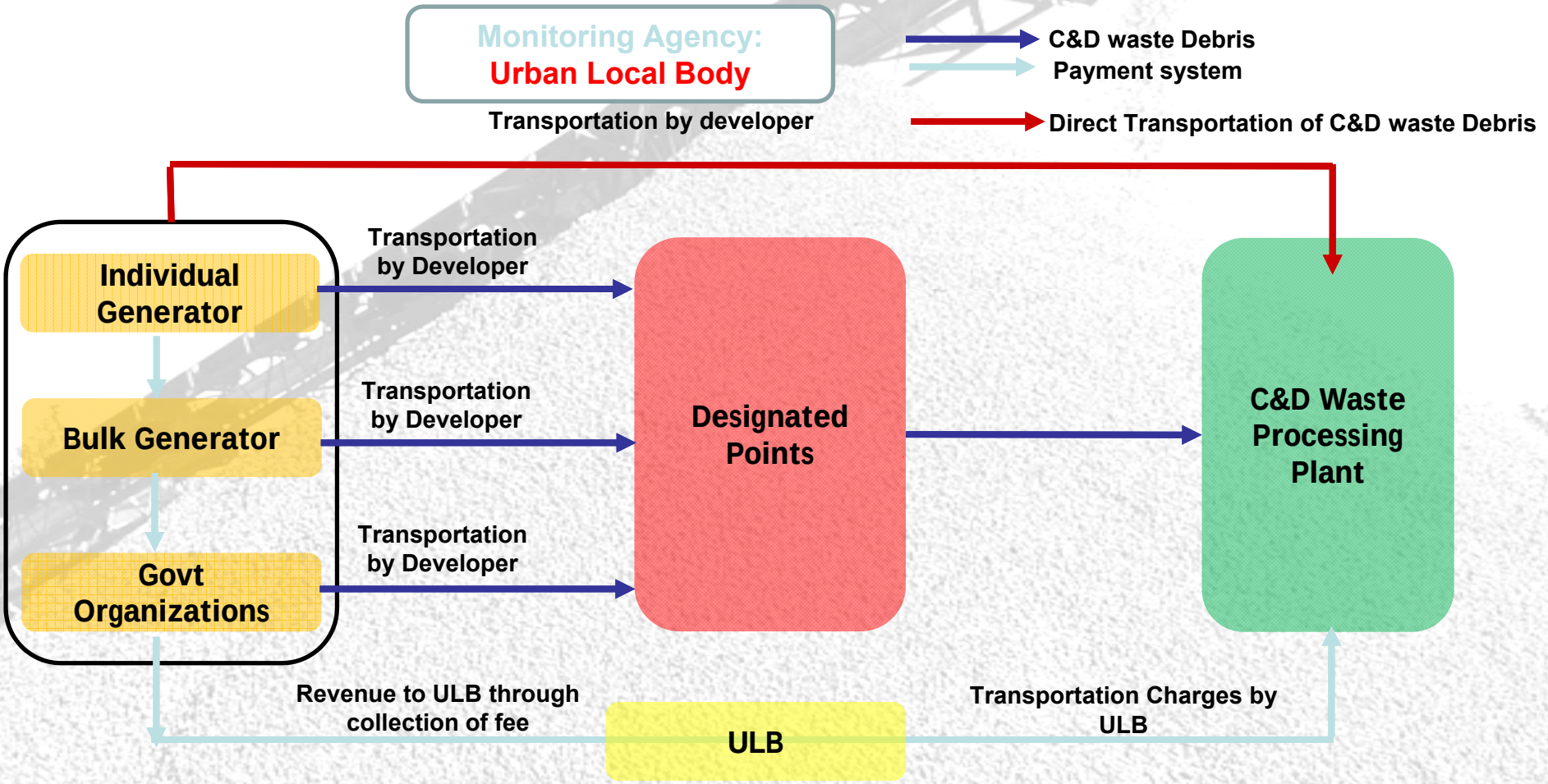
The key highlights of the new notification on C&D waste:

- **Mandates use of recycled of products in construction,** Local bodies will have to utilise 10-20 per cent of material from C&D waste in municipal and government contracts for construction
- **All large developers are accountable for collection and disposal of C&D waste**
- **The Bureau of Indian Standards needs to prepare a code of practice and standards for products of construction and demolition waste**
- **Indian Road Congress needs to prepare standards and practices pertaining to products of construction and demolition waste in road construction**
- **Local authorities to give appropriate incentives to waste generators for salvaging, processing, and recycling, preferably in-situ**
- **Recycling facilities will have to be created at a safe distance from habitation with adequate buffer zone**
- **Local authorities to established a database and update it once in a year**

Current Scenario

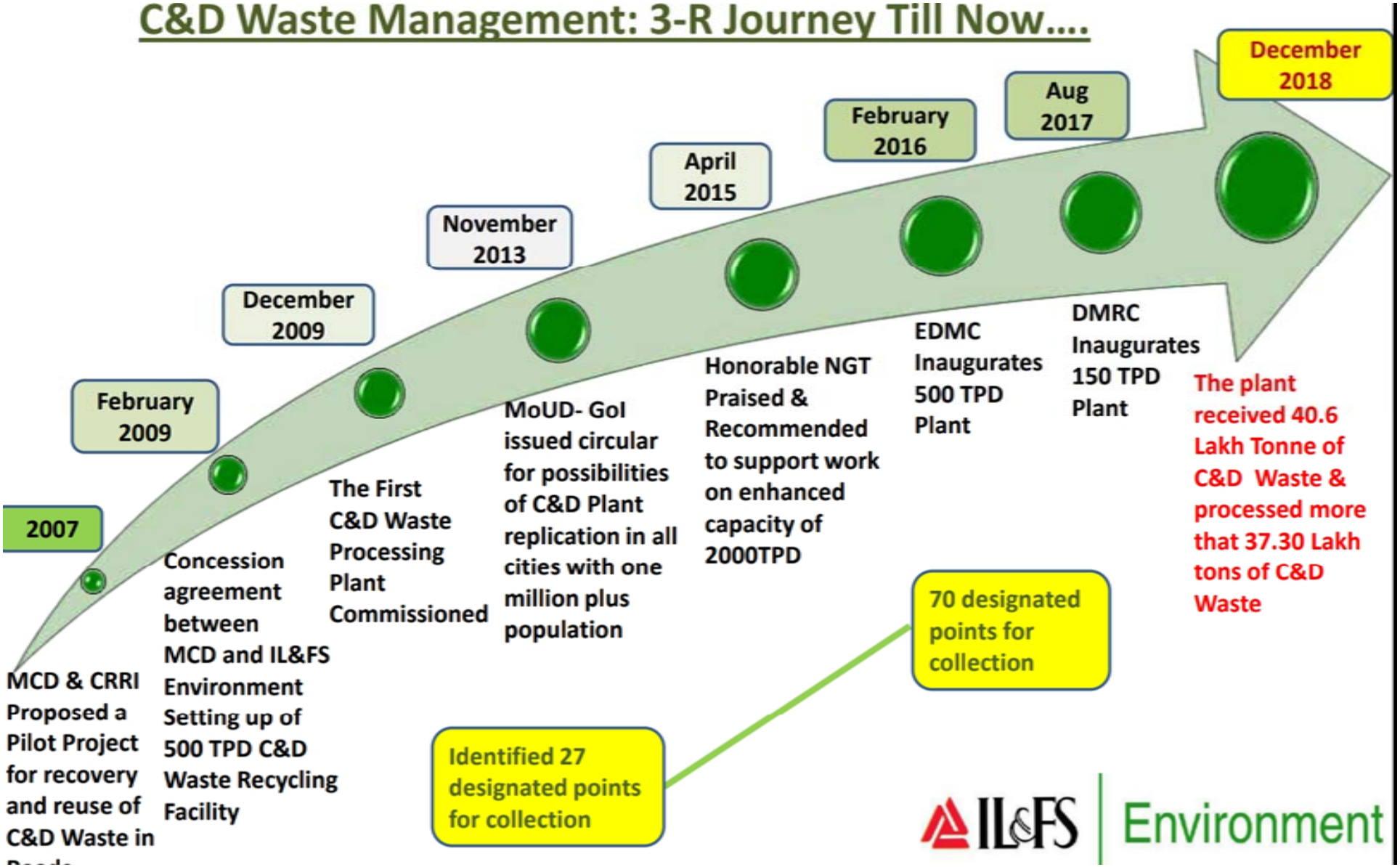


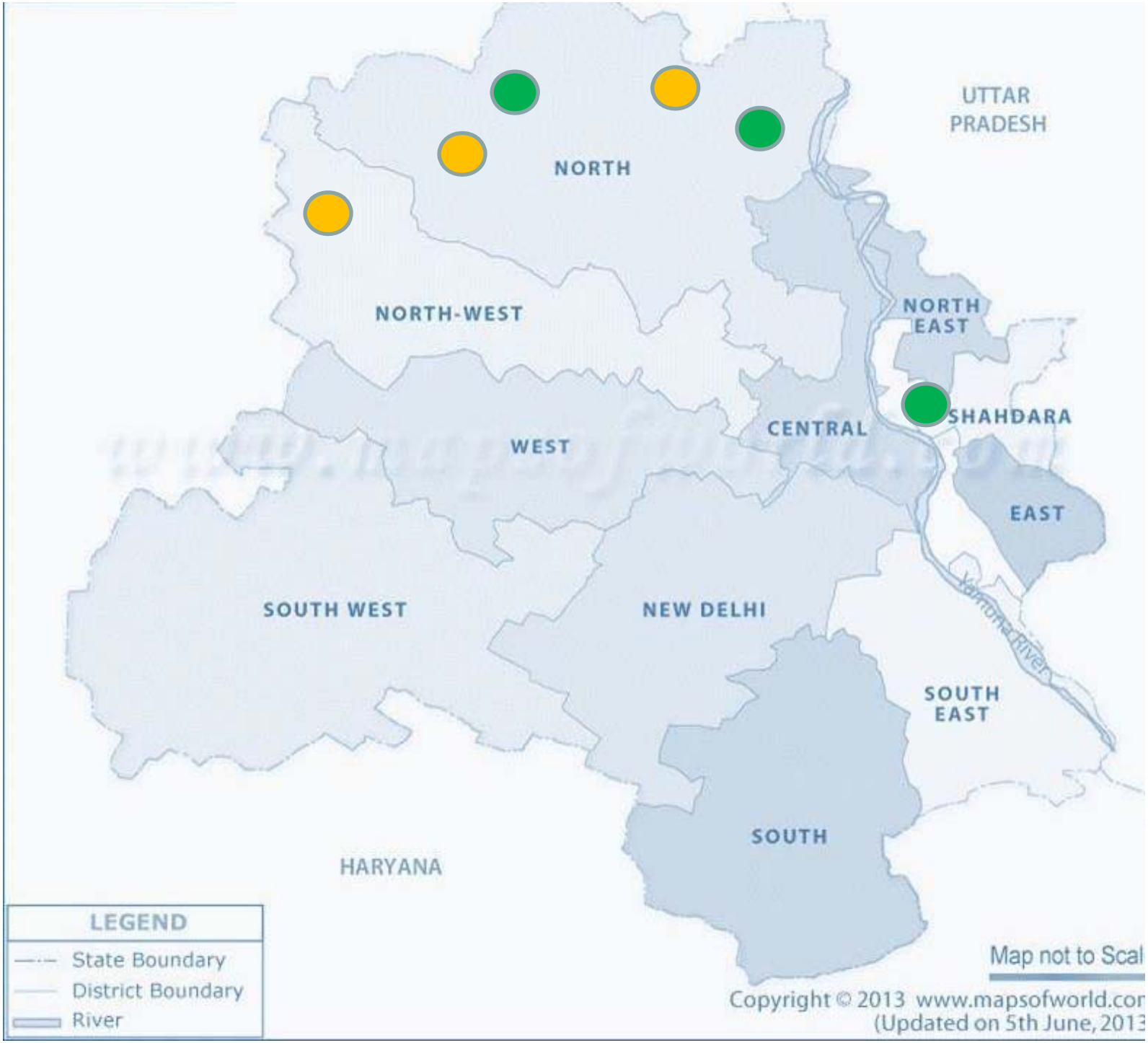
Proposed Scenario



So far

C&D Waste Management: 3-R Journey Till Now....




UTTAR PRADESH
NORTH
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NEW DELHI
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SOUTH
HARYANA
LEGEND
State Boundary
District Boundary
River
Map not to Scal
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(Updated on 5th June, 2013

CSE

So far

So far

CPWD has started **using recycled C&D waste** – the Supreme Court extension has exclusively used recycled C&D waste blocks. Total 1.8 million blocks are used.

The National Buildings Construction Corporation Ltd. also **recycled all the C&D waste** it generated in Government of India's mega redevelopment of East Kidwai Nagar in New Delhi

All Delhi government agencies will be required to incorporate a clause in their tenders that mandate use of a minimum of two per cent recycled products from construction waste in all future contracts for building works and **10 per cent recycled products** for road works. It expects the urban local bodies to **mandate 5 per cent** use of such products for non-structural applications while examining and approving building plans

Global best practices

Hong Kong

C&D waste tax on developers lowers C&D waste at landfill by 60%. 100% waste utilisation is charged at $27 per tonne. More than 50% waste needing landfill disposal is charged at $125 per tonne. Revenue is used to subsidise recycling centres. Promoted efficient construction practices.

Singapore

Recycles 98 per cent of its C&D waste.

South Korea

C&D waste management part of Low Carbon Green Growth strategies. Have separate building codes for recycled asphalt concrete aggregates , recycled concrete aggregates, and road pavements. Effective recycling rate is 36% with a target of 45% by 2016.

European Union

EU 2004 regulations for Aggregates provides for "*aggregates from natural, recycled, and manufactured material*". Some member countries report over 20% recycled material use.

International Best Practice

London Olympic 2012 Stadium used **30% Recycled concrete** in its construction

Indian Best Practice

Supreme Court Extension Project used **1.8 million Recycled C&D waste blocks**

Deconstruct

Deconstruction

livemint

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Delhi's air quality has been oscillating between 'poor' and 'very poor' and severe category over the past one month.

CPCB for ban on construction activities in pollution 'hotspot' if Delhi air quality turns severe

1 min read . Updated: 22 Nov 2018, 08:01 PM IST

PTI

MIRRORNOWNEWS.COM

On Friday the advisory recommended people to avoid strenuous physical activity such as running and jogging during the November 1-10 period.

New Delhi: After the air quality deteriorated to 'severe' category, the environment officials announced a blanket ban on construction and excavation work across the national capital region on Saturday. Accessing the gravity of situation the government has mentioned that the officials who will fail to stop such activities will face criminal prosecution.

hindustantimes

Ban on construction work in Delhi-NCR till Nov 10 to combat pollution, violators to face action

At least 34% of Delhi's PM2.5 pollution during winter is generated by local sources, a recent study by The Energy and Resources Institute (TERI) has found.

Environment officials announced a complete ban on construction and excavation work across the national capital region on Saturday. (AP File Photo)

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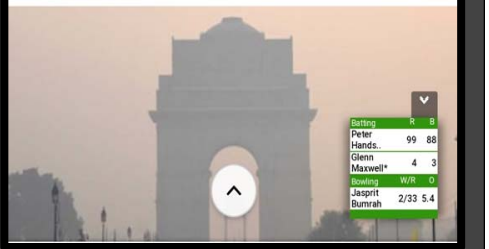
Delhi Air Quality 'Severe', Environment Body Orders Ban On Construction

Delhi | Press Trust of India

The order includes halt of all construction activities involving excavation, civil construction to remain closed in Delhi and other NCR districts from November 1-10, closure of all stone crushers, hot mix plants generating dust pollution in Delhi and NCR districts from November 1-10.

Updated : October 30, 2018 20:38 IST



Directions from the Hon'ble National Green Tribunal

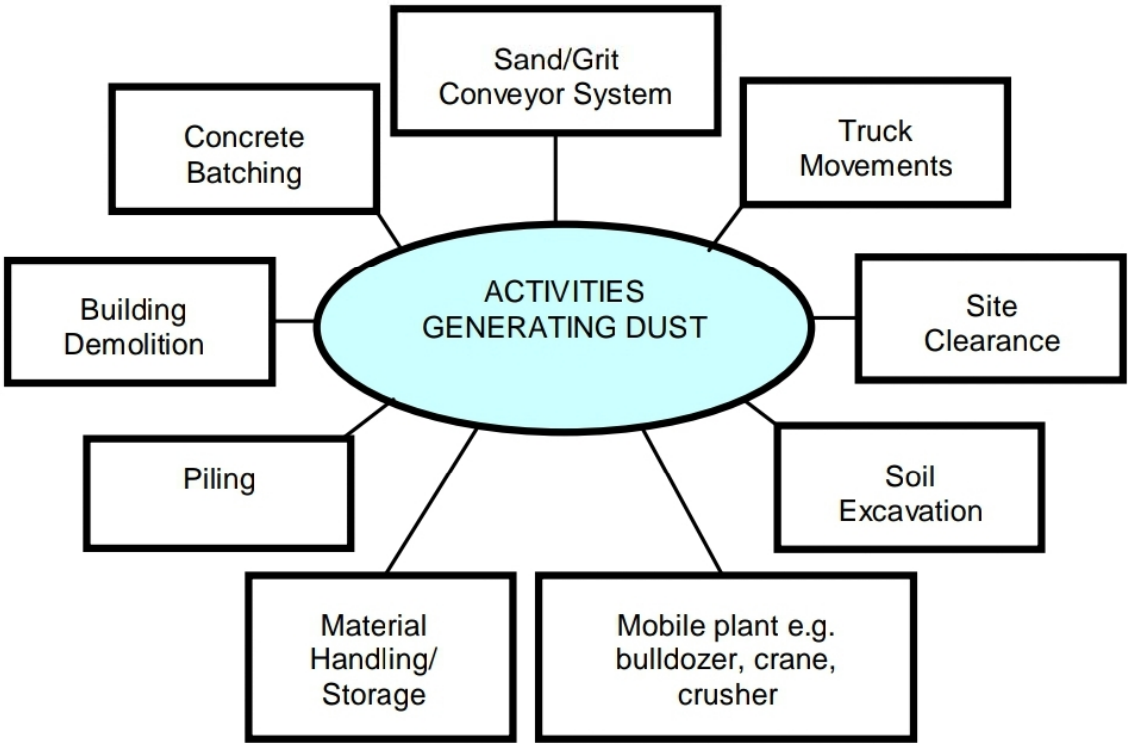
Order dated 10.04.2016

The Hon'ble NGT dated 10.04.2015 in *O.A No.95 of 2014 in the matter of Sanjay Kulshrestha Vs Union Of India & Ors inter alia* directing that if any person, owner and or builder is found to be violating any of the conditions stated in this order and or for their non- compliance such person, owner, builder shall be liable to pay compensation of Rs 50,000/- per default in relation to construction activity at its sites and Rs. 5000/- for each violation during carriage and transportation of construction material, debris through trucks or other vehicles which all stakeholder agencies in NCR are implementing.

Directions from the Hon'ble Supreme Court

Order dated 16.12.2016

"It was submitted that Union of India and State Governments concerned must be directed to take steps to enforce the CPCB rules and norms against those engaged in such construction activities to prevent further rise of pollution levels. We see no reason to decline a direction to that effect. CPCB norms regarding prevention of pollution by putting curtains and other devices at construction sites must be strictly enforced by the enforcement agencies concerned. We direct accordingly."


Sand/Grit
Conveyor System
Concrete
Batching
Truck
Movements
Building
Demolition
ACTIVITIES
GENERATING DUST
Site
Clearance
Piling
Soil
Excavation
Material
Handling/
Storage
Mobile plant e.g.
bulldozer, crane,
crusher

Concrete Batching / Debagging/ Mixing

Building Demolition/Deconstruction

Truck movements

Site clearance

Soil excavation

Material Handling/Storage

Mobile pants – Crusher, Bulldozer etc.

S.No.	Task	Significance
1	Whether **continuous** dust/wind breaking walls of **appropriate height*** have been provided around the periphery of the construction site?	High
2	Whether **tarpaulin or green-net** on scaffolding around the area under-construction and the building is provided?	High
3	Whether **all vehicles** including carrying construction material and construction debris of any kind **cleaned and wheels washed before leaving the construction site**?	High
4	Whether all vehicles carrying construction material and construction debris are **fully covered and protected** so as to ensure dust from construction material or debris does not become air-borne in transportation?	High
5	Whether all construction debris and construction material of any kind is **stored on the site (not dumped on roads or pavements) and is fully covered in all respect**? Ideally in a warehouse.	High
6	Whether **wet-jet** being used in grinding and stone cutting?	High
7	Whether **unpaved surfaces and areas with loose soil are adequately sprinkled with water** to suppress dust? Ideally site to be fitted with fine water spraying nozzle system.	Medium
8	Whether construction and demolition waste is **recycled on-site or transported to authorised recycling facility** and due record of the same is maintained?	Medium
9	Whether every worker working on construction site and involved in loading, unloading and carriage of construction material and construction debris are provided with **dust-mask to prevent inhalation of dust particles**?	Medium
10	Whether arrangement provided for **medical help, investigation and treatment** to workers involved in the construction of building and carry of construction material and debris relatable to dust emission?	Medium
11	Whether green belt or green air barriers created around the construction site? **Note: This method is usually not possible in under-construction site and should not be insisted upon if all high and medium significance requirements are fulfilled.**	Low
12	Any additional measures taken to control dust pollution.	Low

What to inspect for?

*** Three meter (3** mt) or one tenth **of plot length whichever is** higher

But numbers were abysmal

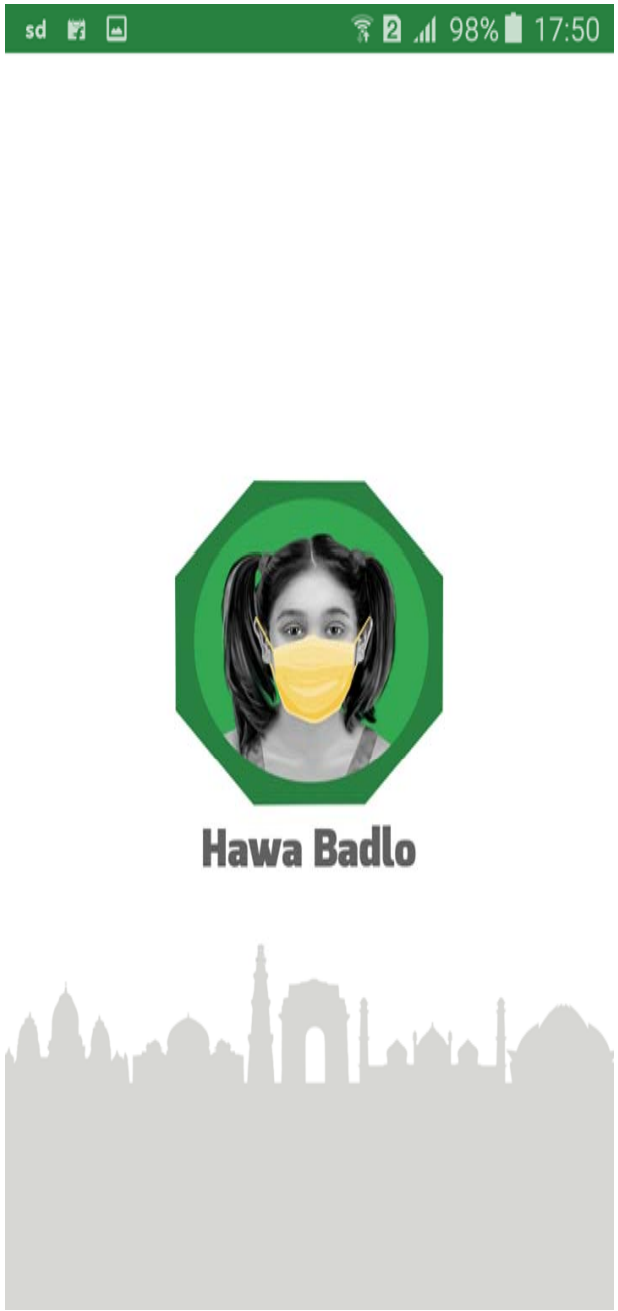
Agency	Number of projects
Delhi	
DPCC	53
Haryana	
HSPCB	138
Uttar Pradesh	
Yamuna Expressway Authority	11
NOIDA Authority	45
Greater Nodia	156
GDA	116

Number projects larger than 20,000 sqm in NCR (as noted by EPCA in 2016)

Majority of construction within the city limit are under 20,000 sqm and thus outside purview of EIA.

Status of Dust Control in projects smaller than 20,000 sqm (Delhi only)

Agency	Number of challans	Amount recovered
NDMC	-	-
North-DMC	240	Rs. 23,00,000
East-DMC	440	Rs. 35,00,000
South-DMC	714	Rs. 33,50,000
Department of revenue	437	Rs. 60,85,000
PWD-Delhi	11	Rs. 95,000
Total	1700	Rs. 2,37,45,000



Citizen engagement

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)
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सं. 107] नई दिल्ली, बृहस्पतिवार, जनवरी 12, 2017/पौष 22, 1938
No. 107] NEW DELHI, THURSDAY, JANUARY 12, 2017/PAUSA 22, 1938

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 12 जनवरी, 2017

का.आ. 118(अ).—दिल्ली में और राष्ट्रीय राजधानी क्षेत्र दिल्ली में वायु प्रदूषण का बढ़ता स्तर गंभीर चिंता का विषय रहा है तथा प्रदूषण स्तरों में लगातार हो रही वृद्धि के विशेष संदर्भ में इस समस्या के निराकरण के लिए तत्काल उपाय किए जाने की आवश्यकता है;

भारत सरकार द्वारा अंगीकृत राष्ट्रीय वायु गुणवत्ता सूचकांक (एनएक्यूआई) के अनुसार विभिन्न स्तरों के वायु प्रदूषण के नियंत्रण के लिए केंद्रीय प्रदूषण नियंत्रण बोर्ड द्वारा तारीख 25 नवम्बर, 2016 को माननीय उच्चतम न्यायालय के समक्ष एक ईडिट रिपोर्ट एक्शन प्लान और उपयुक्त उपाय प्रस्तुत किए गए थे जिनमें और उपायों का विचार किया गया था;

और जबकि माननीय उच्चतम न्यायालय ने अपने दिनांक 02 दिसम्बर, 2016 के आदेश में केंद्रीय सरकार को निर्देश दिया कि वह ईडिट रिपोर्ट एक्शन प्लान की जांच करने पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप धारा (1) के अधीन उपयुक्त अधिसूचना जारी करे;

और जबकि मामले की जांच की गई है तथा उस पर विधिवत् विचार करने के बाद केंद्रीय सरकार यह उपयुक्त समझती है कि उपर्युक्त आदेशों के अनुसरण में एक उपाय के रूप में ईडिट रिपोर्ट एक्शन प्लान के कार्यान्वयन का कार्य पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप धारा (1) के अधीन पर्यावरण प्रदूषण (निवारण एवं नियंत्रण) प्राधिकरण (जिसे इसके पश्चात् 'ईपीसीए' कहा गया है) को सौंपा जाए;

Graded Response Action Plan for Delhi & NCR

In pursuant to the Hon'ble Supreme Court's order dated December 02, 2016 in the matter of M. C. Mehta vs. Union of India regarding air quality in National Capital Region of Delhi, a Graded Response Action Plan has been prepared for implementation under different Air Quality Index (AQI) categories namely, Moderate & Poor, Very Poor, and Severe as per National Air Quality Index. A new category of "Severe+ or Emergency" has been added. Ministry of Environment, Forests & Climate Change has notified for implementation of Graded Response Action Plan through Environment Pollution (Prevention & Control) Authority vide S.O. 118 (E) dated January 12, 2017 (copy enclosed).

Severe + or Emergency (ambient $PM_{2.5}$or PM_{10}concentration values of 300µg/m^{3}or 500 µg/m^3 respectively persist for 48 hours or more)	**Agency responsible/Implementing Agency**
Stop entry of truck traffic into Delhi (except essential commodities)	Municipal Corporations and Traffic Police of Delhi and NCR Towns
Stop construction activities	Delhi Pollution Control Committee/Municipal Corporations of Delhi and NCR towns
Introduce odd and even scheme for private vehicles based on license plate numbers and minimize exemptions	Secretary cum Commissioner of Transport Department, NCT of Delhi, and Transport Commissioners of NCR towns
Task Force to take decision on any additional steps including shutting of schools	
Severe (ambient $PM_{2.5}$or PM_{10}concentration value is more than 250 µg/m^{3}or 430µg/m^3 respectively)	**Agency responsible/Implementing Agency**
Close brick kilns, Hot Mix plants, Stone Crushers	Chairpersons Delhi Pollution Control Committee, State Pollution Control Boards of Haryana

CSE Recommends

Construction Activities

Ensure dust pollution from construction. Check list for inspection of construction sites prepared under directions of NGT and EPCA.

Undertake control measures for fugitive emissions from material handling, conveying and screening operations. Needs enforcement.

Construction and Demolition Waste:

Provide a network of decentralized C&D waste segregation and collection sites across the city.

For material handling, construction and demolition, it should be obligatory on part of the developers to provide evidence of debris on-site recycling and/or disposal at designated site

Promote recycling of construction and demolition waste; change schedule of rates

Thank you!