Working of Mechanized Road Sweeping in the Three Delhi Municipal Corporations

January 11, 2019

Environment and Waste Management Division, TERI

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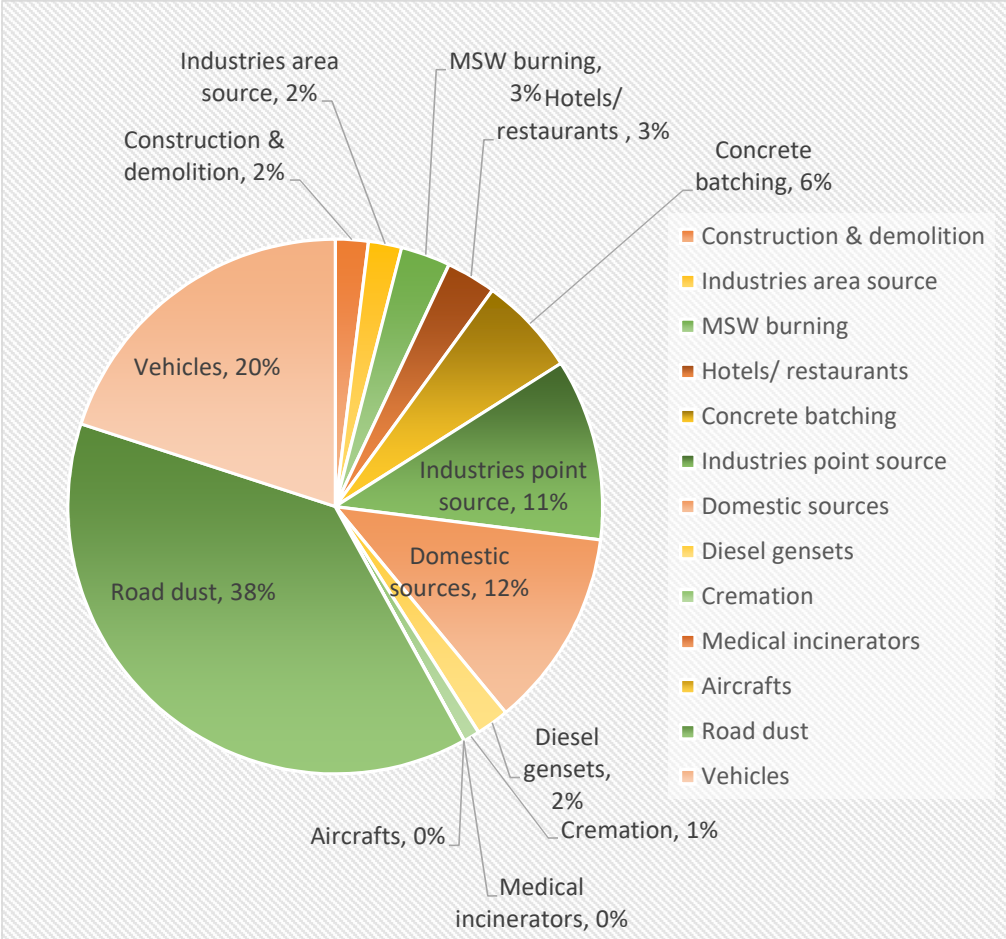
Why Mechanised Road Sweeping ?

- 38% of city pollution comes from road dust.
- Manually sweeping in most of the areas lead to SPM pollution due to fine particulate suspension.
- Letting this road dust accumulate on road sides for lifting also leads to a vicious cycle by entrapping the pollution load back to the environment with moving traffic.
- MRS machines move slowly on the roads at an average speed of about 8km/hr and helps in reducing the SPM load (fine road dust particles) by vacuum suction and sprinkling water to entrap dust load suspension.
- **MRS machines are definitely way forward to reduce city pollution….**

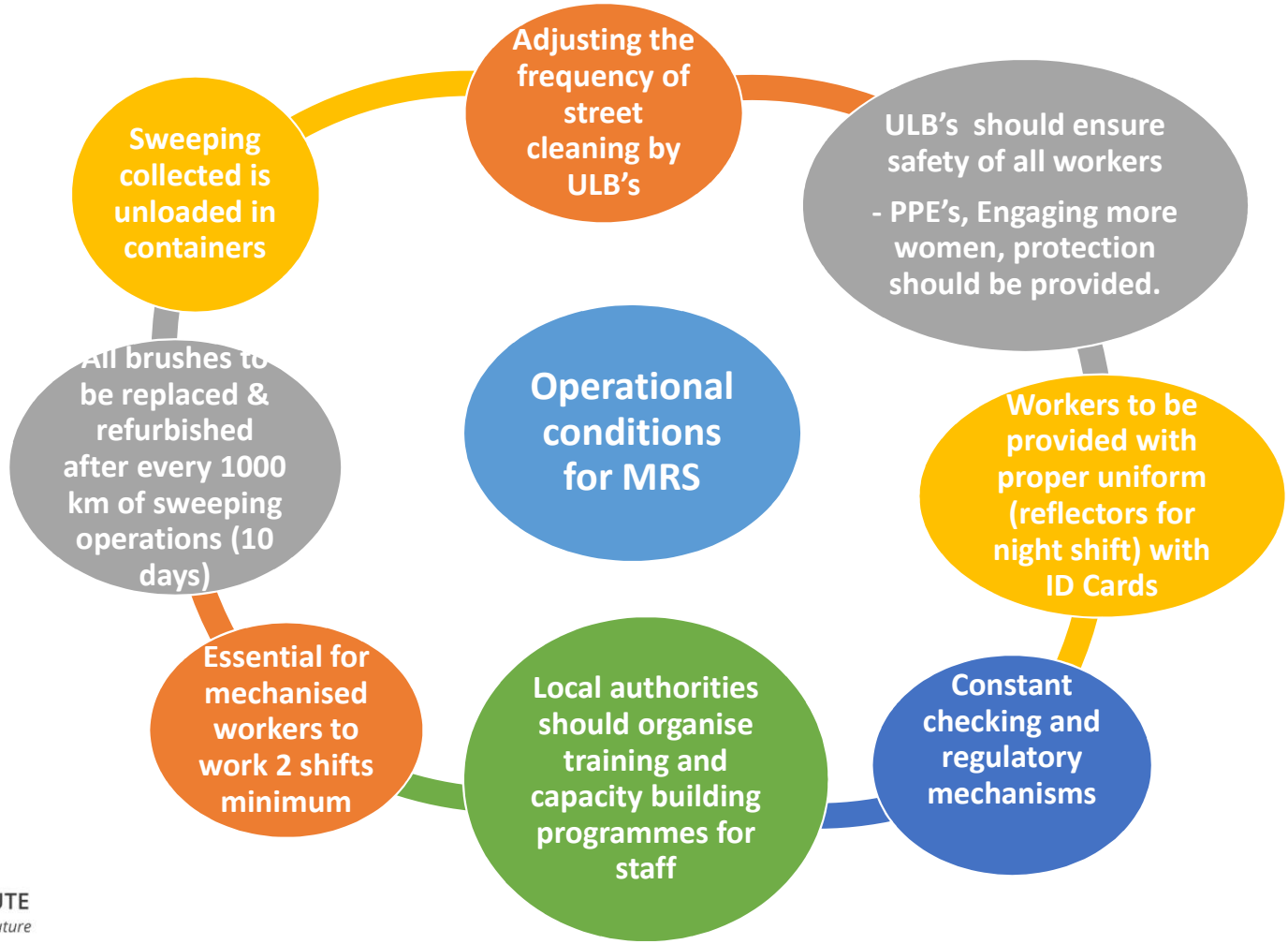
Particulate apportionment in Delhi (on weight basis)



Source: Centre for Science and Environment, 2016

CPHEEO Guidelines

CPHEEO gives guidelines on efficient working of MRS



Suggested sweeping frequency as per SWM Rules, 2016

Class	Character of street	Frequency of sweeping
A	City centre-shopping areas	Daily or twice
B	Market areas	Daily
C	Minor streets	Daily
D	Sub-urban shopping streets	Daily
E	Residential streets	Daily
F	Roads and streets having no households or establishments on either sides	Once a week
G	Highways	Rarely necessary to sweep them as motor traffic creates turbulence
H	Suburban main streets	Twice a week
I	Open spaces	Occasionally when required (minimum once in 2 weeks)

Audit Coverage

To cover 08 MRS in **North DMC** deployed in 06 zones (14 August – 18 November 2018)

Zone	MRS Deployed
Rohini Zone	DL1GC 7518
	DL1GC 7146
Karol Bagh Zone	DL1GC 7190
Civil Lines Zone	DL1GC 7169
	DL1GC 7466
Narela Zone	DL1GC 7515
Keshavpuram Zone	DL1GC 7464
City Sadar-Paharganz Zone	DL1GC 7173

To cover 12 MRS in **South DMC** deployed in 04 zones (10 July 2018- 10 January 2019)

ZONE	MRS Deployed
Central Zone	DL 1GC 7070
	DL 1GC 7136
	DL 1GC 7184
South Zone	DL 1GC 7053
	DL 1GC 7076
	DL 1GC 7109
West Zone	DL 1GC 7095
	DL 1GC 7164
	DL 1GC 7125
Najafgarh	DL 1GC 7061
	DL 1GC 7039
	DL 1GC 7040

To cover 01 MRS in EAST **MCD** deployed in a zone In August 2018 – Random Audit

ZONE	MRS Deployed
Shahhdara South	MRS 01
	MRS 02
Shahdara North	MRS 03
	MRS 04

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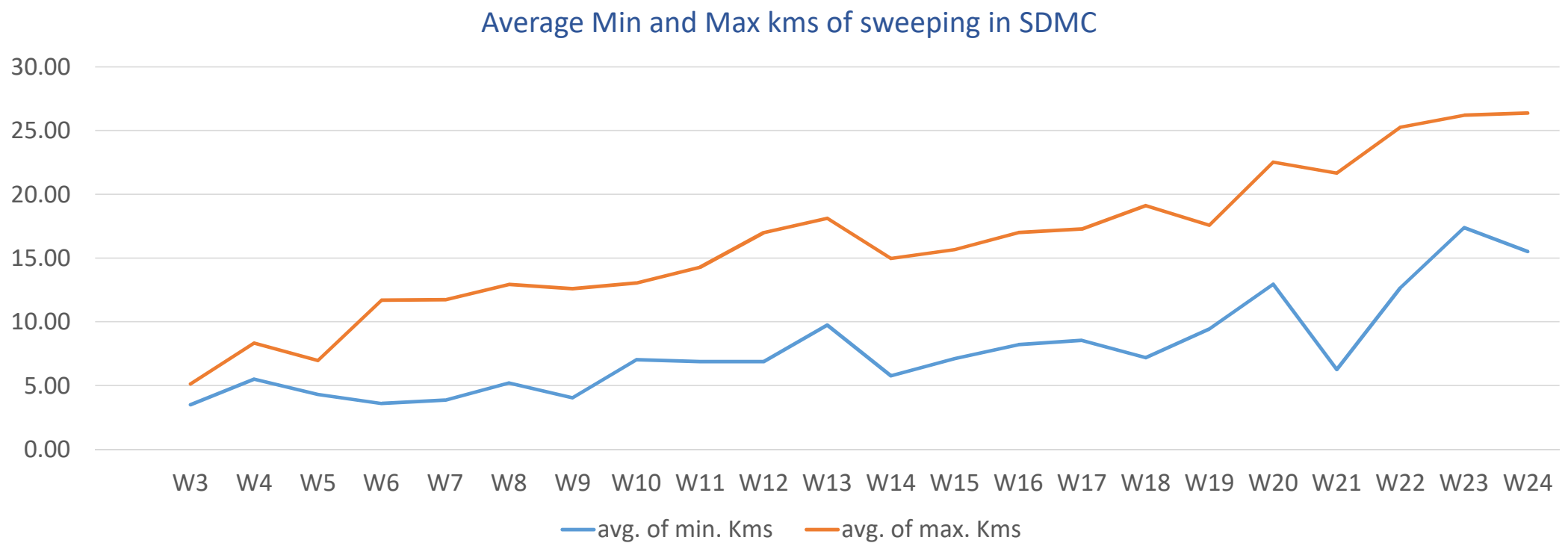
Average sweeping per shift:
13.78 Km

South DMC Findings

Hours of Sweeping Per Shift:
3.55 Hrs



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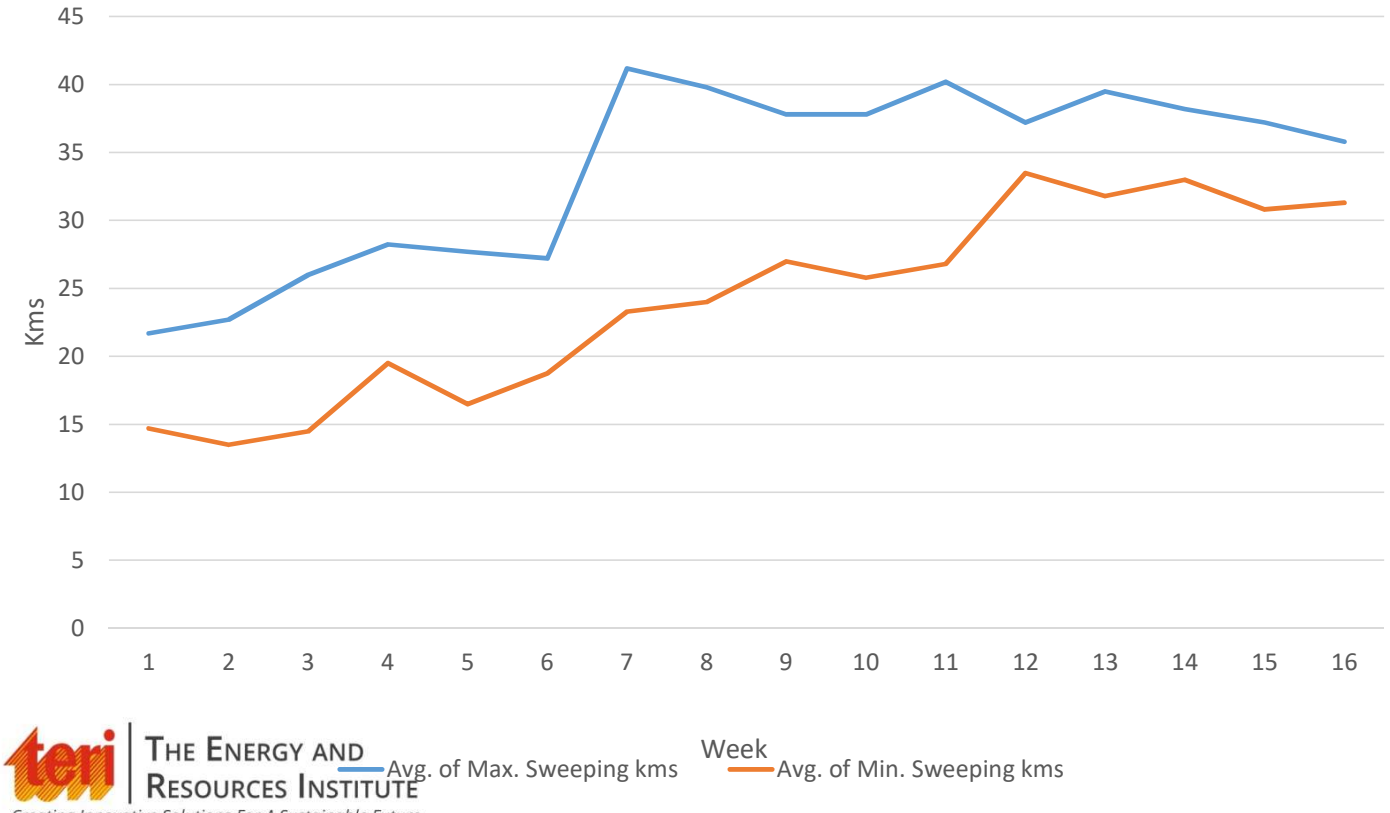
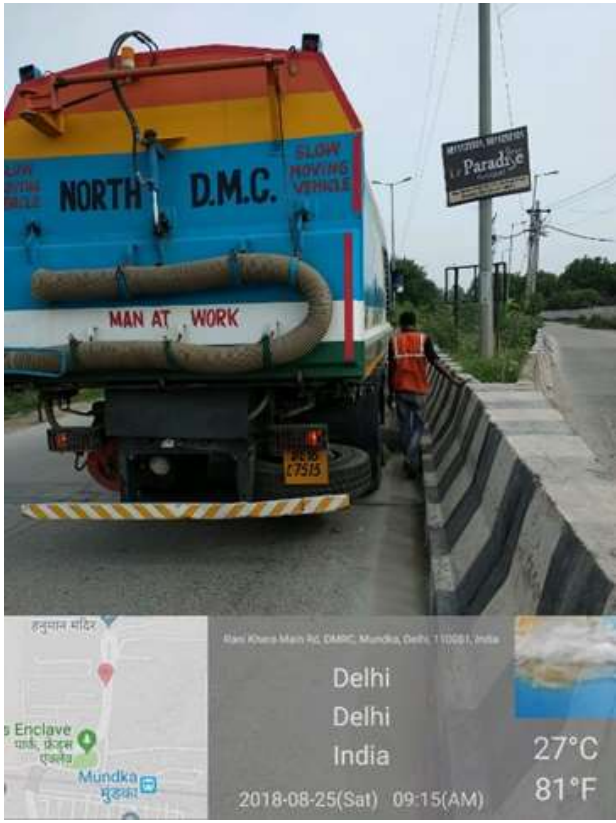
Average Max sweeping per shift:
29.4 Km

North DMC findings

Hours of Sweeping Per Shift:
4.89±0.09 Hrs





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East DMC- Findings

- 1 of 4 trucks audited by TERI : DL-1GC-7152
- **Shift hours : 10 hr 20 min long**
- **Effective sweeping : 39 kms** in **7 hrs** (5.5 kmph) – 69% of the total shift time spent on sweeping

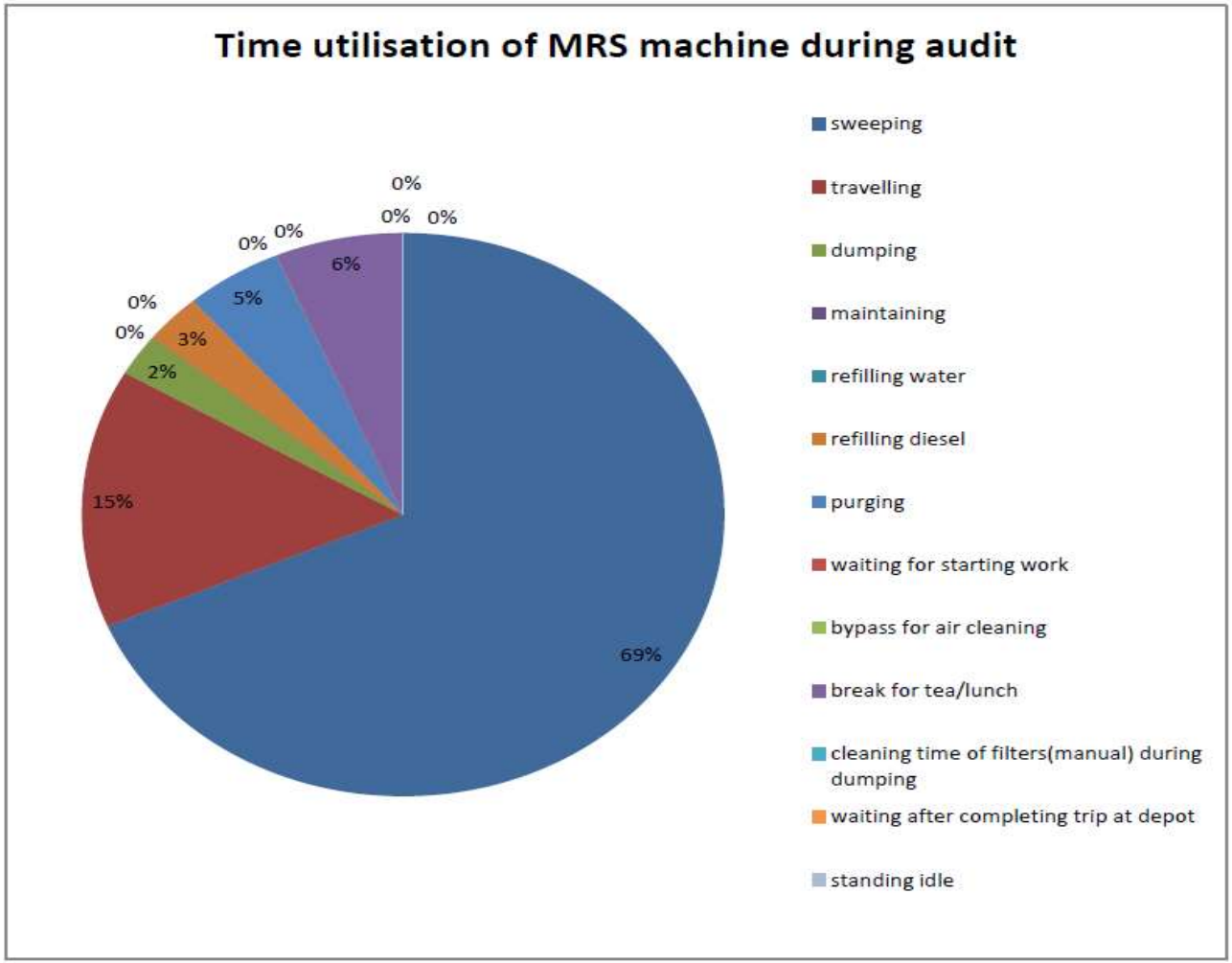


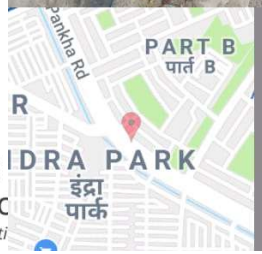
Fig: TERI Auditor with MRS

Good Practice

NDMC.mp4

SDMC – Good Practice- Effective Sweeping - But no sprinkling done

BEFORE



Pankha Rd, Block A1, Uttam Nagar, Delhi, 110058, India

	Decimal	DMS
Latitude	28.621879	28°37'18" N
Longitude	77.069502	77°4'10" E

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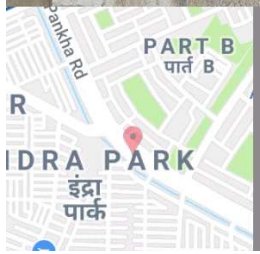
AFTER



Pankha Rd, Indra Park, Ram Datt Enclave, Uttam Nagar, Delhi, 110059, India

	Decimal	DMS
Latitude	28.621566	28°37'17" N
Longitude	77.069658	77°4'10" E

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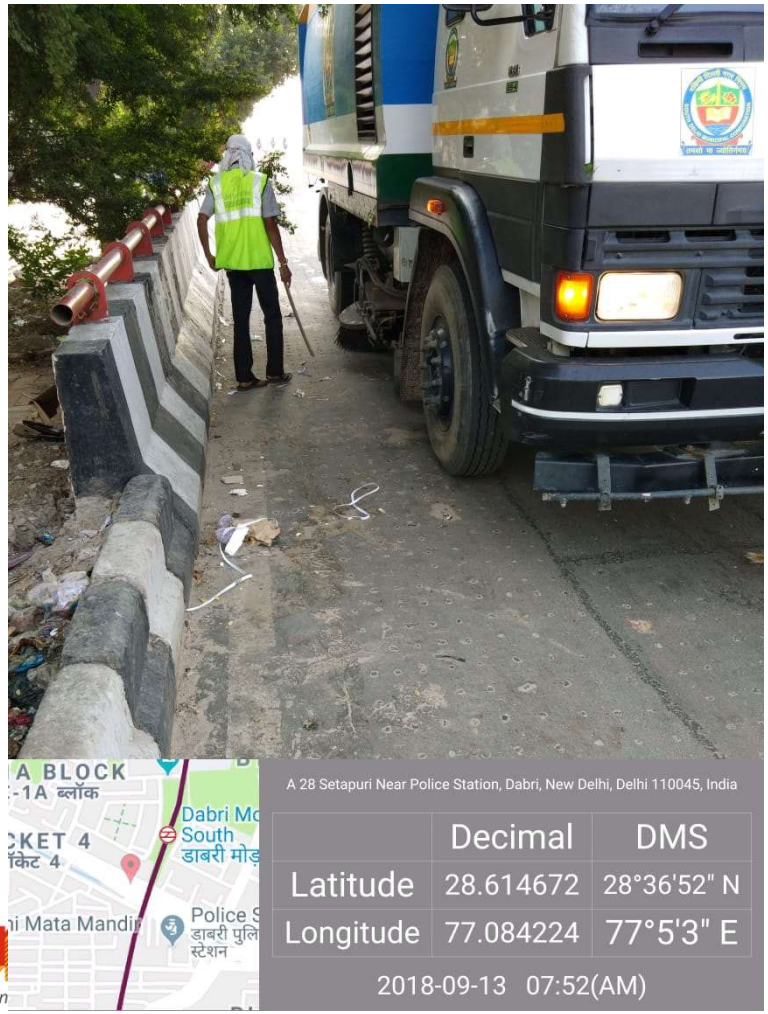
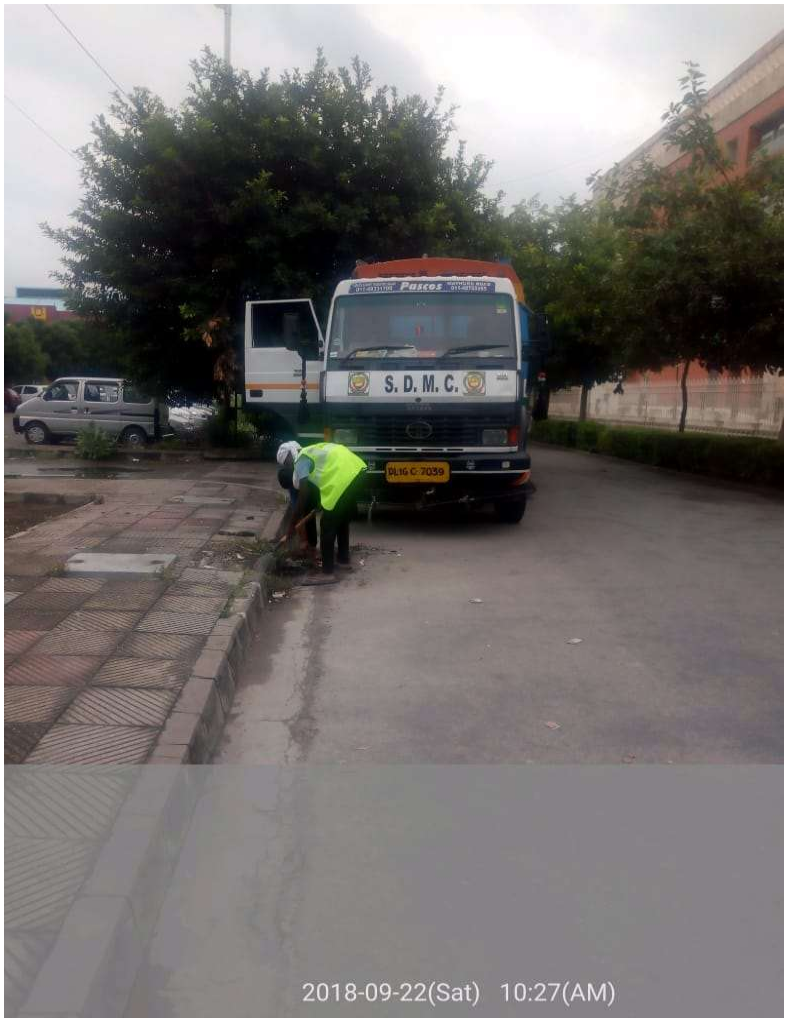
Good Practice- SDMC- Workers wearing reflective jacket





Good Practice- SDMC- Sprinkling being undertaken

EDMC Good Practices

- Operating staff was in uniform
- Cleaner was provided with PPEs
- Dust was weighed (2680 Kg) before dumping
- Dumping ground was 4km away from end point of route
- Purging effectively done, increasing effectiveness of sweeping

Identified Gaps and Mitigation Options

Concerns	Mitigation
Inadequate sweeping distance	Timely start of Sweeping operation and intimation through software based photo (GPS Map camera).
	Monthly route plans with clarity on road sides and target kilometres for each shift.
	Shift wise monitoring of actual sweeping distance and time and uploading same on web portal.
	All the unproductive activities (washing, maintenance, refilling water and fuel) be done in off shift hours by maintenance team.
	Daily Maintenance schedule chart to be adopted along with App based complaint system (may be via WhatsApp) for O&M team to take timely corrective actions

Identified Gaps and Mitigation Options

Concerns	Mitigation
Ineffective sweeping	MRS Filters should be thoroughly cleaned every 4th week*
	Brushes should be changed every 10th Day (or 1000 kms of sweeping operation)
	keep a balance on the speed of the vehicle and **viz-a-viz rpm of auxiliary engine** and speed of side and central brush
	Water Sprinkling be done and adequate water pressure (with mist formation to supress dust) is maintained.
	Back suction pipe (for difficult to reach areas) is used wherever required.
	Proper purging (with water spray) should be done and manual filter cleaning (through bamboo sticks) should not be allowed.

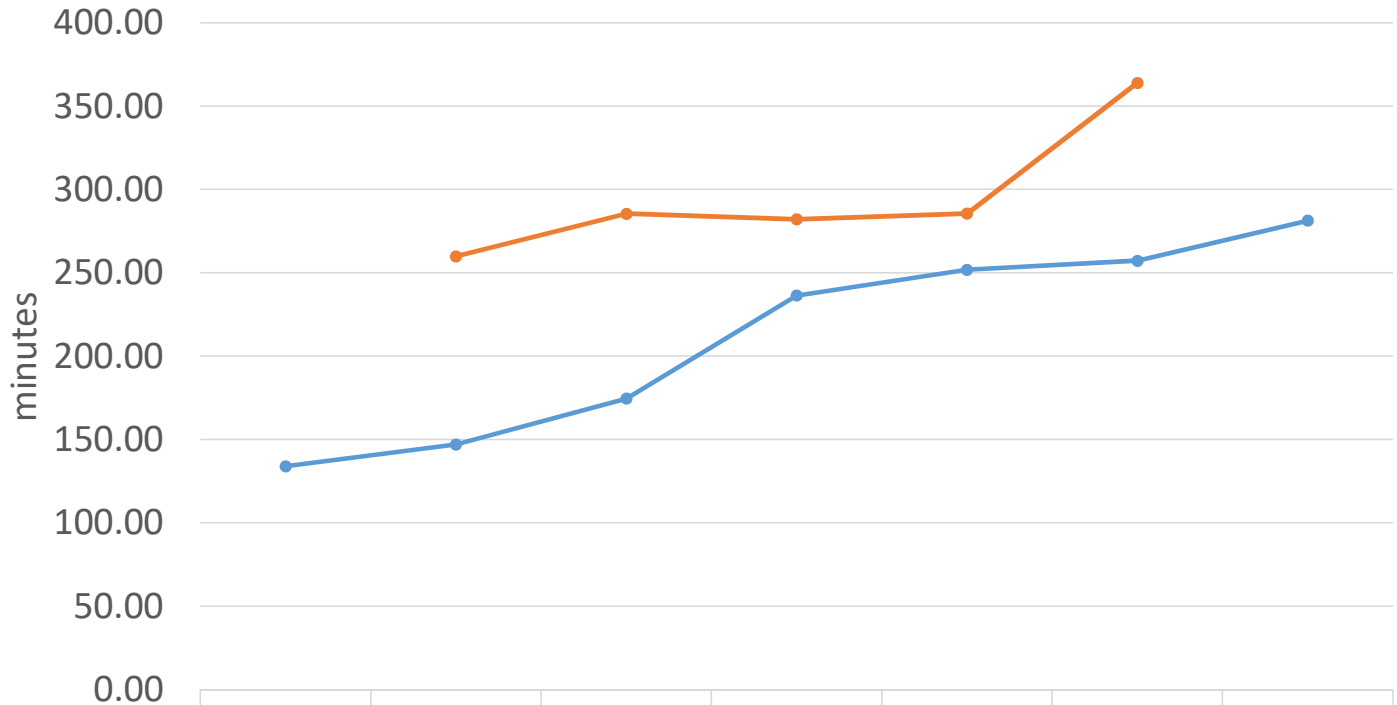
Identified Gaps and Mitigation Options

Concerns	Mitigation
Inappropriate routes for mechanised sweeping	Ensure route allocated are free from potholes, broken/unpaved median.
	For heavy dust loads, ensure frequency of sweeping of each route is consistently maintained.
Appropriate route planning	As far as possible, the starting and end points of sweeping should be such as to save up on travelling time and distance.
	Unauthorised parking of vehicles should not hinder left side sweeping
Unauthorised dumping	Road dust is currently dumped at nearby Dhallao Ghars / garbage vulnerable points (in North DMC), and far off locations (in SDMC) which should be relooked.
	Road dust should be collected in routes via other vehicles for disposal (as per CPHEEO guidelines). OR appropriate dumping locations should be given.
Diesel quantity	Appropriate diesel quantity should be allotted to MRS machines via PETRO Cards

Identified Gaps and Mitigation Options

Concerns	Mitigation
Performance measure	Mechanism to weigh the dust collected per shift
	record the distance and time swept by an operator on sweeping operation- reward best performers
	Training and Capacity building exercises
PPEs	Effective PPEs should be given and utilized by staff.
Traffic jams	Operate in the lean hours of the day
	Ensure trucks do not operate on wrong side
Dust suspension	Sprinkling should be done throughout the sweeping operation to settle dust and jetting gun to be used at the time of dumping
Maintenance	Keep inventory of MRS parts with SDMC store.

Impact of TERI Audit: Improvement in sweeping time per shift in SDMC & NDMC



	JULY	AUG	SEP	OCT	NOV	DEC	JAN
SDMC	134.00	147.03	174.60	236.45	251.83	257.23	281.36
NDMC		259.92	285.43	282.08	285.54	363.95	

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Way Forward

- Double shift operation to achieve 100 kms sweeping per day for economic feasibility with sprinkling operation to curb dust suspension.
- Effective planning – in terms of operations (route and dumping locations) and maintenance.
- Petro cards for providing fuel to MRS and help save time and money.
- Training to operation, maintenance as well as MCD monitoring staff.
- Proper maintenance and upkeep of vehicles.
- Motivation for Operating staff
- Performance measure mechanism to be put in system to record maximum sweeping km and hrs of each operator and quantum of road dust collected.

Thank You!


S. D. M. C.


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