BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI

O.A.No.514/2019

(CONNECTED CASES O.A.533/2018, 534/2018 & 535/2018)

REPORT

PRESENTED BY JUSTICE A.V.RAMAKRISHNA PILLAI
(FORMER JUDGE, HIGH COURT OF KERALA)
CHAIRMAN, STATE LEVEL MONITORING COMMITTEE, KERALA
(FOR AND ON BEHALF OF THE AFORESAID COMMITTEE)
REGARDING THE PRESENT STATUS OF THE SOLID WASTE TREATMENT YARD AT BRAHMAPURAM IN ERNKULAM DISTRICT, KERALA

PRESENTED ON 22.02.2020

DATE OF POSTING: 28.02.2020

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REPORT

This O.A. was Suo Motu registered by this Hon'ble Tribunal on the basis of a brief report dated 23.2.2019 submitted ***after a major fire, broke out on 22.2.2019*** at Brahmapuram Solid Waste Processing Yard on the outskirts of Kochi City. The report was preceded by a field visit by the Chairman, State Level Monitoring Committee (SLMC for short) on 23.02.2019. Prima facie, it appeared that the root cause of the fire, was the unscientific dumping of waste in the yard violating all norms prescribed by the various Environmental Laws.

Basically the solid waste processing plant at Brahamapuram is a windrow composting plant, housed in paved floor having roofed structure with open sides. This structure itself has partly collapsed and represents a safety hazard. The site is used for dumping non-degradable wastes also. Some of the legacy waste dumps have been capped with plastic liner and soil.

The yard is within the local limits of a village on the outskirts of the Kochi Municipal Corporation. The site is a wet land by the side of river Kadambrayar which is identified by the Central Pollution Control Board as one of the polluted river stretches in India (Kindly refer to O.A.673/2018 which is now pending before this Tribunal). The river is overgrown with aquatic weeds as a result of pollutants entering the stream. ***Leach ate from degrading food waste at Brahmapuram is a major source of pollution of river Kadambrayar***. It is relevant to point out that the site does not comply with sitting criteria for sanitary landfills.

Though Brahmapuram yard is under the management and control of Kochi Municipal Corporation, reportedly solid waste from five Municipalities and two Panchayaths is being brought to Brahmapuram site. However, virtually, it has become the responsibility of Kochi Municipal Corporation to process the waste material being deposited at Brahmapuram site. The dumping of untreated waste in huge quantity and the failure to process the same in a time bound manner has resulted in accumulation of legacy waste posing severe threats to the environment, making the life of the people within the locality miserable. The locality which was rich in

vegetation years back, has now become almost deserted and gives the appearance of a baron land.

After the fire incident on 22.2.2019, a special meeting of the SLMC was convened on 1st March, 2019 at Government Guest House, Ernakulam. The Mayor, Kochi Municipal Corporation; the MLAs of Ernakulam, Kunnathunadu and Thrikkakara; were invited to attend the meeting. However, the MLAs of Ernakulam and Kunnathunadu remained absent. The issue relating to Brahmapurm plant was discussed in detail.

At the end of meeting, the Secretary, Kochi Municipal Corporation as well as the Member Secretary, Kerala State Pollution Control Board were directed to submit reports in writing before the SLMC in its next meeting so that remedial measures could be suggested. The importance of taking adequate measures for solid waste disposal, controlling air and water pollution by taking public into confidence was also stressed in the meeting. The copy of the minutes of the said meeting is appended as **Annexure-X1** to this report.

Prior to the meeting, a site inspection was conducted by Dr.Ajith Haridas, the then Chairman of the KSPCB, who reported that in the fire incident on 22.02.2019, solid waste was found to be burnt only at about a depth of six inches. According to him, auto ignition process at waste dumping sites is common.

Simultaneously, a study was caused to be conducted by the Environmental Technology Division, CSIR – National Institute for Interdisciplinary Science & Technology (CSIR-NIIST), Thiruvananthapuram, Kerala, on the emission of dioxins during the fire break out on 22.2.2019. The study report submitted by the aforesaid agency is appended as **Annexure-X2** to this report. The results of the tests are given from page 17 onwards of Annexure-X2.

In the next meeting of the SLMC held at Thiruvananthapuram on 15.3.2019, the issue was considered as Agenda No.3. The extract of the minutes on the agenda item is given below:

"Issue relating to Brahmapuram Solid Wate Yard, Ernakulam with Special reference to O.A.Nos.533/2018, 534/2018 and 535/2018.

The SLMC expressed displeasure over the action taken by the Corporation of Kochi, in disposing of legacy waste. It was suggested by the Additional Chief Secretary, LSGD, that the legacy waste be disposed of part by part by means of bio mining as per the guidelines of CPCB within 15 days ably assisted by a technical expert thereby addressing the present environmental issues till the Waste to Energy plant comes into existence. The Member Secretary, SLMC & KSPCB assured all technical support to Kochi Corporation in this regard. On a specific quarry to the Secretary, Corporation of Kochi as to whether there is any permanent fire fighting mechanism at the site to prevent unexpected fire incidents, he could not give a cogent answer. Therefore, it was suggested by the Additional Chief Secretary, LSGD, that measures such as providing overhead water storage tank of adequate capacity, heavy duty pump sets and fire belt for handling fire hazards, be taken. It was also directed that only segregated waste be taken to the plant. The need to resort to bio mining was also stressed by the Additional Chief Secretary, LSGD.

The Principal Secretary, Environment Department suggested to provide adequate leach ate treatment facility, 24 hrs security, and also to keep records of waste collected, waste treated and land filled.

Dr.Ajith Haridas, Chairman, KSPCB informed that mechanical biological treatment followed by co-processing in cement plant is more economically viable than Waste to Energy plant now proposed by the Kochi Corporation. The proposed Waste to Energy plant of Kochi Corporation has obtained almost all the clearances except Environment Clearance. The Chairman, SLMC suggested that as this project is at an advanced stage the same be continued and the DMT followed by co-processing in cement plant may be considered in the operational stage later on.

The following resolutions were taken in the matter.

1. ***The legacy waste shall be disposed of part by part by means of bio mining as per the guidelines of SPCB within 15 days involving a technical expert and to take necessary arrangement for addressing the present environmental issues till the Waste to Energy plant comes into existence. If capping of waste is resorted to it should be confined to inert waste as per the provisions of the SWM Rules, 2016. (Action: Kochi Corporation)***
2. ***Kerala State Pollution Control Board shall provide technical field supervision and support to the Kochi Corporation in this regard (Action: Kerala State Pollution Control Board)***

3. ***Kochi Corporation shall keep ESCROW amount for handling emergency situation. (Action: Kochi Corporation)***
4. ***The waste transporting vehicles of Kochi Corporation are to be provided with adequate cover, leach ate collection tank and log book. Only those vehicles having all specifications for waste transportation shall be allowed by the Health Supervisor. The permit of the vehicles violating the norms shall be cancelled. The details of vehicles already purchased by the Corporation under different schemes shall be submitted to SLMC before the next meeting. (Action: Health Supervisor, Kochi Corporation)***
5. ***Ex-Service armed security shall be engaged at the segregation in the dump yard as done in Adimali – Idukki Road (Action: Kochi Corporation)***
6. ***The Secretary Kochi Corporation shall inspect the NH Bypass, 'Sahodaran Ayyappan' Road & Banerjee Road to make the roads to 'Zero waste Road' within 15 days. Cameras shall be installed on those roads for proper monitoring.(Action: Kochi Corporation)***
7. ***Door to door collection of waste shall be insisted upon. Deposit of waste on roads and other public places has to be prohibited. Segregation of wastes shall be insisted upon before disposal.***
8. ***Plastics carry bags of thickness below the prescribed limit shall be banned in the city. The violators shall be proceeded against under law for penalisation.***
9. ***As it was brought to the notice of the Committee that waste collecting employees are not sufficiently protected from health hazards, they shall be given adequate protective equipments namely, gum-boots, gloves, masks etc., and those workers shall be compelled to wear the same while on duty.***
10. ***Disposal of sewage, septage and chicken waste in the water resources in the district has to be brought to an end by proceeding against the violators under the law.***
11. ***Apartments, hotels, hospitals which are not operating their sewage treatment plants on lame excuses are to be proceeded against under law to ensure compliance.***
12. ***As it is brought to the notice of the Committee that even segregated plastics are not disposed of properly, methods are to be evolved for effective disposal of plastics. Plastics shall not be disposed of by burning under any eventuality."***

Surprisingly, while the SLMC was holding sitting on 15.3.2019, another fire broke out at solid waste treatment yard at Brahmapuram at about 2 p.m on the same day. This time the fire broke out at the dumping yard where food wastes were deposited. Reportedly, at that area there were more plastic materials. The fire department was able to contain the spreading of fire by 6 p.m on the same day. Smoke was seen spread in and

around the yard only. The KSPCB was directed to monitor the level of pollution. It was seen that the concentration of different parameters were within the specified limits. However, two parameters were slightly above the tolerance level which according to the KSPCB need not be due to the fire incident alone.

The issue again came up for consideration as Agenda No.3 in the meeting of the SLMC held on 6th April, 2019 at Thiruvananthapuram. Following is the true extract of the minutes on the said agenda.

"**Issue relating to O.A.Nos.533/2018, 534/2018 and 535/2018 on Brahmapuram Solid Waste Yard, Ernakulam**.

The SLMC expressed displeasure over the action taken by the Kochi Corporation in disposing of legacy waste and the failure of the Corporation in complying with the directions of the SLMC in the previous meeting. The Secretary, Kochi Corporation informed that they have provided 1500 m road in the solid waste dump yard for the easy access of fire engines. He also informed that NH Bypass, Sahodaran Ayyappan Road & Banerjee Road were made Zero waste roads.

The following resolutions were taken in the matter:

1. ***Kochi Corporation shall dispose legacy waste part by part by means of bio-mining as per the guidelines of CPCB, involving a technical expert. Necessary arrangements for addressing the present environmental issues shall be taken till the Waste to Energy Plant comes into existence. A compliance report shall be filed before the SLMC in the next meeting. (Action: Kochi Corporation)***
2. ***Directions issued to the Kochi Corporation vide the minutes of the 2nd meeting of SLMC dated 15.3.2019 shall be forwarded to the District Collector, Ernakulam to oversee the implementation of these directions. (Action: KSPCB, District Collector, Ernakulam)***
3. ***All the directions as per the discussion of the SLMC shall be complied with and a report be submitted in writing to the SLMC within 2 weeks. (Action: Kochi Corporation)***
4. ***Agenda regarding allocation of land for setting up of CBMWTF at Brahmapuram shall be placed for reconsideration of Corporation Committee. If the committee rejects the agenda, the same shall be submitted to the Government. (Action: Kochi Corporation)***
5. ***In addition to the officials present in the meeting, the Deputy Mayor and Health Standing Committee Chairman shall be invited to the next SLMC meeting. (Action: Kochi Corporation)"***

Again on 8th May, 2019 the SLMC considered the issue as Agenda No.2 in the meeting held at Thiruvananthapuram. The following is the true extract of the minutes of the said agenda.

"Issues relating to O.A. No. 533/2018, 534/2018 & 535/2018 on Brahmapuram Solid Waste Yard, Ernakulam.

Adv.Varghese K. Paul, the learned Counsel appearing for the applicant in O.A.No.533, 534 & 535 of 2018 before the Hon'ble NGT was present in the meeting along with the Member Vadavukode Puthencruz Grama Panchayath (VPGP) who is the applicant in one of the aforesaid OAs to share their views on the Brahmapuram issue. The main issues raised by them before the SLMC are as follows:

(1) Waste transportation in the city is in uncovered vehicles causing spillage of waste and leach ate especially in steep slopes causing environmental pollution.
(2) Unsegregated waste is deposited in the wetland coming within the Costal Regulation Zone. The waste so deposited, include electronic wastes also.
(3) Wetland is filled with plastic waste in spite of the prohibition of reclamation of wetland.
(4) Leach ate from the dumping yard reaches directly to the Kadambrayar.
(5) Several loads of septage are brought to the treatment plant which is beyond its capacity, thereby causing percolation of septage to Kadambrayar, as well as to nearby water sources including wells in the dwelling house.
(6) During the fire hazard happened recently, smoke spread to a radius of nearly 10km causing air pollution. Study has to be conducted by NIIST on the damage caused due to the burning of waste.
(7) A panchayath road leading to the lake is closed by the Corporation
(8) Stray dogs which are attracted to the dumping yard on account of bio-waste, are causing menace in the locality.

After hearing the grievances of the learned Counsel as well as the petitioner, the Corporation of Kochi was asked by the Chairman, SLMC to give specific reply to the grievances projected above and to explain the action taken by them in this regard.

It was informed by the Hon'ble Mayor, Kochi Corporation that action has already been initiated to ensure segregation of waste at source. Log books have been provided to the vehicles carrying waste. It was informed that 390-400 TPD of waste reaches the yard daily. It was

further pointed out that directions were given to modify trucks providing top cover and tank for collecting the leach ate. The proposals received for the disposal of legacy waste were forwarded to the Kerala State Pollution Control Board for advice. As part of strengthening the security system, five additional security men were deployed. Three 5 HP pumps were fixed near the southern boundary for pumping water to the dump yard to control the heat generated and to prevent further chances of fire. Wastes on the southern side were cleared so as to form roads providing easy access in case of emergency. Two cameras have been installed for surveillance. Action is being taken to install more number of cameras. The use of personal protective equipments among the workers has been enforced. The proposal for bio-mining would be placed in the next Council. Sheet piling was already done in order to prevent discharge of leach ate into the Kadambrayar. Environmental clearance is awaited for the installation of 'waste to energy' plant.

The Environmental Engineer Kochi Corporation made a detailed power point presentation supporting the statements of Hon'ble Mayor.

The Chairman, SLMC pointed out the likelihood of aggravating the percolation of leach ate into Kadambrayar during rainy season. As the entire waste is kept on the open ground, it may cause serious environmental issues, it was pointed out. The inadequacy of the present leach ate drains and leach ate collection facilities provided were also pointed out by the Chairman and the immediate need to rectify those defects were stressed. If the aforesaid remedial measures are not likely to be completed before the onset of next monsoon, the possibility of transportation of collected leach ate to other treatment plants in the district has to be explored; it was advised.

The Additional Chief Secretary Local Self Government opined that significant progress in waste management has to be made by the Kochi Corporation. It was also pointed out that the progress report submitted by the Corporation is vague and it was insisted that the same be specific. The information gathered by the Additional Chief Secretary, LSGD that waste materials are being dumped on the side of the Bypass Road, in spite of the declaration of the same as Zero Waste Road was shared in the meeting. Therefore, frequent inspection by the squad was insisted.

The Chairman, Kerala State Pollution Control Board informed that the STP at Elamkulam was found to be not working during the inspection on 07/05/2019. Machines were not working. Mayor, Kochi Municipal Corporation stated that pumping station near Maharaja's College is working only from 9 am to 5 pm, and hence STP machinery is operated by KWA only during daytime.

The following resolutions were taken in the matter.

(1) ***Necessary action shall be taken to ensure 100% segregation of wastes before reaching the Brahmapuram Plant within 40 days.***

(2) ***Three more roads ie, Subash Chandrabose Road, K B Jacob Road, and BOT Bridge to Alexander Parambithara Road shall be made 'Zero Waste Road'.***

(3) ***Heavy fining/ more surveillance cameras/strict squad mechanism shall be in place to prevent waste dumping on roads.***

(4) ***Bid documents shall be submitted to the Kerala State Pollution Control Board, Head Office for evaluation.***

(5) ***Use of personal protective equipments by the health workers shall be enforced.***

(6) ***As an initiative, part of dumping site (10m x 10m) shall be segregated by engaging ex-service men society to determine composition at dump site. Bio-mining of legacy waste shall be done involving technical expert.***

(7) ***The windrow compost plant shall be properly enclosed and protected with sufficient roofing, before rainy season.***

(8) ***Modification in the leach ate drain shall be scientifically done and temporary leach ate treatment plant shall be made operational immediately. If the aforesaid remedial measures are not likely to be completed before the coming monsoon, the leach ate collected shall be transmitted to the leach ate treatment plant at Willington Island which is reportedly working properly.***

(9) ***Time bound proposal shall be submitted to KSPCB for permanent solution relating to leach ate treatment.***

(10) ***Instruction has to be given to the contractor, to remove the manure (compost) from the site at the earliest.***

(11) ***Sewage generated in the city and its present disposal are to be got assessed by the Kerala Water Authority. Time bound action plan for sewage treatment has to be submitted by Kerala Water Authority. Corporation shall make request in this regard to the Water Authority on the strength of this direction.***

(12) ***Proper working of STP at Elamkulam has to be ensured by Kerala Water Authority. The Corporation shall ensure compliance without delay.***

Also resolved that a local inspection of the Brahmapuram site be conducted during the second half of May 2019."

As decided, the Chairman, SLMC and the Chairman, KSPCB along with the engineers of the Regional Office, KSPCB at Ernakulam conducted a site inspection of Brahmapuram on 21st May, 2019. The site inspection

revealed that the statements made and the assurances given in the previous meetings by the Corporation authorities were not fully correct. The following were noted during the site inspection.

Waste Collection

It was seen that source separated wastes materials are received at Brahmapuram. (However, the legacy waste dumped at the yard was in un-segregated condition which indicated that the arrival of waste to the yard in segregated condition, was of recent origin) Trucks containing the waste materials were seen weighed and recorded. Inspection of the registers showed the following details for 19-5-2019.

19-5-2019	*tonnes*	*Collection Area*	*Collected by*
Wet waste	*51.9*	*Kochi Corp. circle 11-21*	*Contractor*
	6.1	*Kochi Corp. circle 1-10*	*Contractor*
	16.5		*Corporation*
	22.7	*Municipality*	
TOTAL WET WASTE	*97.2*		
Dry waste	*14.2*		*Corporation*

The collection contractors were seen paid Rs.1500/- per tonne delivered. The plant operator contractor was seen paid Rs.550/- per tonne.

Treatment of waste

Wet waste was seen heaped to allow composting. This was carried out in the sheds that still have roofs. There was no windrow formation plan. Windrow size was not being followed. Here it is apt to note that it is impossible to follow a scientific windrow pattern or windrow turning pattern as the entire premises has been overfilled. After degradation for a period of time, the material is screened through 40mm, 16mm and 4 mm trommel screens to produce city compost. The trommel screens provided in the plant by Kochi Corporation, were said to be not working. The plant operations contractor has installed 1 trommel screen. Therefore, the quantity of compost produced was very low, compared to the quantity of waste collected at the yard. As there was no off-take of the city compost produced, it was seen stockpiled.

As far as dry waste is concerned, the quantity of dry waste collected was very low and it was seen dumped without further processing.

Odour

The plant had extreme odour, so much so, that it was difficult to carry out the inspection. The workers were not provided with protection equipments.

Leach ate

At the time of inspection leach ate was flowing from the area where initial food waste degradation is taking place. Structured drains are not available on the composting platform for collection of leach ate. The Corporation has constructed garland drains around the composting sheds for collection of leach ate. However, efficient interception of leach ate is not possible. The floors were not properly sloped into the new drains. Major portion of the drains were not covered with slabs. Most of the slabs provided were broken or having holes, indicating that those slabs were used somewhere else by the Corporation.

There was a leach ate pit filled with leach ate allowing percolation and overflow to the nearby areas including river Kadambrayar. No sheet piling as claimed in the previous meeting was seen at the site. No device was seen installed in the leach ate pit for measuring the leach ate produced at the yard. Therefore, no reliable data was available. Given the quantity of waste received (approximately 100 tonnes per day), and the lack of frequent turning, the quantity of leach ate produced may be expected to be 50 m^3 per day as per expert opinion.

A leach ate treatment plant has been erected at the site. It was not functioning. The design is non-standard, and it is unlikely to be effective. Therefore, the environmental Engineer of Kochi Corporation who was there at the site was advised that the best option is to collect the leach ate and deliver the same by tanker to nearby Septage Treatment Plant at Brahmapuram or at Wellington Island.

On 14.6.2019, the SLMC in its meeting at Thiruvananthapuram reviewed the progress in the implementation of the previous directions to the Kochi Corporation as Agenda No.7. The true extract of the minutes on the said agenda is given below.

"Progress regarding the implementation of the directions of SLMC on Brahmapuram issue

It was noticed with distress by the SLMC that a good number of directions issued to the Corporation in the matter are yet to be complied with and therefore expressed displeasure over the same.

The Chairman, SLMC as well as the Additional Chief Secretary, Local Self Government opined that significant progress in waste management has to be made by the Kochi Corporation. It was noticed that wastes are being dumped on the side of the Bypass Road, Subash Chandrabose Road, K B Jacob Road, BOT Bridge to Alexander Parambithara Road, Sahodaran Ayyappan Road & Banerjee Road even if Kochi Corporation declared these roads as Zero Waste Road.

<u>The following resolutions were taken in the meeting:</u>

1. ***The proposal for bio-mining is to be vetted by PCB.***
2. ***Suchitwa Mission shall prepare proposal for bio-mining at Kozhikode, Njaliyan Parambu also.***
3. ***The list of bulk generators has to be submitted by Kochi Corporation within 15 days.***
4. ***Directions shall be issued by the Corporation to the bulk generators to take steps to channelize their own wastes. As the same is homogenous and clean, channelization can easily be done.***
5. ***The details of wards, in which segregation is complete are to be submitted.***
6. ***Segregated plastic waste for shredding has to be stored in areas attached to the zonal offices of the Corporation.***
7. ***Training for commercial establishments, hotel and restaurant associations and residents associations be given by Suchitwa Mission. (Action: Suchitwa Mission)***
8. ***The Corporations shall submit action plan containing the following details;***
    a. ***Action taken by Kochi Corporation in each ward for waste management as per SWM Rules, 2016.***
    b. ***Details regarding Projects which will be implemented urgently.***
    c. ***Details for improving the existing waste management facility.***
    d. ***Details of existing material collection facilities (MCFs)***
    e. ***Details of wards in which MCFs have to be established.***
    f. ***Details of places were Resource Recovery Facilities (RRFs) are functioning.***
    g. ***Details of the locations in which RRFs has to be newly established.***
9. ***The Corporation shall publish the following pieces of information in the website for the public.***
    a. ***Details of locations at which bio-degradable waste treatment bins are functioning.***
    b. ***Details regarding when and where the non bio-degradable wastes will be collected.***

c. ***Details regarding locations where bio bins for bio-degradable wastes collection have been established.***
d. ***Locations where MCFs are functioning.***
e. ***Locations where RRFs are functioning.***
f. ***Details regarding agencies entrusted for waste collection on ward basis.***
g. ***Details regarding where the waste collected by the above agencies are treated.***
h. ***Details regarding collection of non biodegradable waste.***
i. ***Details regarding the treatment of how and where non biodegradable wastes are treated.***
j. ***Source collection shall be extended in all wards as per NULM project.***

10. ***The Corporation should examine how the service of Clean Kerala Company be made use of for treatment of no-biodegradable waste & e-waste.***
11. ***Kochi Corporation should take legal action against open burning non- biodegradable waste including plastic and dumping of waste in water bodies.***
12. ***Corporation shall take steps to establish MCFs in all wards and RRF at least in six wards.***
13. ***Corporation shall prepare an action plan for developing a business model for effective treatment of waste.***
14. ***Identity card should be issued to all workers engaged in waste collection. Necessary training should be imparted to workers.***
15. ***If possible, non degradable waste other than plastics should be collected one or two days during every month.***

The aforesaid directions as well as the previous directions which were not hither to complied with shall be implemented in letter and spirit within 30 days from today. The failure will be taken note of seriously."

The progress in waste management in Kochi Corporation with special reference in Brahmapuram plant was again considered by the SLMC in its meeting held on 3.8.2019 as Agenda No.2. The Corporation had submitted an action plan as well as action taken report before SLMC in the said meeting which are appended as **Annexure-X3 & X4** respectively to this report. The true extract of the minutes on the agenda No.2 of the meeting dated 03.08.2019 is given below.

"**Progress of waste management in Kochi Corporation with special reference to Brahmapuram dumping yard**

The Action Plan as well as the action taken report submitted by the Secretary, Municipal Corporation, Kochi which are appended are Annexures-A and B to these minutes were considered by the Committee.

The Chairman, SLMC observed that if the proposed action plan is adhered to, the Corporation would not become fully compliant regarding the implementation of the Environmental Laws within the time (one year) specified by the Hon'ble National Green Tribunal. The progress of bi-mining proposed by the Corporation was also enquired into by the Chairman.

The Environmental Engineer, Kochi Corporation replied that a proposal was submitted to the Kerala State Pollution Control Board for vetting. A presentation was also done by him on the action taken so far as per the previous directions issued by the SLMC.

The Chairman, Kerala State Pollution Control Board clarified that the proposal had been vetted and returned to the Corporation. It was also asserted by him that the contractor who is engaged for bio-mining should enter into agreements with cement industries as well as thermal power plants for off take of the combustible fraction of waste.

The Additional Chief Secretary, Local Self Government Department instructed that, the Environmental Engineer of the Corporation should visit the office of the Kerala State Pollution Control Board and finalize the proposal expeditiously in a joint sitting. The Corporation was directed to ensure that un-segregated waste do not reach Brahmapuram Plant.

The Member Secretary, Kerala State Pollution Control Board cautioned that the Board would be constrained to levy Environmental Compensation for violation of Municipal Solid Waste Management Rules.

The Environmental Engineer, Kerala State Pollution Control Board informed that the Board had directed the Corporation to monitor the quality of treated leach ate.

Executive Director, Suchitwa Mission suggested that in addition to door to door collection, there should be manned common collection points where people can drop off wastes, as the same would be helpful for the people who are unable to adjust with collection time table of the Corporation.

The following resolutions were taken in the meeting:

1. ***Corporation should finalize the tender specification within five days.***
2. ***Contractor appointed for the bio-mining should enter into agreement with Cement Industries/Thermal Power Plants for off take of the combustible fraction of wastes.***
3. ***Pipe line for conveying the leach ate should be laid from the uncovered leach ate collecting pit at Brahmapuram to the Septage Treatment Plant for treatment.***
4. ***The Health Supervisor of Cochin Corporation Sri. Thomas Joshy should ensure that, 100% door to door collection from all households in all the seventy four wards of the Corporation as well as commercial institutions is implemented by 31st of August. The Secretary should monitor the progress on weekly basis.***
5. ***The report regarding door to door collection should include details such as frequency of collection of biodegradable and non bio degradable wastes, number of workers engaged and number of vehicles utilized for this purpose.***
6. ***The proposal for bio-mining got vetted by the KSPCB shall be implemented within three weeks."***

Meanwhile, the Chairman, KSPCB issued a notice on 12.10.2019 to the Corporation of Kochi under Section 5 of the Environmental Protection Act, 1986 for non compliance of Solid Waste Management Rules, 2016 with a direction to take steps to provide biomethanation plant for the food waste generated within the Corporation and to report compliance of all the directions referred to in the notice within 15 days for avoiding further action including recovery of environmental compensation for noncompliance. Copy of the said notice is appended as **Annexure-X5** to this report.

The Secretary, Kochi Corporation gave a detailed reply dated 28.10.2019 (wrongly typed as 25.07.2019 on the facing sheet) along with a report regarding the actions said to have taken after the meeting of the SLMC on 03.08.2019. The copy of the reply notice along with the action taken report is appended as **Annexure-X6** to this report.

For examining the genuineness of the averments in Annexure-X6, the Chairman, SLMC conducted a local inspection of the Brahmapuram site along with Chief Environmental Engineer, Regional Office, KSPCB, Ernakulam on 16.10.2019. The inspection revealed the following:

The site was in a state of disrepair. The onset of monsoon during the previous months had worsened the situation. Various short comings on the part of the Corporation in maintaining the facilities in accordance with the Solid Wastes Management Rules and the directions of the SLMC were noticed.

No records were provided for assessing the quantity of manure production. Previously, the manure called 'city compost' generated in the yard, had been subjected to chemical analysis. It was found that the manure did not meet the standard stipulated.

The Corporation had failed to set up anaerobic digesters proposed by the KSPCB in reducing the quantity of solid waste.

No action had been taken to install proper effluent treatment facilities. All most all windrow sheds were in a dilapidated state.

The drain provided for leach ate was found blocked with hard slurry flowing from the compost yards and the primary biodegradable dumping area. Though it was reported by the Corporation that works on the drain had almost been completed, a major portion of it was found open, giving chance of oozing slurry from open dump sites and storm water entering it. There was no regular removal of leach ate from the collecting pits.

Water storage facility to prevent fire hazards was not seen provided in the site, in spite of specific repeated directions in the matter.

Though, directions were issued to install sufficient surveillance cameras inside the plant, (this was on account of a suspicion raised by the Corporation that the first fire incident might be on account of sabotage) only nine cameras were seen installed which are insufficient to cover all the strategic points.

After the inspection the Chief Environmental Engineer has submitted a report on 18.10.2019. A copy of the same is appended as **Annexure-X7** to this report. In Annexure-X7, it is proposed that all the cameras be connected to the Regional office to help its surveillance team to watch the day to day operations at the site.

Again, the SLMC in its meeting held on 8.11.2019, reviewed the issue as Agenda No.2.

The true extract of the minutes on said agenda is given below.

"Review of Progress of Waste Management in Kochi Corporation with special reference to Brahmapuram Dumping Yard

The Chairman, SLMC informed the meeting that he along with the Chief Environmental Engineer, Kerala State Pollution Control Board, Regional Office, Ernakulam conducted an inspection of the Brahmapuram Dumping Yard on 16.10.2019 to verify whether the directions issued by the SLMC to the Municipal Corporation, Kochi regarding the activities to be done to mitigate the existing hazards. The Chairman informed that the experience of quite distressing.

It was pointed out that the specific directions issued by the SLMC regarding the installation of cameras, installation of water tank, providing drains for conveying leach ate, etc., were not complied with. It was also pointed out by the Chairman that there are various shortcomings on the part of the Corporation in maintaining the facility in accordance with the Solid Waste Management Rules and as directed by the SLMC. The following are the shortcomings pointed out by the Chairman.

a. The quantity of city compost produced out of the bio-degradable waste dumped at the site is marginal compared to the daily waste collected by the Corporation.
b. No records were provided for assessing the quantity of the production of the city compost.
c. The Corporation has failed to set-up anaerobic digesters proposed by the KSPCB which could have reduced the quantity of solid wastes collected and dumped at the yard.
d. No action has been taken to install proper effluent facilities as agreed to by the Corporation in the previous meetings.
e. All the windrow sheds are in a dilapidated state.
f. The construction of the drain around the dumping site is not completed so far.
g. The portion of the drain already constructed is not properly covered by concrete slabs. Old slabs discarded elsewhere are seen placed over the drain at few places for name sake. As the drains are partly open there is every chance of oozed slurry from the open dump site and storm water entering the drain.
h. The existing drain provided is blocked with hard slurry flowing from windrow compost yards and the primary bio-degradable dumping area.
i. The leach ate collected in the existing leach ate collecting pit which is only few meters away from Kadamprayar is not being removed regularly, resulting in overflow of the leach ate to the nearby vicinities including the Kadamprayar, especially during rainy season.

The representatives of the Kochi Municipal Corporation were directed to furnish their explanation for the aforesaid non-compliances.

The Assistant Secretary, Kochi Corporation reported the following:

- Security has been provided.
- Cameras have been installed.
- Tender was called and agreement signed for road construction.
- Administrative and technical sanction has been obtained for water tank.
- Retender was called for legacy waste management but nobody has responded.

The Executive Engineer, Kochi Corporation submitted the following:

- The area is flooded and works can be done only after the water recedes.
- Drain has been completed.
- For covering the drainage with slabs, decision of the council has to be obtained.
- New trommel will be installed
- All quotations are submitted at rate above the Public Work Department rate.

The Additional Chief Secretary, Local Self Government Department observed that the minutes of the SLMC meetings ought to have been included in the agenda of the Council meetings. He observed that this has not been done.

The Chairman, SLMC expressed displeasure over the inaction on the part of the Corporation in complying with the directions of the SLMC in letter and spirit. He also warned that if the Pollution Control Board does not take action against the Corporation, the matter will have to be reported to the Hon'ble NGT for appropriate action.

The Member Secretary enquired regarding the installation of digester and warned that Environment Compensation would be calculated from the date of visit of Regional Monitoring Committee. She also directed the Corporation to submit proposal for sewage treatment for submitting to the NGT as per a recent order.

The Chairman, Pollution Control Board stated that bio-digester has to be installed and the contention that bio digester is impractical is untenable. He also pointed out that the recent flood in Kochi City was mainly due to choking of drains by waste.

The Chief Environmental Engineer, Regional Office, KSPCB, Ernakulam informed the Committee that O.A.533 & O.A. 535 pertaining

to the issue shall come up before the Hon'ble NGT during the last week of November, 2019.

The Additional Chief Secretary, Local Self Government Department directed that Secretary and Superintending Engineer to attend the next posting of the cases before the Hon'ble NGT personally.

It was resolved that a report regarding the events hitherto taken place and the present situation be presented by the Chairman, SLMC before the Hon'ble NGT.

On 10.12.2019, the Kochi Corporation submitted another report regarding the action taken after the SLMC meeting held on 8.11.2019. The copy of the report is appended as **Annexure-X8** to this report.

On 11.12.2019, the Chairman, KSPCB issued a notice to the Kochi Corporation to show cause why the Board shall not recover Environmental Compensation of Rs.1,12,20,000 (Rupees One Crore Twelve Lakh Twenty Thousand) from 22.11.2018 to 30.11.2019 from the Corporation for not taking steps to provide leach ate treatment plant and biomethanation plant and the non-compliance of Rule 22 of the SWM Rules. The copy of the said notice is appended as **Annexure-X9** to this report.

Annexure-X9 notice was replied against by the Corporation on 1.1.2020, the copy of which is appended as **Annexure-X10** to this report.

Annexure-X9 notice was considered inter alia by the Chennai Bench of this Tribunal on 31.02.2020 in Original Application Nos.442/2013(SZ), 20/2017(SZ) and 276/2017(SZ). In para 7 of the order dated 31.02.2020 the Chennai Bench observed as under;

> "7. ***On going through the report submitted by the Kochi Corporation, we are not satisfied with the progress expected from them for implementation of the directions given by this Tribunal in O.A.No.606 of 2018. Even on the last hearing date in O.A.606 of 2018, the Principal Bench of National Green Tribunal at New Delhi had expressed its displeasure in the manner in which the implementation of Solid Waste Management Rules, 2016 are being carried out in the State of Kerala. It is not known as to what happened after the show cause notice issued by the Pollution Control Board. On receipt of the explanation from the Corporation, the Pollution Control Board is directed to pass appropriate orders and complete the proceedings initiated on the basis of their inspection***

and dispose of the same in accordance with law and come with compliance report before this Tribunal."

Further action from the KSPCB in the matter is awaited.

In the meantime, O.A.No.514/2019 came up for consideration of this Hon'ble Tribunal on 24.1.2020. On that day this Tribunal has ordered as follows:

"***In view of unsatisfactory state of affairs noticed above, let the Secretary, Urban Development, Kerala remain present in person on the next date with tangible progress failing which this Tribunal may be left with no other option except to take stringent measures for enforcement of law as per the provisions of the NGT Act, 2010.***

List again on 28.02.2020.

A copy of this order be sent to the Secretary, Urban Development, Kerala by e-mail."

As it is just and proper to submit a comprehensive factual report before this Hon'ble Tribunal for proper adjudication in the matter, the Chairman, SLMC along with the Chief Environmental Engineer, Regional Office, Ernakulam again conducted an inspection of Brahmapuram yard on 18.2.2020 at 11 a.m. Mr.Raphimon T.M., Health Inspector and Mr.Binoy, Overseer were there at the site. Mr.Kiran Surya K.T., Environmental Engineer of the Corporation joined later.

The windrow composting yard, the garland drains around the yards, the leach ate collection pit, plastic shredding unit, septage treatment plant, area earmarked legacy waste, etc were inspected. After inspection, the Chief Environmental Engineer has prepared a report which is appended as **Annexure-X11** to this report.

The following short comings were noticed during the inspection.

a. ***The condition of windrow composting shed was seen deteriorated. It is preferable to remove those structures as they are incapable of being repaired. (Kindly see Figures 1 and 2 of Annexure-X11)***
b. ***The production of compost is minimal on account of the sluggish nature of the bio-mining activity going on. Only three trammel machines were seen used which are insufficient to wipe out the***

quantity of bio-waste dumped at the site. Resultantly, the waste masses stocked are piling up. Thus legacy wastes get accumulated.

c. *In spite of the specific direction issued to cover the garland drains, several portion of the drain were left uncovered. At certain portions, the drain was covered with slabs of decrepit nature (Kindly see Figure 3 in Annexure-X11). As the drains are not constructed scientifically there are chances of percolation of leach ate to the surrounding area.*

d. *Leach ate was seen flowing in huge quantity through a small canal which in turn percolate down. This can be seen in Figure 2 of Annexure-X11.*

e. *Though, there were repeated directions to provide scientific leach ate collection pit of impervious nature, it was not done. (Figure 5 in Annexure-X11 is the present leach ate collection pit). The ongoing construction of a new collection pit was noticed near the side of the existing leach ate collection pit. (Kindly see Figure 6 in Annexure-X11) The construction of the same also is in an unscientific manner and without intimating the KSPCB. The officials presented at the site claimed that a new pit would be a concrete pit having a capacity of 75,000 Litres. As pointed out at the outset, the site is wet land near the river Kadambrayar. Unless proper construction of the pit as well as constant removal of leach ate from the pit are ensured, there would be chances of percolation and overflow, permitting the present affairs to continue.*

f. *Though there is a leach ate treatment plant in the yard it is not operational (Kindly see Figure 8 in Annexure-X11). The officials present at the site stated that there is plan to introduce another one. However, there is no specific proposal for the same.*

g. *Though there is a plastic shredding unit in the yard it is remaining idle. There were no signs of functioning in the near past. The officials could not give a cogent reply regarding the date on which the unit was closed.*

h. *The quantum of legacy waste could not be assessed till date. The corporation does not have any proposal to conduct survey for the*

assessment of the legacy waste (Figure 11 in Annexure-X11is the dump site of the legacy waste).

i. *The claim of the officials of the Corporation was that leach ate from the present collecting pit is being transferred daily in Tanker Lorries to the nearby septage treatment plant. At the time of inspection, a tanker lorry was seen at the site, loading the leach ate from the collection pit. This was seen taken to the septage treatment plant. However, it could be noted that on account of the construction of the new pit near the old pit, leach ate from the old pit has percolated to the new pit which was being siphoned out to the nearby land using suction pumps. A long hose was seen spread over the area to facilitate the siphoning process (Kindly see Figure 7 in Annexure-X11). Presumably, a major portion of the leach ate collected at the old pit and percolated to the new pit was being pumped out as above. The transportation of the leach ate to the septage treatment plant using tankers was for name sake only.*

j. *The officials, on the strength of a log book maintained in the septage treatment plant, claimed that approximately 5 loads of leach ate are transported daily from the pit to the treatment plant. However, the veracity of the same can be ascertained only if there are proper flow meters. The flow meter in situ was not functioning. The claim of the officials could not be verified from the recordings of the one and only camera installed on the front gate of the plant. The footage showed 12 vehicles have entered the premises on 16.2.2020. However, this include the vehicles carrying septage from other parts of the district also.*

k. *The outlet portion of the septage treatment facility was seen dirt as black coloured effluent was seen spread over there. The treatment effluent was seen discharged to the land on the western side of the treatment plant. On request, the officials submitted the analysis report of the effluent, dated 30.11.2019 issued by the District Office of the KSPCB, Perumbavoor. The copy of the said report is appended as Annexure-X12 to this report. As the said test report did not inspire confidence on account of the blackish nature of the effluent, the*

Regional Office of the KSPCB was directed to take samples of the effluent again and subject the same to further analysis.

l. ***It was distressing to note that in spite of the repeated directions to provide an overhead tank of sufficient capacity with heavy duty pump-sets to prevent fire hazards, the same has not been provided till date. Every time the authorities of the Corporation gave readymade answers viz., that the work has been tendered, clearance is awaited from other authorities etc. As auto ignition in waste dumping yards is a common phenomenon, especially during summer season, it is inevitable to have a fire fighting devise at the yard for immediate prevention of fire breaks.***

The only direction seen implemented by the Corporation is the construction of roads through the different parts of the dumping yard its makes interior portions accessible to vehicles.

No sooner did the team reach the office after inspection, information was received that another fire broke out at Brahmapuram Yard at about 2.30 p.m. on the same day, ie., 18.02.2020.

The surveillance team of KSPCB who reached the yard without delay, analysed the atmospheric condition using toxic gas analysers. On analysis, it was observed that the ozone concentration was beyond the tolerance level. It was 0.52 ppm where as the permissible limit is 0.1 ppm. However, by about 8 p.m., the concentration was seen reduced to 0.18 ppm. The test results are given in the concluding portion of Annexure-X11.

The fire could be contained by the fire department by the evening of 19.2.2020. This time it was easy for the fire force to reach the interior points of the yard as roads have been constructed inside the yard as directed by the SLMC.

After the fire incident during last year, the dioxin level at the area was got assessed by the CSIR-NIIST, Thiruvananthapuram. Therefore, the Member Secretary, KSPCB was addressed on 19.2.2020 to request the same authority to assess the present dioxin level at the site as well as the long term effect of such fire break out using the previous report for comparative

valuation. The copy of the said letter is appended as **Annexure-X13** to this report.

CONCLUSION

The issue at Brahmapuram Waste Treatment Plant cannot be considered in isolation as it is intrinsically connected with the waste management system in the city as well as in the neighbouring local bodies. As already pointed out though Brahmapuram yard is under the management of Kochi Corporation solid waste from five Municipalities and two Panchayaths reaches the yard. The legacy waste dumped at the site is in un-segregated form. The arrival of waste in the yard in the segregated form is of recent origin.

Solid Waste Management Rules, 2016 provides that waste has to be segregated at source, bio-degradable waste has to be composted and recyclable non-bio-degradable waste has to be recycled. Only those waste materials which cannot be recycled, be sent to incineration or land fill.

The State Government in its good intention to have a proper waste treatment system in the State had taken a decision to install waste to energy (WTE) plants in six different districts in the State, of which one is at Brahmapuram. However, the said announcement has created the scenario were all the stake holders including the Corporation have started thinking that all waste materials can be incinerated.

It is understood that the proposal for WTE plant at Brahmapuram has obtained environmental clearance. However, it is learnt that financial closure from the service provider is awaited. A baron land on the southern and western side of the septage treatment plant is identified as the site for WTE plant. However, it is a low lying area and it would take a considerable time for bringing the site to the level of the nearby road.

As the SLMC felt that the establishment of WTE plant is a time consuming process, directions were issued to the Corporation to dispose of the legacy waste part by part by means of bio-mining as per the guidelines of the Central Pollution Control Board involving a technical expert and to take necessary arrangements for addressing the present environmental issues till

the waste to energy plant comes into existence. It was also directed that if capping of waste is resorted to, it should be confined to inert waste as per the provisions of solid waste management rules, 2016. The said direction was given in the meeting held on 15.3.2019. However, the process of bio-mining is done at the yard at a low pace and as a result, the legacy waste is getting accumulated. Even on the day of last inspection, ie., 18.2.2020 only three trammel machines were functioning.

The quantity of waste generated in Kochi City alone is estimated as 350 to 400 tonnes per day, while the quantity received at Brahmapuram shows 120 tonnes per day. Some of the uncollected waste is seen treated at source but there is no data of quantity regarding the waste treated at source and its final disposal. It is essential to improve door to door collection to avoid littering and un-acceptable disposal methods. For a healthy solid waste management system door to door collection need to be dove-tailed with improved treatment facilities at Brahmapuram.

Here it is apt to note that the major portion of solid waste coming to Brahmapuram is bio-degradable waste. The moisture content of bio-degradable waste is nearly 80% of its total weight. If it is assumed that 100 MTs of waste is coming to the plant per day, approximately 60% of the same would be bio-degradable waste, ie., 60 MTs. Approximately 80% of the same would be moisture as stated above, ie., 48 MTs. That means nearly half of the waste reaching the plant is water. Out of non-degradable waste only plastic, the maximum of which may be 20%, ie., 20 MTs has the calorific value which provide energy to create steam. If proper segregation happens at source, approximately half of this ie., 10 MTs can be sent for recycling. Thus only 10 MTs of incinerate-able waste would be remaining to be used in WTE plant.

If non-segregated waste including bio-degradable waste is used in WTE plant, the captive energy required to dehydrate the biodegradable waste will make the project highly unviable due to the huge expenditure involved and the local bodies would be driven to the risk of bridging the viability gap.

Lack of segregations will result in valuable reusable and recyclables ending in incineration. Kerala is now an emerging swap shop region where

those things not useful are used by someone thereby enhancing the life cycle. However, recycling of plastic, glass, paper, metal, rubber, cloth etc. can happen only if segregation happens at source.

The waste management system in the State including Kochi City requires a radical change. What is required is a holistic, integrated and co-ordinated effort to implement the various provisions of environmental legislations from the grass root level.

The stake holders should consider reduction as the primary object of waste management. The ban imposed by the State Government on single use plastics recently is a welcome change. However, it is the responsibility of the local bodies to see that the same is implemented in letter and spirit.

Awareness programmes for the benefit of waste generators can be under taken with the assistance of bodies like District Legal Service Authority, Suchithw Mission as well as Haritha Kerala Mission. This may help to reduce waste generation in the long run.

Treatment of bio-degradable waste at source can be promoted under the supervision and guidance of the bodies aforesaid. There should be proper records regarding the quantity of wastes treated at source and its final disposal. Unauthorised disposal methods, under the pretext of treating wastes at source, have to be prohibited.

Door to door collection of waste which cannot be treated at source has to be improved to avoid un-acceptable disposal methods.

Proper segregation of waste should happen at source and the waste reaching the treatment yard should be in the segregated condition.

WTE plant is an effective solution in the field of waste management. But such plant should not incinerate BD waste or recyclable NBD waste. The incineration in WTE plants shall be confined to soiled NBD waste, sanitary waste and hospital waste. The use of bio-degradable waste and recyclable non-bio-degradable waste in WTE plants has to be discouraged.

The planned 500 tonne per day Waste to Energy Plant at Brahmapuram, when commissioned, may solve the problems at present. The quantity of dry

waste collected may have to be increased to provide adequate fuel for the plant. The proposed project has a Biological Mechanical Treatment (BMT 'Biodrying') unit for drying mixed waste to produce suitable fuel for the WTE plant. Segregated wet waste is not suitable for direct use in WTE plants.

An anaerobic digester of 100 tpd capacity will have to be installed at Brahmapuram without much delay. The capacity can be increased to 200 tpd with installation of additional digesters as required. Anaerobic digester will allow the treatment of wet waste without creating odour, smell and leach ate.

As the planned WTE plant is unviable for source-segregated wet waste, digesters will have to be provided even after installation of WTE.

Therefore, the Kochi Corporation should take immediate steps for anaerobic digestion of wet waste at Brahmapuram without waiting for the establishment of WTE plant. Simultaneously, the bio mining process of legacy waste has to be continued with full strength and figure, deploying sufficient number of trammel machines and this has to be completed within a time schedule. The remaining inert waste after the separation of city compost can be used in the WTE plant. To prevent the existing environmental threats due to the flow of leach ate as well as the recurrent fire hazards, the directions hither to given by the SLMC to the Corporation are to be implemented.

Strict time bound directions from this Hon'ble Tribunal is required to solve the present problems.

Dated this 22nd day of February, 2020.

JUSTICE A.V.RAMAKRISHNA PILLAI
CHAIRMAN, SLMC, KERALA

ANNEXURE X1

MINUTES OF THE SPECIAL MEETING OF THE STATE LEVEL MONITORING COMMITTEE (SLMC) CONSTITUTED BY THE NATIONAL GREEN TRIBUNAL (NGT) HELD AT 2 PM ON 1ST MARCH 2019 AT BANQUET HALL, GOVT. GUEST HOUSE, ERNAKULAM IN RELATION TO THE FIRE HAZARD HAPPENDED AT BRAHMAPURAM ON 22.02.2019

SLMC/KER/MNTS-SPL/1/2019

Present:

1. Justice A.V. Ramakrishna Pillai, Chairman, SLMC.
2. Smt. Sreekala S., Member Secretary, SLMC (Member Secretary,KSPCB)

(Other members could not attend the meeting)

Participation:

1. Sri. P T Thomas, MLA, Thrikkakkara
2. Smt. Soumini Jain, Mayor Kochi Corporation
3. Sri. Ajit Haridas, Chairman, KSPCB
4. Sri. M A Baiju, Chief Environmental Engineer, KSPCB
5. Sri. Rakesh Kumar R, Secretary, Kochi Corporation
6. Sri. Dr. N K Kuttappan, DMO, Ernakulam
7. Smt. Prathibha Ansari, Health Standing Committee Chairperson
8. Sri. A B Salim, Welfare Standing Committee Chairperson
9. Sri. C J Joshy, Health Officer I/C
10. Sri. Kiran Surya K T, Environmental Engineer, Kochi Corporation
11. Sri. Titus H, Executive Engineer, Kochi Corporation
12. Sri. Suliaman C M, Deputy Engineer, Kochi Corporation

(The MLA's of Ernakulam and Kunnathunad as well the District Collector, Ernakulam were asked to attend the meeting. The MLA's did not respond. Though the District Collector could not attend the meeting on account of official exigencies he had expressed his readiness to carry out the directions of the SLMC).

The Chairman addressed the meeting informing the purpose of formation of SLMC and the present meeting. The Chairman informed that he had visited the Brahmapuram site at the time of fire and had filed a preliminary report to the Hon'ble NGT. The necessity of filing another detailed report based on the discussion of the present meeting was also pointed out.

The important paragraphs of the judgment of NGT in OA 533/2018 regarding the waste disposal of Brahmapuram site were read out and the Mayor was requested to report the steps taken in compliance of the

judgment. In the discussions followed, the Mayor, the Secretary Cochin Corporation, District Medical Officer, Sri. P T Thomas MLA and various officers of the Corporation reported the problems faced in solid and liquid waste management as well as the steps taken in compliance with the order of NGT, after the fire hazard. The proposed action plan was also discussed.

Smt. Soumini Jain, Mayor:

1. A stay order has been obtained from the Hon'ble High Court against remittance of fine. The Corporation has taken several steps to successfully deal with the solid wastes collected day to day.
2. A proposal for establishing a plant for converting the entire waste to energy has been submitted by the Kochi Corporation to the Government for which all the clearances except environment clearance has been obtained.
3. The Corporation is at present collecting waste from five municipalities namely Maradu, Thrikakkara, Kalamassery, Aluva and Eloor and two panchayats also which do not have sufficient land for solid waste disposal.
4. At present the corporation is operating 100KLD leachate treatment plant as a temporary measure. Three phase electricity connection for this plant is applied for, so as to ensure continuous operation. Full fledged plant was proposed as a long term measure.
5. Arrangements have been made for segregating the waste before collection. Door to door collection is also arranged.
6. Plastic of thickness below 50 micron is banned. Gauge meter for measuring the thickness is being provided to corporation staff. In order to stop the sale of plastic carry bag less than 50 micron size a meeting is proposed with wholesalers of carry bags.
7. Security and patrolling facility is provided at the Brahmapuram site.
8. Lighting facility is also provided at the Brahmapuram site.
9. Arrangements for wetting the dumped wastes is provided.
10. Drains around the dump site have been cleared. Maintenance was also done to make the collection of leachate easy.
11. A 1500 m long road has been constructed through the periphery of the dump site.

12. Awareness programme to public not to deposit waste particularly bilodegradable waste in tied plastic bags on the road side is proposed.
13. Sheet pilling has been done to prevent seepage along the length of Kadambra river.
14. In order to fill the gap ~~of~~ between production cost and income generation from the proposed **waste to energy plant,** they have made agreement with BPCL to spend their CSR fund and Suchitwa Mission into the project.

Sri.Rakeshkumar.R Secretary of corporation.

The statements made by the Mayor were corroborated. He added as follows:

1. Only the segregated waste are brought to the site.
2. Door to door collection is provided to great extent.
3. Only the road sweepings and waste dumped on the road side are the mixed waste brought to the site.
4. Material recovery centres are provided.
5. Covered vehicle are provided for waste transportation.
6. Full time surveillance is provided at the site.
7. A 10m wide road is being constructed.
8. Two numbers of motors are provided for continues wetting of the heaped waste, in order to avoid further instances of fire.
9. Generally the quantity of wastes collected per day is 350 tonnes (250 tonnes of biological waste and 100 tonnes plastic waste) approximately.
10. Market waste is properly segregated and brought to the site.

Sri.Kiran Surya, Environmental Engineer, Kochin Corporation.

He explained the short term, intermediate and long term measures proposed by the corporation.

Short Term measures

1. All the sieves (Tromwells) of the biological waste processing plant have been repaired.
2. Twenty three windows are prepared in the composting shed.

3. New drains have been constructed and leachate is being transferred to treatment plant. Construction is reported to be difficult as the soil is clayey.

Mid term measures

Expression of interest has been called for capping the legacy waste. Three agencies have applied which are to be opened on 7th March 2019.

Long term measures

1. Capping works to be completed.
2. Scientific sanitary land fill to be set up.
3. Permanent set up to be provide for leachate treatment for which detailed project report (DPR) is being prepared.
4. Waste to energy plant to be set up in 18 months.

Sri.P.T.Thomas, MLA, Thrikkakara Panchayat.

1. The wastes from 5 municipalities and 2 panchayats in addition to the Kochi Corporation are being brought to the Brahmapuram site. The dumping of un treated waste and the open transportation of the waste is causing severe public nuisance particularly to the people of Thrikkakara constituency.
2. The other local bodies are not concerned with the disposal of their wastes, since it is being brought to the Brahmapuram site. Hence responsibilities of each local body have to be fixed.
3. Even though there is specific agreement regarding the transportation of the wastes the conditions therein are not complied with. Open transportation and spilling of the waste into the roads is common practice. Several vehicles are under repair and instead of enclosed vehicle as per agreement open vehicles are used.
4. Common responsibilities are to be decided and assigned to corporation officers also regarding the waste transportation disposal etc. At present vehicle log book is not maintained. Cameras are not functioning. Even a plant set up spending 12 Crore Rupees for wastes processing is not functioning.
5. Door to door collection has to be made more effective. Resident association and Kudumbasree participation has to be ~~assured~~ ensured

6. The wastes collecting employees are not sufficiently protected from health hazards. They shall be given adequate protective equipment/health services.
7. The present wastes dumping yards are to be made proper.
8. The health wing of corporation need to function more effectively.
9. Sewage, septage and chiken wastes are being disposed to all the water sources in the district. Kadambra river is severely polluted particularly in the rainy season.
10. The apartments are not operating their sewage treatment plant on account of increased electricity consumption. They are disposed of through septage collecting lorries. These vehicles are disposing the septage in the nearest available water sources.
11. Even the segregated plastics are not disposed effectively but simply burned.
12. The waste to energy plant proposed by corporation is under stood to be approved and signed by the Government. Its viability should be looked into.

DMO, Dr.N.K.Kuttappan.

DMO informed that no much health issues were reported due to the fire hazard.

Chairman, KSPCB, Dr.Ajit Haridas.

The chairman informed that during site inspection, solid waste were found to be burnt only about 6 inch depth. All the rest of the solid waste dumped at the site are not affected. Auto ignition process at the waste dumping site is common. He has made the following suggestions:

1. The solid waste shall be processed and disposed of as far as possible. Only the inert solid waste shall be capped to avoid fire hazards.
2. Door to door collection shall be made more effective so that there will not be any more dumping of wastes on the road sides.
3. Community bins shall be avoided.
4. Waste to energy plant is not cost effective. In foreign countries incineration plants are most commonly used. First stage of the plant, that is, biological mechanical treatment (BMT), turning wastes into fuel briquettes (RDF) is viable. The fuel thus formed

may be transferred to cement factories as fuel were it will be burned at very high temperature. Thus there will not be pollution generation in the form of air or ash. The BMT plant will be designed against fire hazard, as a completely enclosed shed. Odour control arrangement can be easily done.

5. The cost of waste processing as per this plant will be only Rs.2/- per kg where as that for waste to energy plant will be Rs.5.8u/- per kg.
6. Charred samples have been collected from the burned site for analyzing the dioxin generated due to the burning which will take about one week time for getting the results.
7. Modern sewage treatment plant with vacuum suction facilities are very much effective for treating the sewage from the corporation area.

The chairman (SLMC) instructed the corporation secretary and the chairman, Pollution Control Board to submit the reports in writing before the next SLMC meeting so that remedial measures could be suggested in the next meeting. The Chairman, KSPCB assured to submit the technical report in the next meeting itself. The Chairman also stressed on the importance of taking adequate measures for solid waste disposal controlling air and water pollution by taking public into confidence.

The meeting concluded at 5 PM.

Justice A.V. Ramakrishna Pillai
Chairman

ANNEXURE X2

Study Report on the emission of dioxins and dioxin – like PCBs during the dumpyard fire at Brahmapuram, Feb 2019

Environmental Technology Division
CSIR- National Institute for Interdisciplinary Science & Technology (CSIR- NIIST)
Thiruvananthapuram, Kerala – 695 019

April 2019

Acknowledgements

This study was urgently taken up at the initiative of CSIR- NIIST as soon as the incident of fire breakout at Brahmapuram was reported in media. Open burning of municipal solid wastes is a major source of dioxin emission in developing countries and dumpyard fires are very common in the country. No study report is available in India on the emission of dioxins during a dumpyard firebreak out.

We thank Dr. A.Ajayaghosh, Director, CSIR- NIIST for directing us immediately to take up the study and facilitating the administrative and logistic support in executing the work at short notice. We gratefully acknowledge Dr. Ajit Haridas, former Chief Scientist, CSIR-NIIST & Chairman, KSPCB for suggesting the study and for his significant contributions in establishing and further upgrading the Dioxin Research Laboratory at CSIR-NIIST.

We gratefully acknowledge the significant contributions of Late Dr. Anbu Munusamy in establishing the facility at CSIR-NIIST. Since June 2014, Dr. K. P. Prathish is in charge of the facility.

CSIR-NIIST is the first institute in the country to carry out dioxin analysis and the facilities at NIIST has been upgraded under DSIR-NIIST- CRTDH project in 2016. We gratefully acknowledge the support of Department of Scientific & Industrial Research (DSIR) for funding the upgradation of the facility under CRTDH project.

CSIR-NIIST recently submitted the first study report in India on the "Determination of emission factors of dioxins from open burning of municipal solid wastes in Kerala" to Kerala State Pollution Control Board and other stakeholders such as MoEFCC, MoHUA and CPCB. We gratefully acknowledge the support of KSPCB in funding the project.

The present project was carried out by the following team:

1. Dr. K. P. Prathish, Scientist, CSIR- NIIST
2. Mr. Shaji Kumar. V.K, Senior Technical Officer, CSIR- NIIST
3. Mr. Ajay. S.V, Research Scholar, CSIR- NIIST
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Executive Summary

Open burning of municipal solid wastes is one of the major sources of dioxin emission in developing countries. Dioxins are a class of persistent organic pollutants (POPs) unintentionally produced during various combustion processes such as waste incineration, open burning of MSW, chemical and metallurgical manufacturing processes etc. CSIR- NIIST established the first dioxin research laboratory in India and is a participant institute in India's National Implementation Plan (NIP) submitted in April 2011 for meeting the country's obligations towards Stockholm Convention. The lack of dioxin emission data from open burning of MSW was one of the major shortcomings identified by UNIDO's independent evaluators in India's NIP. A study funded by Kerala State Pollution Control Board (KSPCB) was carried out by NIIST on the "Determination of emission factors of dioxins from open burning of municipal solid wastes in Kerala" and the report was submitted in December 2018.

An incident of massive fire breakout was reported on 23rd February 2019 at Brahmapuram waste dumpyard in Kochi. The total area of the site is approximately 106 acres and about 60 acres is covered with dumped wastes. The smoke from the fire spread to the city and some of the residents required medical attention for respiratory ailments. The fire was brought under control after three days on 25th February evening. Subsequently, there have been smaller fires at least 6 times till April 2019. Dumpyard fires are common during dry season.

CSIR-NIIST was sensitized by the news of fire breakout in media on 23/02/2019 and immediately realized the need to carry out onsite ambient air and residual ash sampling during the incident. Dr. A. Ajayaghosh, Director, CSIR- NIIST deputed a team led by Dr. K. P. Prathish, Scientist, CSIR- NIIST to the site and the ambient air sampling was initiated in the afternoon of 24th February 2019. Ambient air sampling was carried out using high volume sampler at the dumpyard, powered by portable generator. The ambient air, residual ash and sediment samples were collected and transported to Dioxin Research Laboratory on 26th February 2019. The sample preparation, analysis and quantification of dioxins and PCBs were carried out at the NABL accredited (ISO/IEC 17025:2005) laboratory at CSIR-NIIST.

The following are the major findings of the present study.

- Dioxins were detected and quantified in ambient air, residual ash and sediment samples collected from the premises of waste dumpyard during fire break out.

- The average dioxin levels observed in **ambient air** was found to be **10.3 pg TEQ/m^3**. The observed levels are **50 and 10 times higher than reference and field blank data**.

- The average dioxin concentration observed in **residual ash samples** collected from different locations in the fire covered area is **158.5 ng TEQ/kg of ash**.

- The observed dioxin levels in **sediment samples** collected from nearby marsh fields is **6.8 ng TEQ/kg**.

- The dioxin generated by the fire is given by Emission Factor x Activity Rate.

    - The Activity Rate = total quantity of MSW burned = Area burned (from satellite photo of 23/2/2019) x burn depth (20 cm as given by Dr.Ajit Haridas), and bulk density (350 kg/m^3) = **1800 tonnes (appr.)**
    - The **Emission Factor for dioxins** as determined in "Burn-hut" at CSIR-NIIST is **39.81 µg PCDD-F TEQWHO/ ton of waste burned**.
    - Hence, estimated dioxin emitted = **72 milligram Toxicity equivalence (TEQ).**
    - The WHO /FAO maximum tolerable monthly intake of dioxins for humans is **70 picogram TEQ/kg body weight** (tolerable annual intake for a 65 kg person is 54.6 nanogram TEQ). **<u>While only a very small fraction of the dioxins generated reaches humans via the food chain,</u>** the total dioxin generated is sufficient to exceed tolerable annual intake of 72 x 10^{-3} / 54.6 x 10^{-9} = 1.3 million persons

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1. Introduction

Municipal Solid Waste management is an important problem faced by developing countries like India. The major cities in India faces the threats of increasing municipal solid waste generation and it has become a big burden on both the local bodies as well as public. Kerala is one among the most densely populated states in India. Kerala is facing a crisis situation in MSW management due to unscientific practices, shortage of wasteland and huge protest from citizen on acquisition of land for treatment plants learning from the past unsuccessful and bitter experiences. The increasing population, urbanization and improvement in quality of life are the main reasons for the rapid expansion of quantity of MSW. Kochi is the commercial and Industrial capital of the state of Kerala. The total solid waste generation rate is 180 -250 metric tonnes per day [1]. Unlike other cities like Thiruvananthapuram and Kollam, Kochi city has a waste treatment plant operated by corporation. The waste treatment plant of the city is located at Brahmapuram, which is in the vicinity of smart city project. The plant is on the shores of Kadambrayar with an approximate area of 106 acres. The plant treats only biodegradable waste and all the other waste is being dumped outside the plant in an unscientific manner. Open dumping of the waste is an unhygienic process and it can cause severe health issues. However, the most common type of waste management practice followed in Indian cities is open dumping of waste [2]. Unlike other Indian cities the more congested and populated cities like Kochi is extremely vulnerable to the consequences of open dumping of MSW. The estimated waste in the waste dump is approx. 800,000 tonnes, spread over 60 acres of land [1]. The wastes from nearby municipalities such as Ankamaly, Aluva, Kalamassery, Thrikkakkara, Tripunithura are also taken to Brahmapuram and more than half of the plant area is now completely immersed in wastes. A major share of everyday wastes including plastics, non-biodegradables and hazardous wastes are open dumped outside without any proper attention.

An important consequence of such open dumping of wastes is the break out of spontaneous fires. A major fire break out occurred on 22nd February 2019 at Brahmapuram waste treatment plant, where about 8 lakh tonnes of wastes are accumulated. The city was engulfed by thick smoke on the early hours of 23rd February 2019. The intense smoke created much health

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effects and breathing problems to the residents of the area and many were relocated from the vicinity of the treatment plant. The incident raised lot of concern to the residents of Kochi and invited sharp criticism to the stakeholders. The district collector coordinated the efforts of government machinery such as fire and rescue force, health department etc. to extinguish the fire and smoke. Finally the situation was brought under control and smoke was completely shut down after three days on 25th February evening.

Uncontrolled open burning of MSW has been recognized as the major source for un-intentionally produced persistent organic pollutants (U-POPs) called "Dioxins" into the environment. Dioxins (polychlorinated dibenzo p-dioxins - PCDDs) and furans (Polychlorinated dibenzofurans - PCDFs) are the prominent groups which comes under the U-POP category. Tetra chlorinated dibenzodioxin (TCDD) is the most toxic congener of dioxins and certain polychlorinated biphenyls (PCBs) which exhibits TCDD like property are known as dioxin-like PCBs (dl-PCBs). Dioxin is the general term used to represent these three groups of compounds viz. PCDDs, PCDFs and dl- PCBs and a total of 29 compounds from these groups are in the watch list. These compounds have very high persistency in the environment and can cause bio-accumulation. The major health effects associated with dioxins are immunotoxicity, carcinogenesis, reproductive ailments, kidney and liver malfunctions etc. These compounds are highly toxic to humans and animals at picogram levels. As per WHO/FAO, the maximum tolerable monthly intake of these highly toxic compounds is 70 pg TEQ/Kg body weight, above which human beings are vulnerable to its consequences. The POP phase out got an international recognition with Stockholm Convention in 2001. India, being a member nation of the convention in April 2006 developed a National Implementation Plan (NIP) on POPs. The NIP was focused to develop annual emission inventories of POPs and the country's road map to its reduction, elimination and exploring the Best Environmental Practices (BEP) and Best Available Technologies (BAT). India's NIP project was funded by United Nations Industrial Development Organisation (UNIDO) and the final report was submitted in April 2011[3]. The lack of adequate data on emission of dioxins during open burning of MSW was identified as a major shortcoming in India's NIP by UNIDO's expert evaluation team [4].

CSIR-NIIST is one of the participant institutes in the NIP preparation and has the state of the art analytical facilities and technical expertise to carry out dioxin analysis in environmental and food matrices. CSIR-NIIST has recently conducted simulated waste combustion studies in a laboratory scale "Burn Hut" and generated the emission factors of dioxins from open burning of MSW in Kerala. It is the first report in India. The study was funded by Kerala State Pollution Control Board and the final report has been submitted in December 2018. The study found that high levels of dioxins are emitted during open burning of untreated wastes and it is a serious problem to be addressed.

The present study was undertaken by CSIR-NIIST when fire at Brahmapuram was reported by news media. Director, CSIR- NIIST was appraised about the requirement to carry out onsite ambient air sampling and residual ash sample collection, and with his support, a pickup van, generator and two High volume ambient air PUF sampler were rushed to the site on the early morning (4 am) of 24th February 2019. The team led by Dr. K. P. Prathish, Scientist, Mr. Shaji Kumar V. K., Senior Technical Officer, Mr. Ajay S V , Research Scholar and Mr. Rajendra Prasad, Skilled worker, reached the site at around 11.30 am on 24th February 2019. The ambient air, residual ash and sediment samples were collected and transported to Dioxin Research Laboratory on 26th February 2019. The sample preparation, analysis and quantification of dioxins and PCBs were carried out at the NABL accredited (ISO/IEC 17025:2005) laboratory at CSIR-NIIST. The fire report supplements our previous report on "Emission factors of dioxins from open burning of municipal solid wastes in Kerala" submitted to Kerala State Pollution Control Board in December 2018. We hope that these studies will help Government to take important policy decisions on scientific solid waste management.

2. Experimental Section

2.1 Materials and Methods

2.1.1 High Volume Polyurethane Foam Sampler for Ambient Air Sampling

Ambient air sampling of Dioxins and PCBs were carried out by passing large volume of air through glass micro-fibre filter and Polyurethane foam cartridge in a high volume sampler. The

high molecular weight long chain dioxins and PCBs associated with particulates are trapped on the filter. Due to the volatilization, the lower chlorinated dioxins and PCBs are not entirely associated with particulates and hence are not trapped on the glass micro fibre filter. They are predominantly adsorbed on to the polyurethane foam cartridge kept at the downstream of glass microfiber filter. Upon completion of sampling, filter paper as well as the PUF cartridge is extracted in Soxhlet apparatus by following standard procedures as given in sec.2.3. The final extract contains the total dioxins and PCBs sampled from the particulate and gaseous phase in the ambient air.

APM 460 PUF sampler from M/s. EnviroTech Instruments Pvt. Ltd. (Fig 1) was employed for the ambient air sampling from open burning sites in the study. The equipment consists of following parts.

1) Particle Fractionator: A cyclone device designed for flow range of 200 – 250 LPM for fractionating dust into two fractions. PM 10 dust is accumulated on the filter paper (8" x 10" size) while coarse dust is collected in a cup laced under the cyclone.

2. PUF Cartridge: Polyurethane foam for trapping the low molecular weight dioxins and PCBs

3. PUF Housing: Housing of APM 460 PUF is compatible with standard borosilicate glass cartridges available from SKC or other international vendors. It is lined with Teflon and fitted at the bottom of the filter adapter casting.

4: Recommended Filter: Any standard 8 "x10 "filter such as Whatman GD/A for sampling of PM 10 dust where high molecular weight dioxins and PCBs are collected with particulates

Sampling time: upto 48 hours depending on the expected levels and analytical capabilities

Sampling Time record: Electromechanical Time Totalizer accurate up to 0.6 minutes record actual time of the sampling.

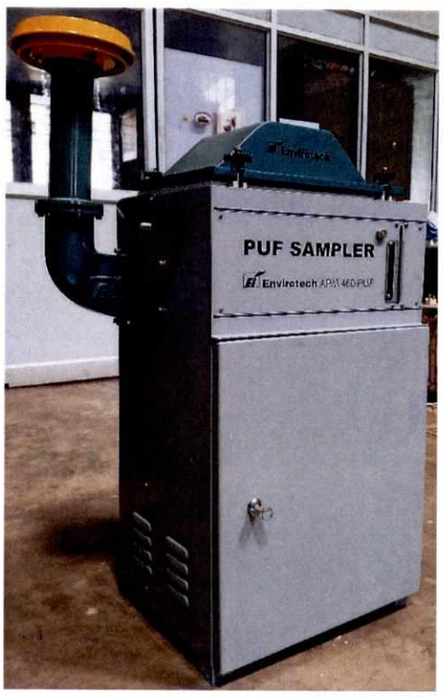

Fig 1: PUF sampler

2.1.2 Extraction and Cleanup apparatus/equipment

The HVS air, ash and sediment samples obtained from the Brahmapuram waste dump yard were extracted with organic solvents. Soxhlet extraction apparatus was used for the manual extraction of samples (Fig 2).

- The source material containing the compound to be extracted is placed inside the thimble. The thimble is then loaded into the main chamber of the Soxhlet extractor.
- A condenser is fitted above the main chamber
- The extraction solvent to be used is placed in a distillation flask and is placed on the heating element
- Upon heating the solvent in distillation flask will be evaporated and will be condensed down to the main chamber. The hot solvent will dissolve off the organic content in the

sample. The solvent will flush out to the flask by siphoning action. The process is repeated for several cycles so as to ensure maximum extraction of contaminants.

Fig 2: Soxhlet Extraction System

2.1.3 Automated sample cleanup system

The removal of unwanted matrix components such as lipids, fats and other organic impurities prior to GC- MS/MS quantification is essential to avoid interferences. Also the Non-dioxin like PCBs (NDL), Non-ortho PCBs (NO) and Mono- ortho PCBs (MO) has to be separated from the dioxin fraction. Manual cleanup methods are available. However, it is tedious and time consuming. To ensure fast and better cleanup efficiencies, we have employed DEXTech Automated Dioxin clean up system (Make: LCTech) (Fig 3). The system consisted of 3 columns connected in series – Universal silica column, alumina column and carbon column. MO-PCBs & NDL-PCBs are collected as first fraction and PCDD/F & NO-PCBs fraction is collected as second fraction from the system.

Fig 3: Automated Dioxin clean up system

2.1.4 Nitrogen Evaporator

The fractions obtained after cleanup is evaporated to dryness and finally reconstituted to 200 uL using nonane before injecting to GC-MS/MS. The fraction is concentrated to 200 uL by using Nitrogen Evaporator (FMS make, Fig 4). Nitrogen evaporator consists of nitrogen purging as well as heating facilities inside a closed chamber. Specially made concentrating tubes are used to perform the concentrating steps. Continuous vacuum will be applied inside the container withdrawing the evaporated solvent from the system. Purge flow and temperature shall be controlled throughout the process. The instrument minimizes the losses due to the volatility of the compounds and nullifies the chances of cross contamination. Ultra high purity (UHP) nitrogen is used for the purging process.

Fig 4: Nitrogen Evaporator

2.1.5 GC-MS/MS

A triple quadruple mass spectrometer (GC-MS/MS) is used for the quantification of dioxins, furans and PCBs. Agilent Technologies Make 7890 Series gas chromatrograph coupled to 7000C Triple Quadrupole MS/MS is used for the analysis (Fig 5).

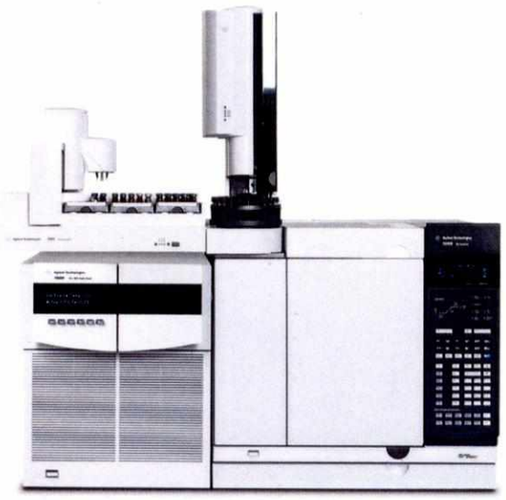

Fig 5: Gas Chromatography – Triple Quadruple Mass Spectrometer

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2.1.6 Standards, Chemicals and Solvents

All native dioxins, furans, PCB standards were procured from Cambridge Isotope Laboratories, UK. C^{13} labelled mixture of dioxins (DF-LCS-C200), non-ortho PCBs (MBP-CP), mono - ortho PCBs (MBP-MO) and cleanup standard spiking solution ($^{37}Cl_4$ - 2,3,7,8-TCDD) (Cat No: S13CSSA) were procured from Wellington Laboratories, England. Unlabelled and C^{13} labelled non-dioxin-like PCBs were procured from CIL. All high purity solvents such as toluene, hexane, dichloro methane were procured from Spectrochem, India. Keeper solvents such as nonane and isooctane were obtained from E-Merck, Germany.

2.2 Sampling of ambient air, residual ash and sediment

The ambient air sampling was initiated at 2.0 pm on 24th February 2019 and was operated till the fire was extinguished at around 4.00 pm on 25th February 2019. As the KSEB power supply was disconnected in the area, the samplers were operated on generator power. The sampling team tirelessly refueled the generator overnight to ensure its uninterrupted operation. There were difficulties in accessing a sampling location closer to the dump yard due to (1) It was unethical to interrupt selflessly hardworking firemen to extinguish the fire by installing the samplers in their pathway and (2) It was not safe to keep the generator near the fire range, where any uncontrolled fire would harm our equipments. Hence the ambient air sampler was kept about 50- 100 meters away from the epicenter of fire and was not in the predominant wind direction. With reference to the wind rose diagram obtained from the India Meteorological Department the predominant wind movement in the Cochin area was in the north-east direction. The dumpyard area in the north- east direction was fully covered with huge waste piles and leachates and hence installing samplers and generator was extremely difficult in the north east direction. Hence active sampling in the pathway of smoke movement was not possible and the sampling done south-west direction can be considered as a passive ambient air sampling at the site.

Pre-weighed filter papers and pre-cleaned polyurethane foam plugs were set onto the sampler and started the sampling at around 2.00 pm. The sampling was conducted with periodic refueling of generator at regular intervals to ensure uninterrupted operation. The samplers

were switched off for 1-2 hrs for relocating the position, and to avoid overheating of the system. Considering the dilution factor that may affect the sample concentration the sampling was stopped at 22 hours upon extinguishing of fire on 25th February 2019 at 4.00 pm. The air suction rate ranged from 0.15 m^3/min to 0.17 m^3/min for one sampler and it ranged from 0.10 m^3/min to 0.12 m^3/min for the second sampler. Hence average suction rate was taken as 0.16 m^3/min and 0.11 m^3/min respectively. Total volume of air sampled was 213.8 m^3 and 141.8 m^3 respectively.

Apart from ambient air samples, we have collected residual ash from various locations in the waste pile and sediment samples from the marshy field about 150 meters away from the dumpyard. Coning and quartering method was followed for residual ash sampling. Upon completion of sampling on 25th February 2019, the samples were carefully packed and transported to Dioxin Research Laboratory, CSIR-NIIST for analysis and quantification.

Fig 6: Brahmapuram waste dumpyard

Fig 7 & 8: Air samplers positioned at the site

Fig 9 & 10: Collection of Ash and residue from the site

2.3 Sample analysis & Quantification

2.3.1 Sample preparation

All the samples were extracted using Soxhlet apparatus with toluene as the extraction solvent. 100 pg of C^{13} isotope labelled congener mixture was spiked as internal standard on to the samples before extraction. The internal standard recovery percentages will be calculated along with quantification of native compounds to evaluate the efficacy of the end to end analytical workflow. In addition, the internal standard spike recovery rates will compensate for the loss of native congeners in its quantification procedure. 16 hour Soxhlet extraction with 5 siphons per hour was followed as per the method (Refer US-EPA 8290) was carried out.

The sample cleanup and fractionation was done using DEXTech Automated Dioxin Cleanup System. Two fractions PCDD/F & NO-PCB combined and NDL & MO-PCBs are collected separately in two concentrator tubes and concentrated to near dryness using nitrogen evaporator.

2.3.2 Quantification of Dioxins and Dioxin- like PCBs

Agilent 7890B GC system coupled to an Agilent 7000C series triple quadrupole GC/MS system was used for quantification of dioxins and furans. The sample upon evaporation to near dryness was mixed with 20 pg labelled syringe/recovery standard before making it upto 200 µL. The syringe standard is used to gauge the performance of the instrument. Thus the internal standard recovery studies will monitor the analyte loss during extraction & cleanup steps, while the syringe standard will monitor the instrumental losses. The GC-MS run conditions are as given in table 1.

GC Conditions	
Column	Agilent DB-5 MS UL, 60 m*250 um*0.25um Fused silica capillary column
Inlet	Programmed temperature vaporization inlet (PTV)
Outlet	Vacuum
Injection volume	4 uL
Injection port	Multi-Mode Inlet (MMI)
Injection port liner	Multi-baffle, deactivated PTV liner
Injection mode	Solvent vent
Vent flow	100 mL/min; pressure 5 psi
Purge flow	60 mL/min
Carrier gas	Helium
Carrier gas mode	Constant flow
Column flow	1.02 mL/min
Retention time locking	15.192 for TCDD
Oven program	60 ^{0}C (1 minutes) 30 ^{0}C/min to 270^{0}C (9 minutes) 2 ^{0}C /min to 310 ^{0}C (29 minutes) 10 ^{0}C/min to 325 ^{0}C (35.5 minutes)
Total run time	35.5 minutes
MS conditions	
Operation mode	Electron ionization (EI), Multiple reaction monitoring (MRM)
Transfer line temperature	280 ^{0}C
Source temperature	330 ^{0}C
Quadrupole temperature	150 ^{0}C

Table 1: GC/MS run conditions

2.4 Toxicity Equivalence factor and Quantification and Recovery calculation

2.4.1 Toxicity Equivalence Factor calculation

The toxicity of a mixture is stated as TEQ (TCDD equivalents) and is equal to the sum of the concentration of individual congeners multiplied by their toxicity equivalent factors (TEF).

$$\text{TEQ} = \sum [PCDDi \times TEFi] + \sum [PCDFi \times TEFi] + \sum [PCBi \times TEFi]$$

The 2005 World Health Organization re-evaluated the human toxicity equivalency factors for dioxins and is given in Table 2.

SL. No	Target Analytes (PCDD/ PCDF/PCB)	WHO-Toxic Equivalent Factor (WHO-TEF_{05})
PCDDs		
1	2,3,7,8- TCDD	1
2	1,2,3,7,8- PeCDD	1
3	1,2,3,4,7,8- HxCDD	0.1
4	1,2,3,6,7,8 – HxCDD	0.1
5	1,2,3,7.8.9 – HxCDD	0.1
6	1,2,3,4,6,7,8-HpXDD	0.01
7	OCDD	0.0003
PCDFs		
8	2,3,7,8 –TCDF	0.1
9	1,2,3,7,8-PeCDF	0.03
10	2,3,4,7,8-PeCDF	0.3
11	1,2,3,4,7,8-HxCDF	0.1
12	1,2,3,6,7,8- HxCDF	0.1
13	1,2,3,7,8,9- HxCDF	0.1
14	2,3,4,6,7,8-HxCDF	0.1
15	1,2,3,4,6,7,8- HpCDF	0.01
16	1,2,3,4,7,8,9- HpCDF	0.01
17	OCDF	0.0003
MO PCBs (Dioxin like-PCBs)		
18	PCB 105	0.00003
19	PCB 114	0.00003
20	PCB 118	0.00003
21	PCB 123	0.00003
22	PCB 156	0.00003

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23	PCB 157	0.00003
24	PCB 167	0.00003
25	PCB 189	0.00003

Table 2: Toxicity equivalency factors for dioxins and dioxin like PCBs as per WHO_{2005}

2.4.2 Calculation of RF & RRF of native and labelled compounds

Response factor (RF) is the ratio of area of the peak of a particular compound to its concentration or quantity. Relative response factor of native compound ($RRF_{(n)}$) is the ratio of response factor of native congener with respect to that of labelled congener (also called internal standard).

The relative response factor of labelled compound is the ratio of response factor of internal standards with respect to that of recovery or syringe standard. The recovery or syringe standard is used to quantify the instrument efficiency.

(a) $$RRF_{(n)} = \frac{A_x}{Q_x}\frac{Q_{is}}{A_{is}}$$

(b) $$RRF_{(l)} = \frac{A_{is}}{Q_{is}}\frac{Q_{rs}}{A_{rs}}$$

Where

Ax is the response (sum of two m/z's) of native compounds;

Ais is the response (sum of two m/z's) of corresponding internal standard

Ars is the response (sum of two m/z's) of recovery standard;

Qis is the amount of internal standard pg/mL;

Qrs is the amount of recovery standard pg/mL;

Qx is the amount of native component pg/mL.

The average relative response factor is calculated as

$$\overline{RRF} = \frac{1}{m} x \sum_{i=1}^{m} RRF_{(n)}$$

Where

m is the number of standards (concentration levels);

n is the native component;

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i is the calibration level.

The average relative response factor for labelled compounds is calculated as

$$\overline{RRF} = \frac{1}{m} x \sum_{i=1}^{m} RRF_{(l)}$$

Where

m is the number of standards (concentration levels);

l is the labelled compound;

i is the calibration level.

2.4.3 Calculation concentration component of interest

The content component of interest is calculated by = $C_x = \frac{A_x}{A_{is}} \frac{Q_{is}}{DIV} \frac{}{\overline{RRF_{(n)}}}$ where

Cx is the content of the component of interest in ng/kg;

Ax is the response (sum of two m/z values) of native compounds in sample extracts

Ais is the response (sum of two m/z values) of corresponding labelled internal standard in sample extracts;

Qis is the amount of injected labelled internal standard pg/mL;

DIV is the calculation factor from concentration (pg/mL) to content on sample basis (ng/kg) = M/V, where

V is final volume in µl;

M = sample intake in g.

RRF(n) is the relative response factor of native congeners

2.4.4 Internal Standard Recovery

The recovery for the internal standards used is calculated by:

Percentage recovery (%) $= \frac{A_{is}}{Q_{is}} \frac{Q_{rs}}{A_{rs}} x \frac{100}{RRF_{(l)}}$ where

Ais is the response (sum of two m/z's) of the internal standard in the sample;

Ars is the response (sum of two m/z's) of the recovery standard in the sample,

Qis is the Amount of internal standard pg/mL;

Qrs is the Amount of recovery standard pg/mL;

RRF(l) is the relative response factor of labelled congeners

3. Results and Discussion

3.1. Levels of dioxin and dioxin-like PCBs in ambient air, residual ash and sediment samples

3.1.1 Dioxin levels in Ambient Air samples

We carried out the sampling, sample preparation and quantification of dioxins in ambient air, residual ash and sediment samples following the procedures as given in section 2. Table 3 shows the concentration of dioxins present in two ambient air samples, two residual ash samples and one sediment sample collected during the fire break out at Brahmapuram.

Table 3: Concentration of dioxins in ambient air, residue and sediment samples in Brahmapuram, Kochi

Sl No	Matrix		Concentration	Average Concentration
1	Ambient Air	S1	9.5 pg TEQ/m^3	10.3 pg TEQ/m^3
2		S2	11.1 pg TEQ/m^3	
3	Residual Ash	Res -1	153.2 ng TEQ/kg	158.5 ng TEQ/ kg
4		Res- 2	163.8 ng TEQ/kg	
5	Sediment	Sed- 1	6.8 ng TEQ/kg	6.8 ng TEQ/kg

Hitherto this study, CSIR- NIIST conducted the ambient air sampling and analysis from some of the open burn sites in Thiruvananthapuram city. A comparative evaluation of the ambient air dioxins levels in various open burn sites and that of the levels observed at Brahmapuram is given in Table 4. We have also assessed the background ambient air dioxin levels in two neutral locations to get deeper insight into the effect of open burning activity in the state.

These two sites are

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(1) **Reference Blank:** 24 hr ambient air sampling inside NIIST campus representing a location devoid of any open burning activities and is considered as reference blank.

(2) **Field Blank:** A field blank has been taken near an open burning site at Thakaraparampu at Thiruvananthapuram city. The field blank sampling was carried out on a day devoid of any open burning activity for 24hrs. Previously we carried out sampling from the same location under open burning condition.

Table 4 show the comparison of concentration of dioxins observed in ambient air at Brahmapuram waste treatment plant during accident fire vis-à-vis that observed at other open burning sites in Thiruvananthapuram city.

Table 4: Concentration of dioxins in ambient air at Brahmapuram vis-à-vis Other open burning sites

SL. No	Sampling location	Distance of sampler from the epicenter of open burn (metre)	Date of Sampling	Observed Concentration (pg TEQ/m^3)
1	**Brahmapuram S1**	50 -100	25/02/2019	9.5
2	**Brahmapuram S2**	50 -100	25/02/2019	11.1
3	**Open burn site, Pettah**	10	14/11/2018	13.04
4	**Open burn site, Thakaraparampu**	2-3	05/12/2018	41.36
5	**Control Site (NIIST Campus)**	Reference Blank	22/10/2018	0.2
6	**Open burn site, Thakaraparampu (Same site as in 3)**	Field Blank (Devoid of open burning activity)	08/01/2019	1.35
7	**European Cities**	NA	NA	0.3

It can be observed from Table 3 and 4 that the levels of dioxins observed in ambient air during the fire breakout at Brahmapuram is about 50 & 10 times higher than the reference blank and field blank concentration respectively. In addition, the sampler was placed about 50 -100 meter

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away from the waste pile. It may also be noted that passive sampling was conducted at Brahmapuram due to difficulties in accessing the active wind direction and for maintaining a safe distance from the fire spots to operate the generator and sampling equipments. The concentration of dioxins observed at open burn sites at Pettah and Thakaraparambu indicates that the distance of the sampler and wind direction influence the sampling. The samplers at Thakaraparambu and Pettah were kept at 2 meters and 10 meters distance respectively and the concentrations were decreasing with increasing distance. It is quite obvious due to dilution occurring with distance and possible quick condensation of semi-volatile dioxins.

3.1.2. Dioxin levels in Residual Ash samples

The dioxin levels observed in the residual ash samples collected from different points on the burned waste heap at Brahmapuram was analyzed as per the procedures mentioned in section 2.3. The obtained results are shown in Table 5. It can be understood the concentration of dioxins measured in two residual ash are very similar ie 153.2 and 163.8 ng TEQ/kg respectively. Hence an average concentration of 158.5 ng TEQ/kg can be considered for the comparative evaluation of the observed levels at Brahmapuram vis-à-vis other dumpsites in various countries.

Table 5: Concentration of dioxins in residual Ash and sediment samples in Brahmapuram, Kochi

Sl No	Matrix		Concentration	Average Concentration
1	Residual Ash	Res -1	153.2 ng TEQ/kg	158.5 ng TEQ/ kg
2		Res- 2	163.8 ng TEQ/kg	
3	Sediment	Sed- 1	6.8 ng TEQ/kg	6.8 ng TEQ/kg

Table 6 shows the PCDD/Fs concentrations (ng/kg dry wt) in soils from dumping and control sites in Asian developing countries with those in general and contaminated soils from other locations in the world. It was the first comprehensive data of PCDD/Fs and related compounds in dumping soils from Asian developing countries, which were comparable or greater than

those in soils from dioxin-contaminated sites reported in developed nations. It highlighted the role of dumping sites as a significant source of PCDD/Fs.

The average concentration of 158.5 ng TEQ/kg observed in residual ash samples at Brahmapuram is in the range of dioxin levels observed in various infamous dumping site of the world such as Vietnam, Philippines, Cambodia, The Netherlands, Greece and USA. The dioxin levels reported at an infamous dumpyard soil in India at Perungudi, Chennai is 52 ng TEQ/kg[7]. The level observed at Brahmapuram is about 3 times higher than that at Perungudi. The variation in the levels may be due to difference in sampling sites, composition of wastes and combustion conditions and the sensitivities of the analytical instruments used in the previous study.

The table shows that data is not available in many developed countries on dump yard samples, because there are no such sites in most of those countries.

3.1.3 Dioxin levels in Sediment samples

We observed that there is a marshy field near the Brahmapuram waste dumpsite which is about 150 metres away from the epicentre of fire breakout. Also the marshy field lies in the predominant wind direction. Hence, we were interested to examine the dioxin levels in the sediment samples collected from the field. The dioxin levels present in the sediment samples is not related to the present fire break out. However, it could give an idea of the dispersion of such pollutants over the years from similar fires occurred at the dumpyard. The dioxin levels observed in sediment sample is 6.8 ng TEQ/kg. Since it cannot be compared with dioxin levels in river sediments, no comparative evaluation has been carried out for the sediment data. We need to carry out further investigation to understand the long term effect of such fire break out incidents and the present data will be useful for future comparative evaluation.

Table 6: Comparison of PCDD/Fs Concentrations (ng/kg dry wt) in soils from Dumping and Control Sites in Asian Developing countries with those in General and Contaminated Soils from Other Locations in the World [7]								
Country	Year	Soils from contaminated sites			General soils			Remark
		Mean concentration	ng/kg WHO TEQ	Concentration range	Mean concentration	ng/kg WHO TEQ	Concentration range	
Philippines	1999	6100	546	44000-75000	57	na	14 - 100	Dumping sites, uncontrolled burning
Cambodia	1999	30000	402	330-20000	130	1.9	40 - 370	Dumping sites, uncontrolled burning
India	2000	7400	52	22000-34000	32	0.22	18 - 79	Dumping sites, uncontrolled burning
Hanoi, Vietnam	2000	6100	102	125-50500	370	1.1	na	Dumping sites, uncontrolled burning
Hochiminh, Vietnam	2002	370	2.7	21-880	190	1.27	130 - 260	Dumping sites, uncontrolled burning
Rio de Janeiro, Brazil	1999	na	13900	na	na	na	na	HCH plant waste site
Crete, Greece	1996	37000	410	2900-105000	na	na	na	Open landfill dump sites, uncontrolled burning
Barcelona, Spain	1999	700	11.85	na	na	na	na	Municipal waste incinerator
The Netherlands	1989 /90	na	3-252	na	na	na	na	Municipal waste incinerator
Ohio, USA	1995 /96	15700	458	na	na	na	na	Municipal waste incinerator
Thailand	1997	na	na	na	15	na	na	na

Australia	1998	na	na	na	37	na	31 - 42	na
Lake Baikal, Russia	1997	na	na	na	73	na	na	na
Japan	1997 /98	na	na	na	3700	42.8	na	na
Hong Kong	1996	na	na	na	6100	na	2500 - 8650	na
Brazil	1997	na	na	na	20	na	na	na
British Columbia, Canada	1997	na	na	na	460	na	49 -1900	na
Michigan, USA	1998	na	na	na	230	na	94 - 490	na
Indiana, USA	1996	na	na	na	2000	na	1600 - 2400	na
Norway	1997	na	na	na	130	na	na	na
Spain	1996	na	na	na	315	na	130 - 500	na
United Kingdom	1997	na	na	na	290	na	286-600	na
United Kingdom	1990	na	na	na	4660/324	21 /19	na	na
Germany	1996 /97	na	na	na	649	na	647-650	na

3.2 Evaluation of the analytical data

3.2.1 Internal standard recovery rate

The sample preparation procedures are the most critical aspect determining the quality of analytical data obtained in dioxin analysis. The ultratrace levels of dioxins in environmental samples (in picogram levels) and presence of high levels of interfering compounds (in micro to milli gram) are the critical factors. The isotope dilution method is followed in dioxin analysis to monitor the performance of analytical methodology as well as to compensate for the native analyte losses during the sample processing. It is carried out by spiking known concentration of isotope labelled internal standards of all the congeners in each sample prior to extraction and the recovery of internal standards are assessed at the end of each analysis. As per regulations and standard methods, the recovery of internal standards should be in the range of 60 -120 %. The equation for calculating internal standard recovery is given in section 2.4. In case the recovery rate is less than 60%, the results are still acceptable if the particular congener's contribution to total toxicity equivalence (TEQ) is less than 10 %. Table 7 and 8 shows the internal standard recovery rate observed in a representative ambient air and residual ash sample in the present study. It can be observed that the recovery rates for all dioxins are in the range of 60 – 120 % and hence the sample preparation and analytical methods followed in the present study is acceptable.

Table 7: Recovery rate and TEQ calculation of ambient air sample											
Spiked IS concentration (except OCDD & OCDF) Qis				500 ppt		OCDD and OCDF concentration			1000 ppt		
Spiked Syringe standard concentration						100 ppt					
Compounds	**Avg resp IS**	**Obt resp of IS**	**Syr std avg resp**	**Syr std obt resp**	**RF of IS**	**RF of Syr std**	**RRF of IS to Syr std**	**% recovery**	**conc /gm**	**TEF**	**TEQ**
PCB 81	98927.3	89463.3	15711.6	21143.0	197.9	157.1	1.3	67.2	14.1	0.0003	0.004
PCB 77	109098.9	63398.0	15711.6	21143.0	218.2	157.1	1.4	43.2	12.0	0.0001	0.001
2378-TCDF	95361.3	89455.1	15711.6	21143.0	190.7	157.1	1.2	69.7	10.4	0.10	1.04
2378-TCDD	27414.2	27326.9	15711.6	21143.0	54.8	157.1	0.3	74.1	1.0	1.00	0.96
PCB 126	43680.2	68241.5	15711.6	21143.0	87.4	157.1	0.6	116.1	3.1	0.10	0.31
12378-PeCDF	32754.7	34283.9	15711.6	21143.0	65.5	157.1	0.4	77.8	7.5	0.03	0.22
23478-PeCDF	35962.1	37888.7	15711.6	21143.0	71.9	157.1	0.5	78.3	1.2	0.30	0.36
PCB 169	30714.4	30076.6	15711.6	21143.0	61.4	157.1	0.4	72.8	1.7	0.03	0.05
12378-PeCDD	19652.7	20403.9	15711.6	21143.0	39.3	157.1	0.3	77.2	2.9	1.00	2.89
123478-HxCDF	38985.0	53388.9	7547.9	10616.0	78.0	75.5	1.0	97.4	4.0	0.10	0.40
123678-HxCDF	43075.8	11159.5	7547.9	10616.0	86.2	75.5	1.1	18.4	2.8	0.10	0.28
234678-HxCDF	41109.6	47569.5	7547.9	10616.0	82.2	75.5	1.1	82.3	8.3	0.10	0.83
123478-HxCDD	13302.7	17786.1	7547.9	10616.0	26.6	75.5	0.4	95.1	4.4	0.10	0.44
123678-HxCDD	16547.1	17786.1	7547.9	10616.0	33.1	75.5	0.4	76.4	2.9	0.10	0.29
123789-HxCDD	14205.4	16860.9	7547.9	10616.0	28.4	75.5	0.4	84.4	3.2	0.10	0.32
123789-HxCDF	34250.5	39974.9	7547.9	10616.0	68.5	75.5	0.9	83.0	1.7	0.10	0.17
1234678-HpCDF	33704.3	38183.7	4880.9	8368.0	67.4	48.8	1.4	66.1	3.9	0.01	0.04
1234678-HpCDD	11068.4	13168.4	4880.9	8368.0	22.1	48.8	0.5	69.4	122.4	0.01	1.22
1234789-HpCDF	28531.6	35358.8	4880.9	8368.0	57.1	48.8	1.2	72.3	1.8	0.01	0.02
OCDD	12181.8	14452.5	4880.9	8368.0	12.2	48.8	0.2	69.2	25.8	0.0003	0.01
OCDF	18730.2	21539.8	4880.9	8368.0	18.7	48.8	0.4	67.1	5.4	0.0001	0.001

Table 8: Recovery rate and TEQ calculation of residue ash sample

Spiked IS concentration (except OCDD & OCDF) Qis	500 ppt	OCDD and OCDF concentration	1000 ppt
Spiked Syringe standard concentration		100 ppt	
Sample intake – 5.036 gm			

Compounds	Avg resp of IS	Obt resp of IS	Syr std avg resp	Syr std obt resp	RF of IS	RF of Syr std	RRF of IS to Syr std	% recovery	conc/ gm	TEF	TEQ
PCB 81	73670.9	86487.2	11435	15728	147.3	114.4	1.3	85.4	73.3	0.0003	0.02
PCB 77	76123.5	54868.2	11435	15728	152.2	114.4	1.3	52.4	457.1	0.0001	0.05
2378-TCDF	72627.2	66146.2	11435	15728	145.3	114.4	1.3	66.2	97.1	0.1	9.71
2378-TCDD	21220.4	23923.9	11435	15728	42.4	114.4	0.4	82.0	19.8	1	19.8
PCB 126	34247.3	37904.4	11435	15728	68.5	114.4	0.6	80.5	108.3	0.1	10.8
12378-PeCDF	39283.6	43893.0	11435	15728	78.6	114.4	0.7	81.2	90.6	0.03	2.72
23478-PeCDF	48297.4	54433.6	11435	15728	96.6	114.4	0.8	81.9	209.5	0.3	62.8
PCB 169	42258.8	49136.5	11435	15728	84.5	114.4	0.7	84.5	17.5	0.03	0.52
12378-PeCDD	27361.1	31412.3	11435	15728	54.7	114.4	0.5	83.5	33.9	1	34.0
123478-HxCDF	71268.2	78332.4	13939	19327	142.5	139.4	1.0	79.3	62.3	0.1	6.23
123678-HxCDF	73096.7	82381.1	13939	19327	146.2	139.4	1.0	81.3	56.4	0.1	5.64
234678-HxCDF	80781.5	87606.2	13939	19327	161.6	139.4	1.2	78.2	67.2	0.1	6.72
123478-HxCDD	26547.7	32404.3	13939	19327	53.1	139.4	0.4	88.0	13.8	0.1	1.38
123678-HxCDD	31005.1	32649.4	13939	19327	62.0	139.4	0.4	75.9	27.7	0.1	2.77
123789-HxCDD	29371.2	28975.5	13939	19327	58.7	139.4	0.4	71.2	21.0	0.1	2.10
123789-HxCDF	78891.9	86444.8	13939	19327	157.8	139.4	1.1	79.0	14.9	0.1	1.49
1234678-HpCDF	82630.8	83056.2	13453	19327	165.3	134.5	1.2	70.0	26.4	0.01	0.26
1234678-HpCDD	27435.4	31528.5	13453	18891	54.9	134.5	0.4	81.8	786.7	0.01	7.87
1234789-HpCDF	82305.5	81092.9	13453	18891	164.6	134.5	1.2	70.2	16.0	0.01	0.16
OCDD	37607.2	44864.2	13453	18891	37.6	134.5	0.3	85.0	303.2	0.0003	0.09
OCDF	60444.6	65672.2	13453	18891	60.4	134.5	0.4	77.4	35.0	0.0001	0.004

Fig: 11

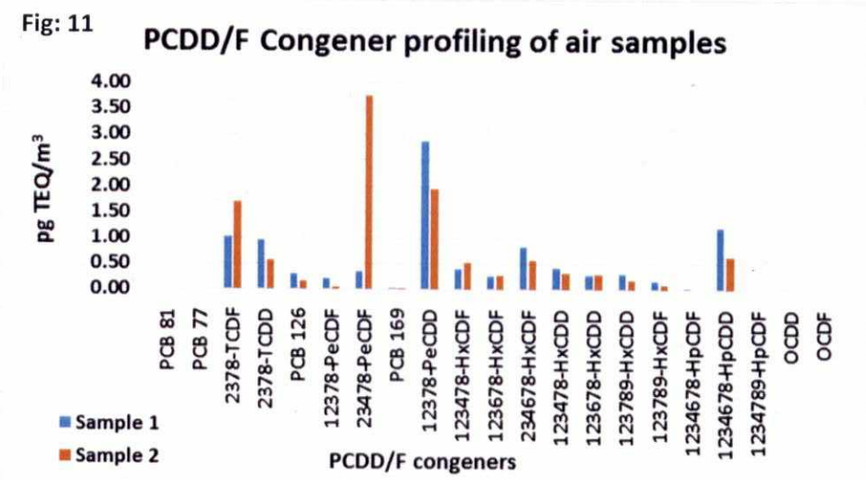

Fig: 12

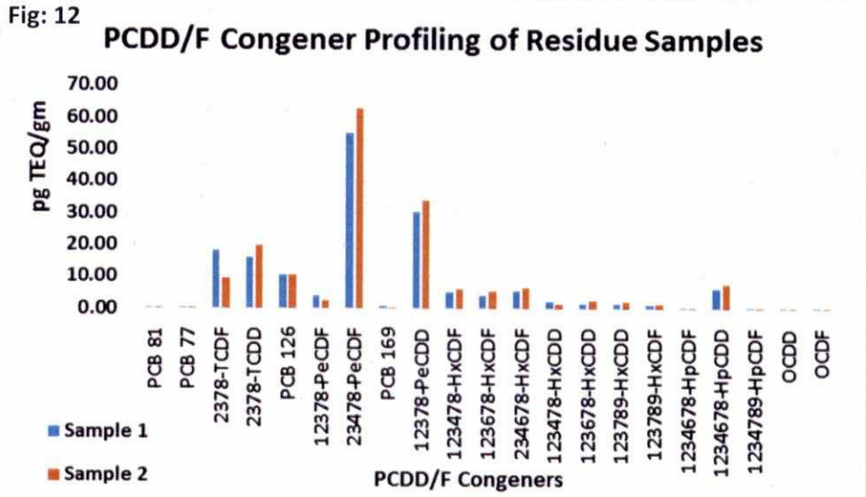

Fig: 13

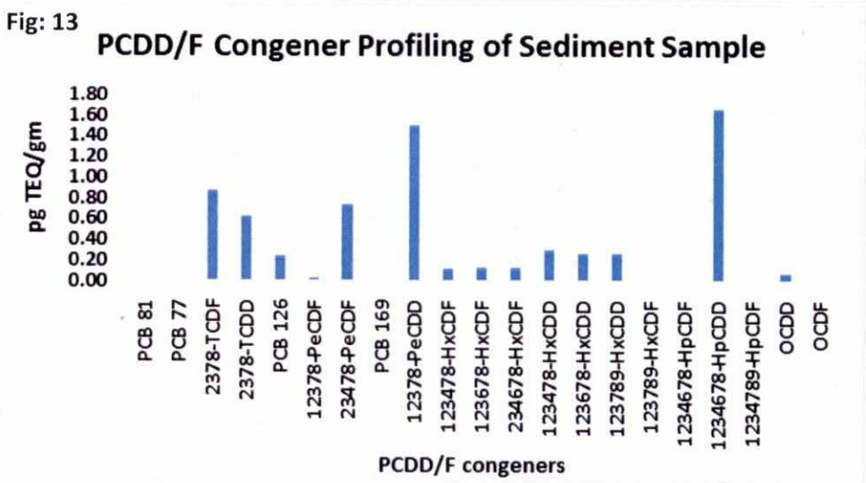

Fig 11, 12 & 13: PCDD/F congener profiling with respect to TEQ for air, residue and sediment samples

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3.2.2 Congener Profile

A comparative study on the observed levels of each congener on the basis of its contribution to total toxicity equivalence (TEQ) was also conducted. Fig 11, 12 and 13 shows the congener distribution profile in ambient air, residual ash and sediment samples. All the samples showed predominance of lower chlorinated dioxins and furans in terms of toxicity equivalence. TCDD (the known human carcinogen) the most toxic congener with WHO TEF value 1 has been detected in all the samples. 'Penta' chlorinated species were found to be particularly higher in all the samples. The formation tendencies are not clear as the critical parameters influencing the predominance of particular congeners such as the waste composition, temperature, oxygen levels etc. are still under study.

3.3 Comparative evaluation vis-à-vis simulated waste combustion experiments

CSIR- NIIST had submitted the study report on "Determination of emission factors of dioxins from open burning of municipal solid wastes in Kerala" to Kerala State Pollution Control Board in December 2018. We reported the emission factors of dioxins in air and residual ash by carrying out simulated waste combustion studies in a laboratory scale "Burn Hut". It is the first study report in India on emission factors of dioxins from open burning of MSW.

A comparative evaluation of the reported concentrations of dioxins from simulated waste combustion studies and the data observed in air and residual ash samples at Brahmapuram fire break out was carried out.

The concentrations of dioxins in two experiments conducted at the laboratory studies at NIIST using simulated waste composition (10 Kg) and combustion conditions is 9.7 pg TEQ/Nm^3 & 23.85 pg TEQ/Nm^3. Whereas the average dioxin levels observed at ambient air sampled from Brahmapuram during fire break out is 10.3 pg TEQ/m^3. The observed dioxin levels in air at Brhampuram is comparable with respect to the concentrations observed in simulated waste combustion studies conducted in burn hut.

Table 9: Concentration of dioxins in air & residual ash in Brahmapuram and Burnhut samples			
Sl No	**Matrix**	**Sampling site**	**Concentration**
1	**Air sample**	**Brahmapuram**	**10.3 pg TEQ/Nm^3**
2	Air sample	Burnhut expt 1	9.7 pg TEQ/Nm^3
3	Air sample	Burnhut expt 2	23.85 pg TEW/Nm^3
4	**Residual ash sample**	**Brahmapuram**	**158.5 ng TEQ/ kg**
5	Residual ash sample	Burnhut expt 1	136.9 ng TEQ/ kg
6	Residual ash sample	Burnhut expt 2	101.9 ng TEQ/ kg

Similarly the average dioxin emission levels in residual ash was found to be slightly higher at Brahmapuram (158.5 ng TEQ/kg) compared to that from the two simulated burn hut studies ie 136.9 and 101.9 ng TEQ/kg. The slight variation observed in field data and in the laboratory studies is negligible considering the possible diversity of waste composition and combustion conditions. The stark similarity of the observed concentration in simulated combustion studies and field emission data indicates the effectiveness of the "Burnhut" study data for the estimation of emission factor. Most importantly, it can be considered as the default emission factor from open burning of MSW in India and can be used for total emission calculations and annual emission inventorisation.

3.4 Estimate of total dioxin generated during the fire breakout incident

An estimate of the total quantity of dioxin emitted during the fire breakout at Brahmapuram on 22 – 25th February 2019 was calculated based on the present monitoring study as well as the dioxin emission factor study report submitted by CSIR-NIIST in December 2018 [8]. The present study clearly indicates that the concentration of dioxins present in the ambient air and in residual ash were closely matching with the dioxin levels observed in the simulated open burning study conducted in a "Burn Hut " using known quantities and typical composition of original municipal solid wastes in Kerala. Hence, the emission factor of dioxins calculated using

the simulated open burning studies can be applied for calculating the total quantity of dioxins emitted during the fire breakout.

Emission factor (EF) is the total quantity of dioxins emitted per ton open burning of MSW.
As per CSIR-NIIST study report, the average emission factor of dioxins to air and land is **5.1 & 34.71 µg PCDD-F TEQ_{WHO}/ ton of original waste** burned respectively and the total emission factor (EF_{total}) is **39.81 µg PCDD-F TEQ_{WHO}/ ton of original waste [8].**
An estimate of total emission of dioxins during the incident can be calculated by multiplying the emission factor obtained from simulated waste combustion studies and the activity rate.

Total dioxin emission = 'Emission Factor' X 'Activity rate'

Activity rate is the estimated total quantity of waste burned during the incident. The estimate of MSW burned was calculated based on the preliminary site investigation and satellite data on 23/02/2019. Fig 14 shows the site status as per satellite data as on 23/02/2019 and the boundary marked in red is the dumpyard area where fire breakout occurred. The flat surface area covered with fire in the demarked boundary region is 17,000 square meters. It was assumed that the fire surface area of waste piles is 1.5 times the plane area and the depth of burn is about 20 cm (0.2 m). The volume of waste burned is 5100 m^3. The typical bulk density of municipal solid wastes is 350 kg/m^3 as per literature [9]. Hence the total quantity of waste burned or the **'activity rate'** is estimated to be **1800 tonnes**.

Total estimated dioxin emission obtained by multiplying the emission factor (EF_{total}) of **39.81 µg PCDD-F TEQ_{WHO}/ ton of original waste** and the activity rate of **1800 tonnes** is ~ **72 milligram Toxicity equivalence (TEQ).** It is a significant quantity considering the fact that the maximum tolerable monthly intake of dioxins for humans as per WHO/FAO is only **70 picogram TEQ/kg body weight.** For a person with body weight of 65 Kg, 54.6 nanogram TEQ (70*65*12) will be the annual tolerable intake. **<u>While only a very small fraction of the dioxins generated reaches humans via the food chain,</u>** the 72 mg TEQ of dioxins generated during the fire is sufficient to exceed the tolerable annual intake of 1.3 million people.

Fig 14: Brahmapuram waste treatment plant (Google Inc.) as on 23/02/2019 and the boundary demarked in red is the fire covered area

It may also be noted that several such fire breakouts incidents had occurred in the past and is still occurring intermittently at Brahmapuram as well as at several small, medium and large scale MSW open dumpyards across the state and in the country. The findings of the studies conducted by CSIR-NIIST clearly indicate that alarmingly high levels of dioxins are getting emitted from such anthropogenic activities across the country. The possible health consequences of human exposure to these highly toxic POPs are a matter of great concern.

4. Summary and Recommendation

The waste dump at Brahmapuram caught fire during early hours of 23/2/2019 and the fire was brought under control on 25/2/2109. CSIR-NIIST conducted the dioxin emission monitoring during 24- 25th February 2019.

The major findings of the study are:

1. The average dioxin levels observed in ambient air was found to be 10.3 pg TEQ/ m^3 at a distance of 50m to 100m from the fire. The observed levels are 50 and 10 times higher than reference and field blank data.
2. The dioxins generated are predominantly captured in residual ash. This was observed also in our previous laboratory studies. The Brahmapuram residue ash has dioxin content 159 ng TEQ/kg of ash. It is comparable with the results obtained from the Burnhut studies (101.9 and 136.9 ngTEQ/kg of waste) conducted at CSIR-NIIST.
3. The quantity of dioxins emitted during the fire at Brahmapuram **is 72 milligram Toxicity equivalence,** using emission factors determined in burn-hut studies.

Recommendations

- It is essential to establish modern solid waste treatment plants and clear the dumpyards of wastes by 'bio-mining' to separate combustible and inert material. The contaminated ash separated during bio-mining should be removed to sanitary landfill.
- Given the widespread burning of waste and dumpyard fires, analysis of dioxins in animal origin food samples such as milk, egg, meat and in human milk is recommended.

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ANNEXURE - X3

ACTION PLAN FOR SOLID WASTE MANAGEMENT AND ACTIVITIES TO BE COMPLETED IN BRAHAMPURAM

Ref. Minutes of the meeting of the SMC-NGT on 14/06/2019

(I) *Action taken by Kochi Corporation in each ward for waste management as per SWM Rules, 2016.*

- Meetings conducted with Kudumbasree and the workers of corporation on 14/01/2019 to transfer the message of source level segregation of waste.
- Orientation meeting conducted with the Health Inspectors/Junior Health Inspectors of Corporation for enforcing proper segregation of waste.
- Responsibilities of proper segregation of waste assigned to Health Inspectors of respective health circles and introduced vehicle pass system to ensure waste segregation vide proceedings No. MOE2/16428/2017 dated 05/02/2019 of Secretary.
- *Orientation meeting conducted on 22/03/2019 for HI/JHIs by Chairman Health Committee.*
- Orientation meeting/ follow up meeting conducted on 12/04/2019 for HI/JHIs
- Mandatory segregation of waste ensured vide proceedings No. MOE2/16428/2017 dated 15/05/2019 of Secretary.
- *Ward level orientation meetings and awareness campaigns conducted by Health Standing Committee Chairperson and concerned Health Circles in June 2019.*
- *Notices issued to households for compulsory segregation of wastes at source.*

(II) Details regarding Projects which will be implemented urgently.

(a) BIOMINING OF LEGACY WASTE *(Expected to start in September 2019 after tendering of the work)*

- Tender documents prepared for bio-mining of legacy waste sent to Kerala State Pollution Control Board for vetting. The suggestions of pollution control incorporated in the tender document. Work to be tendered.

- *As an interim measure, Health standing committee on 27/06/2019 has given approval to the proposal of M/s Planet Savers, Pondicherry to excavate the legacy waste, bale it and to transport it to the cement kilns on trial run basis for 3 months. Placed before council to be held on 17/07/2019.*

- The Rejects from the composting plant will be used for landscaping the medians of Kochi Metro. Health Standing Committee on 27/06/2019 has given approval to the proposal. Placed before the council to be held on 20/07/2019.

(b) CONSTRUCTION OF LEACHATE TREATMENT PLANT *(Expected to start the work in September 2019 with completion time of 6months)*

- GIZ the agency extending technical support to Corporation is doing a rapid study on the leachate generation, its quality and the method of treatment which is to be adopted. It is expected that GIZ would submit the final report on 30/07/2019. Based on their recommendation the work of preparation of DPR would be awarded to the already selected bidder who has to complete the DPR preparation in 1 month's time.

(c) Proper segregation of waste *(Complete segregation of waste generated will be completed by end of July 2019)*

With details collected from field, it is assessed that about 88% of the households are covered under the door to door collection of waste and in such households the wastes are stored in segregated form. It will be ensured that door to door collection of waste are extended to all households in Kochi Corporation and all the wastes collected are properly segregated.

(d) Laying of roads inside the waste dumping yard (To be completed by the end of August 2019)

The work for laying of Granular Sub Base (GSB) has been tendered. Work to be awarded to the lowest bidder. Awaiting approval of council.

(e) Construction of watch tower cum elevated storage tank (To be completed in December 2019)

Design finalized, estimate is being prepared.

(f) Construction of leachate storage tank (To be completed in December 2019)

Obtained TS. The work will be tendered and completed before December 2019.

(III)Details for improving the existing waste management facility.(To be completed in December 2019)

For improving the existing waste management facility, drains have been constructed around the plant. A collection tank also will be constructed to ensure that the complete leachate is collected. The collected leachate will be treated in the Leachate treatment plant to be set up.

To treat the leachate generated till the commissioning of the new leachate treatment plant, it is being taken to the existing septage treatment plant.

The possibility of using the new shed in Brahmapuram for composting is being explored. The manufacturers of the sieving trommels have been called to Brahmapuram to check the available space and make customized design. They are to visit Brahmapuram by end of July 2019.

(IV) Details of existing material collection facilities (MCFs)

Corporation is having MCFs at Kadavanthara, Panambilly nagar and Edapally. In areas where there are no dedicated MCFs, the dry wastes that are collected from households and shops are directly loaded into trucks from waste transfer points.

(V) Details of wards in which MCFs have to be established.(To be completed in mid of August 2019)

As part of preparation of the DPR under the Swatch Bharath Mission grant, it is being assessed where MCFs can be established.

(VI) Details of places where Resource Recovery Facilities (RRFs) are functioning

Corporation is having RRFs at the following locations

1. At Edapally Zonal Office compound
2. At Padiath yard near Kochi Corporation main office
3. At Ravipuram
4. At Brahmapuram

The RRFs located at Brahmapuram and Ravipuram are operated.

About 5 tonnes of non-biodegradable wastes are generated at Edapally area from the 13 wards and about 5 tonnes of wastes are generated from the central area of the city consisting of 6 wards. This would be taken to the Edapally MRF and Padiath MRF for further processing of the waste. Tenders are to be floated for engaging agencies capable of operating the MRF independent of other facilities including provision to recover, recycle, and bale it for making Refuse Derived fuel which could be sent to cement kilns.

(This will be completed in September 2019)

(VII) Details of locations where RRFs has to be newly established

RRFs are to be newly established at Mattanchery yard and at Palluruthy yard of Corporation.

(VIII) Details regarding agencies entrusted for waste collection on ward basis

Only Kudumbashree group and the health workers of Corporation are collecting waste from wards

(IX) Details regarding collection of non-biodegradable waste

Non-biodegradable waste are collected along with the biodegradable waste alternate days.

(X) Details regarding the treatment of how and where non biodegradable wastes are treated

At present some non-biodegradable wastes are taken to the material recovery facilities at Kadavanthara and Brahmapuram. Other wastes are taken to

Brahmapuram where the valuable recyclables are recovered and residual wastes end up in the dumping yard.

Miscellaneous

Corporation is not having community level aerobic waste treatment systems like bio-bins. Kochi Municipal Corporation is to roll out a mobile application called click for kochi to share information to the public regarding the schedule of collection of non-biodegradable waste, location of RRF and all crucial information related to solid waste management including features to warrant those who dumps waste in public places and to shame them by displaying the photos on Corporation website and other popular media.

LIST OF BULK WASTE GENERATORS IN KOCHI MUNICIPAL CORPORATION

				BULK WASTE GENERATORS
Circles	Health Circle Name	Ward No	Ward	*List of Bulk waste generators*
1	Fortkochi	1	FORTKOCHI	
		27	Fort Kochi Veli	
2	Fortkochi	2	KALVATHY	
		3	EARAVELI	
3	Mattanchery	4	KARIPPALAM	1.Vijayalekshmi catering 2.Shajahans chicken centre
		5	MATTANCHERY	1.Kayees catering unit
4	Mangattumukku	6	KOCHANGADI	
		7	CHERALAYI	
		9	CHAKKAMADOM	
5	Pandikkudi	25	CHULLICKAL	
		26	NAZRETH	
		28	AMARAVATHY	
6	Chullikkal	8	PANAYAPPILLY	
		10	KARUVELIPPADY	
7	Moolamkuzhi	22	MUNDAMVELLY	
		23	MANASSERRY	
		24	MOOLAMKUZHY	
8	Thoppumpady	11	THOPPUMPADY	
		12	THAREBHAGAM	
9	Palluruthy	13	KADEBHAGAM	

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		14	THAZHUPPU	
		20	NAMBYAPURAM	
		21	PULLARDESAM	
		15	EDAKOCHI NORTH	
		16	EDAKOCHI SOUTH	
		17	PERUMBADAPPU	
		18	KONAM	
10	Edakochi	19	PALLURUTHY-KACHERIPADY	
		29	ISLAND NORTH	1. Taj Malabar
		30	ISLAND SOUTH	
		58	KONTHURUTHY	1.Sacred Hearts College Thevara
		59	THEVARA	1.Hotel Riviera Suite
		60	PERUMANUR	1.Jalavayu apratment
11	Thevara	61	RAVIPURAM	
		54	ELAMKULAM	
		55	GIRINAGAR	
		56	PANAMPILLI NAGAR	
		57	KADAVANTHRA	
12	Kadavanthara	63	GANDHI NAGAR	
		45	THAMMANAM	
		47	CHALIKKAVATTAM	
		48	PONNURUNNI EAST	
		49	VYTTILA	
13	Vytilla	50	CHAMBAKKARA	

		51	POONITHURA	
		52	VYTTILA JANATHA	
		53	PONNURUNNI	
		38	DHEVANKULANGARA	
		40	MAMANGALAM	
		41	PADIVATTAM	
	Edapally Anchumana	42	VENNALA	
		43	PALARIVATTAM	
		44	KARANAKKODAM	
14		46	CHAKKARAPARAMBU	
		33	ELAMAKKARA NORTH	
		34	PUTHUKKALAVATTAM	Lourde Matha church hall
		35	PONEKKARA	St. Ignacious church hall
		36	KUNNUMPURAM	
		37	EDAPPALLY	1.Al. Ammen Hall 2. Gayathry Kallyanamandapam 3.NSS Hall
15	Edapally Ganapathy temple	71	ELAMAKKARA SOUTH	1.Bhaskareeyam 2.Shangrilla auditorium 3.SNDP Hall
		39	KARUKAPPILLI	
		64	KATHRIKADAVU	
		65	KALOOR SOUTH	1. IMA 2. Gokulam park
		70	KALOOR NORTH	
16	Kaloor	72	POTTAKUZHY	

17	Yathra	61	RAVIPURAM	1. Medical trust hospital
		62	ERNAKULAM SOUTH	1. South Railway station
18	Market	66	ERNAKULAM CENTRAL	1. Peevees projects limited 2. Abad Plaza
		67	ERNAKULAM NORTH	1. Hotel Taj GateWay, 2. A R Camp, 3. St.Theresas College, 4. St Mary's School, 5. St.Alberts College, 6. St.Alberts School, 7. Honourable High Court
19	Town hall north	66	ERNAKULAM CENTRAL	
		67	ERNAKULAM NORTH	
20	Pachalam Cemtery mukku	68	AYYAPPANKAVU	
		69	THRIKKANARVATTOM	
		73	PACHALAM	
21	Vaduthala	31	VADUTHALA WEST	1.St peter's school
		32	VADUTHALA EAST	1.St antony's school 2.Chinmaya school
		74	THATTAZHAM	1.Donbosco school 2.Attipetty school 3.Lmcc school 4.Lourde's hospital

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ANNEXURE - XIV

ACTION TAKEN REPORT TO THE STATE LEVEL MONITORING COMMITTEE OF NGT

01/08/2019

(GIVEN IN BOLD ARE ACTION TAKEN AFTER THE MEETING ON 14/06/2019)

To comply with the directions of the Hon'ble National Green Tribunal on 22/10/2018 Corporation had prioritized the works that were to be carried out in Brahmapuram into: *works that are to be carried out immediately on war footing basis, short-term basis* (in 2-3months), *Mid – term basis (3-6 months) and long term basis*. The action taken is as given in the table below:

Immediate (Completed on 18/12/2018)

1. *Formation of windrows*

For scientific processing of the waste the wastes have been re-arranged to form windrows. 23 such windrows could be formed.

2. *Clearing and cleaning of existing drains*

The drains that carry the leachate were cleaned for the free flow of leachate into collection tanks.

3. *Identification of collection point and fixing of collection tanks for leachate*

Two collection points for leachate were identified; one to the southwest of the plant and one to the eastern side of the plant. 2 precast collection tanks of capacity 3500 litres each were placed in southwest portion and 1 collection tank of 3500litres was kept in the lowest point in the eastern side.

4. *Installation of Leachate treatment plant on trial run basis*

A prefabricated leachate treatment plant based on electro-coagulation technology was installed on a trial run basis. The plant has been installed in the pre-sorting shed situated in the south-east side of the plant. The leachate collected in the collection tanks are pumped into the collection tanks of the treatment unit and taken for treatment.

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5. Channelizing leachate to drains & collection tanks

Half cut 8" pipes were laid in existing drain/trenches from where leachate is oozing out from the windrows to the main peripheral drains to avoid infiltration of leachate into the soil and for channelizing the flow. Later concrete drains were constructed.

SHORT TERM

1. **Ensuring proper segregation (to be completed in March 2019)**

- Responsibility of proper segregation of waste at source level assigned to Health Inspectors of respective health circles.
- HI's shall ensure that source level segregation is in place or shall enforce wherever necessary and from the waste transfer points plastic wastes are not loaded into the truck that carries food waste/Biodegradable waste.
- In the meeting with the Kudumbasree and the workers of Corporation associated with waste collection held on 14/01/19 it was clearly informed that no mixed waste shall be collected or loaded into trucks. Also in the meeting with the HI/JHI's of all Health circles on 14/01/2019 it was reiterated to ensure proper segregation of waste.
- The matter of segregating the waste at source level itself is being rolled out through the Kudumbasree and health workers of Corporation. Kochi Corporation will stop collecting mixed waste after March 2019
- Direction issued in the form of proceedings (dated 05/02/19) of Secretary that the HI/JHI's of respective health circles shall certify/issue pass to trucks transporting waste stating that the truck load contains only food waste/wet waste/bio-degradable waste. JHI of the plant shall acknowledge the passes and shall let to tip wastes certified as biodegradable waste by HI/JHI's of respective health circles.
- An amount of Rs. 120000 imposed as fine since 10/05/2019 to defaulters
- Orientation meeting conducted on 22/03/2019 for HI/JHIs by Chairman Health Committee
- Orientation meeting/ follow up meeting conducted on 12/04/2019 for HI/JHIs
- About 50% of wastes brought to the plant are now segregated as on 02/05/19

- Ward level orientation meetings and awareness campaigns conducted by Health Standing Committee Chairperson and concerned Health Circles.
- **A rapid survey was conducted in June-July'19 to know the status of segregation of waste. About 88% of the households are covered in door to door collection of waste and in households where door to door collection is in practice the wastes generated are stored separately – Biodegradable waste in plastic buckets or bins and non-biodegradable waste in plastic bags. 76% of the commercial establishments are covered under door to door collection and such establishments store waste in segregated form. Corporation is mobilizing the Haritha Karma Sena to streamline the activities**

2. **Repair of trommels (to be completed in March 2019)**

Completed all the repair works related to the trommels including re-fixing of the sieves on 11/01/2019 itself.

3. **Setting up proper drainage system (to be completed in March 2019)**

- Completed construction of drains to a length of 300m in areas of earthen drain and connected to the existing concrete drains.(Completed in 12/03/2019). **Now cover slabs have been laid over the drains.**

4. **Establishing semi-permanent Leachate Treatment System (to be completed in March 2019)**

- Hon'ble Mayor suggested taking advice from Suchitwa Mission also regarding the specification that shall be adopted for the leachate treatment plant. Accordingly Suchitwa Mission was requested on 31/01/19.

- Vide letter dated 13/02/2019 received on 20/02/2019 Suchitwa Mission informed that the work of installation of leachate treatment plant shall be tendered after preparation of DPR based on electro-coagulation technology with pre-treatment systems from agencies empanelled by Suchitwa Mission.

- Tender for preparation of DPR was floated on 06/03/2019 with closing date on 13/03/2019. Closing date extended to 21/03/2019 as no tenders were received and extended again to 27/03/2019 as only one tender was received. Tenders were opened on 29/03/19. Two tenders were received, one from M/s Sens wasser solutions(L1) and one from M/s Ram Biologicals. **Counicl that met on 29/07/2019 has given approval to award the work to the lowest bidder**.(Meanwhile as directed by Hon'ble Mayor GIZ, the German cooperation agency was engaged to do a rapid study on leachate generation and apt technology that can be adapted. The work will be awarded after getting their technical inputs also. Two rounds of sampling for testing the leachate characteristics done, based on the report they are to submit the technical note by 05/08/2019.

  Now the leachate from the composting plant is being taken to septage treatment plant in trucks and treated there.

- **To avoid ad-hoc hiring of trucks and reduce cost, tender was floated on 12/07/2019 to hire septage collecting trucks to operate continuously for 3 months. Assessing that the amount quoted by the lowest bidder @ Rs. 5,54,400 as higher and cost per trip coming to Rs. 1,232 Health Standing Committee that met on 29/07/2019 decided to re-tender the work.**

- **Council that met on 29/07/2019 approved to award the work of preparation of DPR of leachate treatment plant to the lowest bidder M/s Senswasser solutions.**

5. **Setting up fully functional plastic shredding system/Capacity addition (to be completed in March 2019)**

- Plastic shredding unit is operational as of January'19
- Baling unit installed (the contractor who collects the plastic waste for recycling installed the baling unit) in January 2019
- Purchase order given to Clean Kerala Company for purchase of 2 shredding units on 13/05/2019.

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- Clean Kerala Company has over phone informed that they are yet to empanel the new shredding unit providers, and they will be able to supply the shredding units in August 2019 only.
- **The health standing committee that met on 29/07/2019 has given approval to float tenders for *engaging agencies capable of operating* the MRFs in Corporation area *independent of other facilities including provision to recover, recycle, and bale the waste for making Refuse Derived fuel which could be sent to cement kilns. This is to avoid taking the bio-degradable waste to Brahmapuram***

6. **Inviting tenders for remediation of legacy waste and reclamation of land(to be completed in March 2019)**

- M/s Zonta Infratech who has done capping of waste in Tirunelveli and Salem of Tamil Nadu was contacted and one of their experts Mr. Zenthil visited the site on 2/02/2019.

- Mr. Senthil opined that the wastes that are spread over 16 acres of land can be compressed and brought together in 4 acres of land and can be capped.

- Recovery of waste is not economically viable as there is no market for purchasing such huge amount of plastic waste as per the view of M/s Zonta Infratech.

- EOI invited on 21/02/2019 with closing date on 07/03/2019. 3 EOI's received, each from M/s Zonta infratech Bangalore(for capping of waste), M/s Zigma Erode(for biomining of waste) and M/s CED Trivandrum (for capping of waste after recovery of waste). Evaluation of EOIs completed on 11/03/19. In the 2nd meeting of state level monitoring committee of NGT held at TVM on 15/03/19 it was directed to consult Pollution control Board, CUSAT for advice. Professor from CUSAT visited Brahmapuram on 25/03/19. PCB had called a meeting on 26/3/19 at their regional office EKM and has asked the Corporation to send the proposals received for processing the legacy waste to PCB for getting their advice. Proposals were sent on 29/03/2019. It was insisted in the meeting of SMC-NGT on 6/04/19 to go ahead with bio-mining only.

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- Request for Proposal prepared for tendering the work of bio-mining as decided in the RMC_NGT meeting on 06/04/2019

- **As decided in the meeting of SLMC-NGT on 14/06/2019, the tender document was submitted to Pollution Control Board for vetting on 01/07/2019 after approval of the Health Standing Committee and council. After incorporating the suggestions of PCB the bid document was sent to PCB on 30/07/2019 for final vetting.**

- **M/s Planet Saviors, a Pondicherry based firm was consulted in disposing the legacy wastes and they have expressed their willingness to take the legacy wastes after baling for burning in cement kilns without financial commitment to the Corporation. Corporation council that met on 29/07/2019 has approved the proposal. Work to commence from 7/08/2019.**

7. **Disposal of flood waste(to be completed in March 2019)**

- Started disposing the flood waste through Clean Kerala Company from 18/01/19.
- Due to issues between the waste transporting contractor and clean kerala company regarding the dues to be paid, the work was temporarily stopped after 2/2/19
- Work resumed on 8/02/2019
- Work stopped again after 18/2/19 due to issues regarding payment of dues to the contractor and non-availability of trucks as informed by Clean Kerala Company
- Work resumed on 27/03/2019
- After completing the disposal of about 2800 tonnes of flood waste in the first week of April, the work was stopped as the agreed amount of waste disposal is complete.

Mid-term basis (To be completed in 3-6 months before 15/06/2019)

Item	Action taken/To be taken

Sanitary land fill for rejects to be constructed.	**Vetting of the design of landfill being done by College of Engineering Thiruvananthapuram.**
Proper segregation of wastes in place	**In 88% of the households where door to door collection of wastes are in practice, wastes are segregated in 2 streams – Biodegradable and Non biodegradable and for commercial buildings about 76% of wastes are segregated.**
Fully functional leachate treatment plant	Tender for preparing DPR was floated on 06/03/2019 Report/Technical input from GIZ(German International Cooperation agency) awaited before awarding the work. **Council approved the lowest bidder. GIZ has informed that they will be submitting the report by 05/08/2019. After getting the technical input the work will be awarded.**
Remediation of legacy waste and reclamation of land.	**After incorporating the suggestions of PCB, sent to PCB for final vetting of the tender document.**

Long-term basis (To be completed till commissioning of the waste to energy plant)

Item	Action taken/To be taken
Sanitary land fill for rejects to be constructed.	Sanitary landfill to be constructed in 1 year's time . The design is being vetted by College of Engineering Trivandrum
Proper segregation of wastes in place	**In 88% of the households where door to door collection of wastes are in practice, wastes are segregated in 2 streams – Biodegradable and Non biodegradable and for commercial buildings about 76% of wastes are segregated. Haritha Karma Sena is being mobilized to ensure 100% door to door collection of wastes.**

ACTION TAKEN

On the Directions of the State Level monitoring committee of NGT in the meeting on 01/03/2019

- As part of strengthening the security of the plant 5 additional security men are deployed in addition to the 4 security men working at the plant.

- 3Nos of 5 HP pumps are fixed near the southern boundary for pumping water to the dump yard to control the heat buildup and to prevent further chances of fire.

- Wastes laying near the southern side cleared so as to form roads for easy access to fire tenders in case of emergency
- Wastes cleared so as to form road along the centre portion of the waste heap, along the river side, along plastic shredding unit to make fire breakers.

- Installed 2 cameras for surveillance 1 at the entry and the other at area of core activity near the weigh bridge

- Expression of Interest/EoI for biomining/capping the waste was invited on 21/02/2019.

- Deployed 20 additional health workers for the activities associated with the dumping yard.

- Deployed engineering staff on shift basis for technical support.

- Completed lighting of the road coming to the waste dumping yard utilizing the existing electric posts of KSEB. 34 lamps fixed

- **New security men deployed from 15/07/2019. Camera surveillance included under their scope of work. 2 additional cameras installed. Installation of remaining 4 cameras in progress. Poles for fixing the camera fixed at key locations.**

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ACTION BEING TAKEN

- **Formation of roads inside the waste dumping yard using GSB/Granular Sub Base tendered. The council that met on 29/07/2019 approved to award the work to the lowest bidder.**
- Construction of watch tower/over head water tank for proper surveillance of the entire waste dumping yard and the premises of waste treatment plant. Estimate prepared.
- Installation of mini-high mast light near the waste dumping yard

2nd Meeting of State Level monitoring committee of NGT on 15/03/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. The legacy waste shall be disposed of part by part by means of bio-mining
2. Corporation shall keep escrow account for handling emergency situation
3. Vehicle transporting waste shall be provided with adequate cover, leachate collection system and proper log book.
4. Ex-service armed security shall be deployed at the plant site
5. Sahodaran Ayyappan road, Banerji road and NH bypass roads are to be waste free
6. Door to door collection of waste shall be insisted upon. Segregation of waste shall be ensured
7. Plastic carry bags of thickness below the prescribed limit shall be banned.
8. Health workers shall be given personal protective equipments when working on waste related activities.
9. It shall be explored whether the ex-service men society that carried bio-mining of waste in Adimaly/Munnar belts can be engaged at Brahmapuram for processing the legacy waste

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3rd Meeting of State Level monitoring committee of NGT on 06/04/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. Kochi Corporation shall dispose legacy waste part by part means of bio-mining as per the guidelines of CPCB involving a technical expert. Necessary arrangements for addressing the present environmental issues shall be taken till the waste to energy plants comes into existence. A compliance report shall be filed before the next meeting of the committee.

2. Directions issued to Kochi Corporation vide minutes of the 2nd meeting of SMC-NGT may be forwarded to District collector to oversee the implementation of directions.

4th Meeting of State Level monitoring committee of NGT on 08/05/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. 100% segregation of solid waste is to be ensured within 40 days (before 17/06/2019)

2. The following roads also shall be declared waste free

   (i) Subhash Chandra Bose Road

   (ii) K.V Jacob Road

   (iii) BOT Bridge to Alexander Parmabithara Road

3. To complete the previous directions

5th Meeting of State Level monitoring committee of NGT on 14/06/2019 at Govt. guest house Thiruvananthapuram.

Directions:

1. Corporation shall submit an action plan on the activities that will be carried out immediately.
2. The drains constructed for draining leachate shall be covered with slabs to avoid rain water getting mixed with the leachate.
3. A collection tank for leachate shall be constructed

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4. To submit the ward level details of waste segregation.
5. Details of RRFs, MCFs in Corporation area and other waste management options in practice.
6. To submit the tender document of Bio-mining to Pollution Control Board for vetting.
7. To identify the bulk waste generators and issue notice to them to make own arrangements for disposal of plastic and other non-biodegradable wastes.

ACTION TAKEN SO FAR

1. EOI invited on 21/02/2019 with closing date on 07/03/2019. 3 EOI's received each from M/s Zonta infratech Bangalore(for capping of waste), M/s Zigma Erode(for biomining of waste) and M/s CED Trivandrum (for capping of waste after recovery of waste). Evaluation EOIs completed on 11/03/19.

   In the 2nd meeting of state level monitoring committee of NGT held at TVM on 15/03/19 it was directed to consult Pollution control Board, CUSAT for advice. Professor from CUSAT visited Brahmapuram on 25/03/19.

   Professor from CUSAT visited Brahmapuram on 25/03/19 and had advised to carry out bio-mining of waste manually.

   CUSAT was requested to conduct a rapid study to determine the composition of wastes in the plastic and non-biodegradable waste dumping yard, **but they denied.**

   PCB had called a meeting on 26/3/19 at their regional office EKM and has asked the Corporation to send the proposals received for processing the legacy waste to PCB for getting their advice. Proposals were sent on 29/03/2019. It was insisted in the meeting of SMC-NGT on 6/04/19 to go ahead with bio-mining.

   Ex-service men society personnel Sri Varghese visited Brahmapuram on **29/03/2019**. He has informed that he will submit a proposal in consultation with the Government. (*Orally he informed that it is not possible to recover*

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80% of the waste. It can only be land filled. If the work is awarded to them they will carry the waste to a landfill area in Mysore and dispose it there and that would incur a cost of Rs.40000 per truck load of waste (~15 tonnes) in addition of Rs. 5.25 per kg for recovering it from the dump yard.)

Request for Proposal prepared for tendering the work of bio-mining as decided in the RMC_NGT meeting on 06/04/2019

- **As decided in the meeting of SLMC-NGT on 14/06/2019, the tender document was submitted to Pollution Control Board for vetting on 01/07/2019 after approval of the Health Standing Committee and council. After incorporating the suggestions of PCB the bid document was sent to PCB on 30/07/2019 for final vetting.**

- **M/s Planet Saviors, a Pondicherry based firm was consulted in disposing the legacy wastes and they have expressed their willingness to take the legacy wastes after baling for burning in cement kilns without financial commitment to the Corporation. Corporation council that met on 29/07/2019 has approved the proposal. Work to commence from 5/08/2019.**

- **Legacy waste composition study conducted in association with M/s Aggrezzo Industries Pvt Ltd on 22/05/2019**

2. Directions given to modify trucks to hard top and get it fully covered with provision for collecting the leachate. The tender which is due to be floated for renewing the contract with waste transporters will be tendered with clear direction and specification.

3. **New team of security personnel deployed from May 15 2019.** (Camera surveillance is done by them on their own)

4. The following roads have been declared as zero waste roads:

    (i) Sahodaran Ayyappan road,

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(ii) Banerji road
(iii) NH Bypass roads
(iv) Subhash Chandra Bose Road
(v) K.V Jacob Road
(vi) BOT Bridge Thoppumpady to Alexander Parambithara road

Sl.No	Road	Length (km)	Waste dumping points	Remarks
1	Bypass road	8.6	4	Major dumping
2	Sahodaran Ayyappan road	4.8	0	CLEAR
3	Banerji road	7.2	0	CLEAR
4	BOT Bridge - Alexander Parambithara bridge	3.3	2	Recurrent dumping
5	KB Jacobs road	2	0	CLEAR
6	Subhash Chandra bose road	3.7	0	Clear

As the Bypass road is having many intersections it is really challenging to maintain the roads as waste free and in BOT-Bridge – Alexander Parambithara road though the wastes dumped at 2 major points are cleared by Corporation it is getting dumped again with wastes. Have requested the support of Cochin Port Trust also.

5. Orientation meeting conducted on 22/03/2019 and 12/04/2019 for HI/JHIs to ensure proper segregation of wastes

6. Ward level orientation meetings and awareness campaign held by Health Standing Committee Chairperson in June 2019

7. It is ensured that about 75% of the waste collected are in segregated form as of 14/06/2019

8. It is strictly enforced at grass root level to segregate waste at source and strict directions are given not to load mixed waste in trucks carrying waste into Brahmapuram plant.

Annexure A (Page 14)

9. Plastic manufacturers association, merchants associations were called for a meeting on 15/04/2019 to bring them on board and to cooperate with the Corporation in the drive to completely ban plastic carry bags of size less than 50 microns.

10. Use of personal protective equipments (PPE) by health workers enforced.

11. 3, 5 HP pumps are fixed near the southern boundary for pumping water to the dump yard to control the heat buildup and to prevent further chances of fire.

12. 2 Cameras are fixed, the surveillance area to be expanded by adding more cameras. Included under the scope of work of the new security to be deployed. **New Security deployed from 15/07/2019 and 2 cameras have been installed. Installation of remaining 4 cameras in progress**

13. About 11 heaps are formed in the legacy waste dumping area to make fire breakers and easy access to fire tenders.

14. Completed lighting of the road coming to the waste dumping yard utilizing the existing electric posts of KSEB. 34 lamps fixed

15. Application made with KSEB for HT connection to the leachate treatment plant. Estimate to be prepared and Technical sanction to be given by the committee constituted for electrical works at District Panchayat level. It is under the consideration of the committee. **Obtained TS for the work. Work to be tendered**

16. **Of the 611 m of drains around the plant, about 430metres are covered with slabs. Old discarded slabs from various wards of Corporation were brought to Brahampuram and used for covering the drains.**

17. **Work for constructing leachate collection tank tendered on 27/07/2019**

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Annexure A (Page 15)

18. **Work for constructing damaged compound wall and grill tendered on 27/07/2019**

19. **Ward level details of waste segregation, RRFs, MCFs already submitted to SLMC-NGT on 27/07/2019.**

20. **Tender document for Biomining of waste submitted to Pollution Control Board on 01/07/2019 and after getting the suggestion from PCB the revised tender document was sent to PCB on 30/07/2019 for final vetting of the document.**

21. **About 35 bulk waste generators were identified and have issued notice to make own arrangements for disposal of non-biodegradable wastes including plastic.**

22. **A rapid survey was conducted in June-July'19 to know the status of segregation of waste. About 88% of the households are covered in door to door collection of waste and in households where door to door collection is in practice the wastes generated are stored separately – Biodegradable waste in plastic buckets or bins and non-biodegradable waste in plastic bags. 76% of the commercial establishments are covered under door to door collection and such establishments store waste in segregated form. Corporation is mobilizing the Haritha Karma Sena to streamline the activities**

23. **Corporation council that met on 29/07/2019 approved to invite tenders for fixing fire hydrants. Work to be tendered.**

IMPLEMENTATION OF WASTE TO ENERGY PROJECT

1. Following Clearances have been obtained

   I. Consent to Establish the plant from KSPCB (Obtained on 30/08/2018)

   II. Factories and Boilers(Obtained on18/04/2018)

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Annexure A (Page 16)

III. Forests and Wildlife (Obtained on 11/06/2018)

IV. NOC from Aviation department (Obtained)

V. License from DMO(Obtained on 15/3/2018)

VI. Clearance from the Chief Town Planner (Obtained on 6/7/2018)

VII. NOC from Fire and Rescue

VIII. Development permit

2. *And the following clearances are to be obtained*

IX. Environmental Clearance from SEIAA (Under consideration of the committee)

X. Building permit from the Puthencruz Grama panchayath (under consideration of the GP and will be issued after getting the Environmental clearance)

Public hearing of the waste to energy plant conducted on 10/06/2016. Revised Environmental Impact Assessment report submitted to SEIAA and a presentation was also given to SEIAA on 01/08/2019.

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ANNEXURE - X 5

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
E-mail: ms.kspcb@gov.inFAX: 0471 – 2318134, 2318152 web: www.keralapcb.nic.in
KERALASTATE POLLUTION CONTROL BOARD
കേരളസംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004

PCB/HO/RULES/SWM - ERNAKULAM/2018 Date: 12/10/2019

Regd. with A/D

NOTICE UNDER SECTION 5 OF THE ENVIRONMENTAL PROTECTION ACT, 1986

Sub: Non-compliance of Solid Waste Management Rules, 2016.

Ref:
1. The Hon'ble NGT order dated16/01/2019 in OA no. 606/2018.
2. The Hon'ble NGT order dated 22/11/2018 in O.A. No. 353/2016.
3. The Hon'ble NGT order dated 20/11/2018 in O.A No. 117/2014, 499/2014 and 102/2014.
4. Letter No. PCB/HO/SEE2/RMC- Meeting/2018 dated 09/10/2018, 22/10/2018 and 24/10/2018.
5. This office notice of even No.PCB/HO/EE4/NGT/SWM DIRECTIONS TO LB/2019 dated 17/04/2019.
6. Minutes of the 4th meeting of the State Level Monitoring Committee.
7. This office notice of even No.PCB/HO/EE4/AG/2019 dated 09/05/2019.
8. Letter No. MOE2/10948/2017 dated 27/05/2019.
9. Letter No. MOE2/10948/2017 NGT/Vol.II dated 19-07-2019.
10. Annual Report No.PCB/HO/SWM/AR/18/2019 dated 23/07/2019.
11. This office letter No. PCB/HO/RULES/SWM-ERNAKULAM/2018 dated 13-02-2019.
12. This office letter No. PCB/HO/RULES/SWM-ERNAKULAM/2018 dated 04-04-2019.
13. Minutes of the second and fifth meeting of the State Level Monitoring Committee constituted by the Hon'ble NGT on 15-3-2019 and 14-6-2019.

WHEREAS the Central Government notified the Environmental (Protection) Act, 1986 for the protection and improvement of environment and for matters connected therewith;

WHEREAS as per Section 3, 6, and 25 of the Environment (Protection) Act, 1986, the Central Government re-notified the Solid Wastes Management Rules, 2016 (herein after referred as SWM Rules) vide notification S.O. 1357(E) dated 8-4-2016;

WHEREAS as per Rule 22 (1) of the SWM Rules, suitable sites for setting up solid waste processing facilities are to be identified;

WHEREAS as per Rule 22(3) of the SWM Rules, suitable sites for setting up solid waste processing facility and sanitary landfill facilities are to be procured;

WHEREAS as per Rule 22 (5) of the SWM Rules, door to door collection of segregated waste and its transportation in covered vehicles to processing or disposing facility shall be ensured by 8-4-2019;

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WHEREAS as per Rule 22 (7) of the SWM Rules, solid waste processing facilities for the complete quantity of waste generated from the local body at 0.4 to 0.5 kg/person/day, shall be set up by 8-4-2019;

WHEREAS facilities with the technologies specified in CPHEEO manual and SWM Rules are to be in place for the effective treatment and disposal of the solid waste generated in the local body;

WHEREAS as per Rule 22 (6) of the SWM Rules, separate storage, collection and transportation of construction and demolition waste shall be provided;

WHEREAS as per Rule 22(11) of the SWM Rules, bio-remediation or capping of old and abandoned dump site shall be ensured;

WHEREAS repeated instructions were issued vide the communications read above, for the compliance of the SWM Rules;

WHEREAS Chairman SLMC during their 4th meeting on 08-05-19 directed to submit specific and detailed time bound action plan to the Kerala State Pollution Control Board, to adopt mechanized system for the disposal of legacy waste, to implement heavy fining/ surveillance cameras/ strict squad to prevent waste dumping on roads, to insist on segregation of wastes at source, to transport vehicles with adequate cover, leachate collection tank and logbook, to provide adequate personal protective equipments to workers and they should be compelled to wear the same, to prohibit deposit of wastes on roads and other public places, to deploy haritha karma sena for door to door collection, to report on the action taken shall be submitted to the SLMC.

WHEREAS during the second meeting of the State Level Monitoring Committee constituted by the Hon'ble State Level Monitoring Committee on 15-3-2019, the resolutions were made to conduct bio mining of legacy waste part by part; keep ESCROW amount for handling emergency situation; provide adequate cover, leachate collection tank and log book for waste transporting vehicles and allow waste transportation only by those vehicles by Health Supervisor; engage Ex-service armed security at the segregation in the dump yard; to make the roads, NH Bypass, Sahodaran Ayyappan Road and Banerjee Road as Zero Waste road; to insist door to door collection and prohibit the deposition of waste on roads and other public places and insist for segregation of waste before disposal; ban the plastic carry bags below the prescribed limit and to proceed against violators under the law of penalization; to give adequate protective equipment namely gumboots, gloves, masks etc., proceed against the violators disposing sewage, septage and chicken waste in the water resources; apartments, hospitals, hospitals which are not operating their

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sewage treatment plants and to evolve methods for the effective disposal of plastics and not to dispose plastic by burning;

WHEREAS during the fifth meeting of the State Level Monitoring Committee constituted by the Hon'ble State Level Monitoring Committee on 14-6-2019, noticed with distress that a good number of directions issued are yet to be complied with and therefore expressed displeasure over the same and it was again directed to issue directions by the Corporation to the bulk generators to take steps to channelize their own wastes as the same is homogenous and clean, channelization can be done easily; to submit the details of wards, in which segregation is complete; segregated plastic waste for shredding is to be stored in areas attached to the zonal office of the Corporation; and to submit action plan in each ward for solid waste management, projects to be implemented and to improve the existing water management facility, existing material collection facility and resource recovery facility; to publish the information on waste management in the website; to take legal action against open burning of non-biodegradable waste and dumping of waste in water bodies; to take steps to establish MCFs in all wards and RRF at least in six wards; issue identity card to all workers engaged in waste management and to prepare action plan for developing a business model for effective treatment of waste;

WHEREAS it is noted that you have not identified the land for the solid waste processing facility and sanitary landfill;

WHEREAS the Hon'ble National Green Tribunal, Principal Bench, New Delhi in the order dated 22/11/2018 in O.A. No. 353/2016 clarified that apart from prosecution, the statutory authorities under the Environment (Protection) Act, 1986, the Air (Prevention and Control of Pollution) *Act,* 1981 and the Water (*Prevention and Control of Pollution*) Act, 1974, must, in exercise of their incidental powers, prescribed scale of compensation to be collected from the polluters on the "Polluter Pay's Principle". Such scale which may be laid down at various levels, having regard to the local condition or as per direction in the hierarchy of the authorities. In various other application also, the Hon'ble NGT passed similar orders, for instance, in the Order dated 20/11/2018 in O.A No. 117/2014, 499/2014 and 102/2014 the Hon'ble NGT noted as; "Needless to say that statutory authorities under the Environment (Protection) Act, 1986, Air (Prevention and Control of Pollution) *Act,* 1981 and the Water (*Prevention and Control of Pollution*) Act, 1974 are entitled to assess and recover damages as "Polluter Pay's Principle" in exercise of incidental powers to protect environment".

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WHEREAS it is noted that you have not fully complied with the above directions of Hon'ble SLMC, Solid Waste Management Rules and also not obtained authorization under SWM Rules, 2016;

ANDWHEREAS it is noted that the windrow composting plant at Brahmapuram is not working properly and the food wastes taken to the plant are not treated properly;

NOW THEREFORE, in exercise of the powers vested under Section 5 of the Environment Protection Act, 1986, you are directed to take steps to provide biomethanation plant for the food wastes generated within Kochi Corporation and to report compliance of all above directions within 15 days for avoiding any further action including recover Environmental Compensation for the noncompliance of the SWM Rules, 2016.

Ajit Haridas

CHAIRMAN

To

The Secretary,
Kochi Corporation

Copy to:

1. The Chairman
   State Level Monitoring Committee.
2. The Additional Chief Secretary
   Local Self Government Department.
3. The District Collector, Ernakulam.
4. The Director, Urban Directorate.
5. The Chief Environmental Engineer, Regional Office, Ernakulam.
6. The Environmental Engineer, District Office, Ernakulam.

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ANNEXURE X6

KOCHI MUNICIPAL CORPORATION

Phone { 2369007, 2369196
2369143, 2369149
2369197, 2369069
Fax : 91-484-2369023

Corporation Office
P.B.No.1016
Ernakulam, Cochin 682 011

No.MOE2/10948/2017

25/07/2019

From

Secretary

To

The Chairman
Kerala State Pollution Control Board
Pattom P.O, Thiruvananthapuram
695004

Sir,

Sub: Clarifications to the Notice issued under Section 5 of Environmental Protection Act 1986

Ref. PCB/HO/Rules/SWM-Ernakulam/2018 dated 12/10/2019

1. In compliance to the Municipal Solid waste management Rules 2000 and Solid waste management rules 2016: Rule 22(1), 22(3), Corporation had established a windrow composting plant of 250 TPD capacity in 2008 at Brahmapuram and has also entered into an agreement for establishing a waste to energy plant at Brahmapuram with sanitary landfill facility.
2. In compliance with the Rule 22(5) of the SWM Rules it is ensured that wastes are transported in covered vehicles only.
3. Kochi Corporation had established a 250 tonnes per day capacity windrow composting plant in 2008 itself in compliance with the MSW Rules 200 and SWM Rules 2016 – Rule 22(7) and to cater to the expanding waste management issues is set to establish another state-of-the-art waste gasification plant, the construction of which to be started in November 2019.
4. In compliance to the Rule 22(6) of the SWM Rules, Construction and Demolition wastes are dealt with separately and are not mixed with other wastes.

5. To comply with the Rule 22(11) of the SWM Rules a large portion of the dump site was capped in 2011 itself, and on 21/02/2019 Expression of Interest was called for capping the wastes in the dumping yard with closing date on 07/03/2019, later as per the direction of the State Level Monitoring Committee of NGT in its meeting on 06/04/2019 to biomine the legacy waste instead of capping, the EOIs obtained for capping were cancelled and fresh tender for bio-mining the legacy wastes was floated on 14/08/2019 after vetting of the tender document by Pollution Control Board and with closing date on 04/09/2019. As nobody participated in the tender the closing date was extended to 20/09/2019. Even then nobody participated in the tender. The work is retendered on 26/10/2019 after the assembly bye elections.

6. It is submitted that Kochi Municipal Corporation is the only LSGI in Kerala to conduct systematic collection, transportation and treatment of solid waste. Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs/Flats (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy – Kacheripadi wards of Edakochi area and few wards in Kaloor.

7. Specific and time bound action plan was submitted to the Chairman SLMC and Kerala State Pollution Control Board on 27/07/2019 by E.Mail to chairman.slmckerala@gmail.com,acslsgd@gmail.com deputysecretarylsgd@gmail.com, slmckerala2019@gmail.com . Biomining of waste has been re-tendered on 26/10/2019 as mentioned in detail in the above paragraph No.5.

   Heavy fines were imposed on people who disposed wastes in public places by the Health squad. An amount of Rs. 7,80,000 was collected towards fine since January 2019 and a mobile app called click for kochi has been made as a public interface to check and control dumping of waste and to provide other services related to waste management.

   Personal Protective Equipments were given to the field level workers and it is ensured that they are using it.

   About 84 vehicles are deployed for transporting waste of which only 20% of the vehicles that were owned by the Corporation alone had full cover body and provision for leachate collection. Now 80% of the fleet of vehicles used for transporting the wastes are having full cover and provision for collecting leachate.

   Vehicle log book is maintained at the Solid waste treatment plant at Brahmapuram.

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The present waste collection system is run by the Kudumbasree and in few wards by Haritha karma sena.

8. It is submitted that several round of attempts were made by Kochi Corporation for biomining of the legacy waste but nobody turned up after visiting the site. On 29/03/2019 Ex-service men society personnel who did similar works in Munnar areas visited the site and a firm named M/s Planet Savers based in Pondicherry ready to take the legacy waste for burning it in cement kilns was awarded the work on 07/08/2019 but later they also did not turn up.

   Starting of ESCROW account for handling emergency situation is under the consideration of council.

   Vehicles with pass issued by the Health Inspectors of respective Health Circles with duly signed certification that the truck carries only segregated wastes only are permitted to tip wastes at Brahmapuram plant.

   Sahodaran Ayyappan road, Subhash Chandra Bose road, Banerji road, Jacobs road in Fort Kochi, BOT bridge –Alexander Parambithara road made waste free. The bypass road having many intersections couldn't be made waste free due to practical difficulty due to few numbers of employees for surveillance and enforcement.

   Strict action was taken by Corporation in enforcing the ban of plastic carry bags below 50 microns. About 2.42 tonnes of plastic carry bags were seized by the Health Inspectors and Junior Health Inspectors and an amount of Rs.52000 was imposed as fine during March – August 2019 period.

   Directions were not given to Corporation with regard to the disposal of sewage, septage and chicken waste in the water resources and to check apartments, hospitals which are not operating their sewage treatment plant. Though to streamline the activities related to the sewage disposal and septage management and to ensure that no wastes are dumped in water bodies and to keep log of septage business a septage management mobile app has been developed by Kochi Corporation and has been approved for direct purchase by the Start up mission, Government of Kerala on 23/09/2019.This will be implemented immediately.

9. About 38 bulk waste generators (generating non-biodegradable wastes over 50kg per day) were identified and notices were given to process wastes on their own by aligning with private agencies engaged in waste recovery and recycling. Segregated plastic wastes are collected at Zonal offices and Health Circle offices of Corporation at various places. The details regarding the solid waste management has been published in Corporation website and can also be accessed through www.clickforkochi.kerala.gov.in 5 MRFs have already been constructed at Kaloor, Padiath, Mattanchery, Edapally and Brahmapuram. Decision related to letting out for waste recovery is pending with the Council.

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10. Corporation had identified land for solid waste processing facility way back in 2004 and had established a windrow composting plant in 2008. Vide letter No. PCB/RO-EKM/GEN-97/12 dated 22/08/2019 Chief Environmental Engineer, Regional Office Ernakulam had informed that the land identified by Corporation in Brahmapuram behind the security cabin is not suitable as per the guidelines of CPCB as 2m clearance to the ground water table from the bottom liner of the landfill cannot be ensured and to find some other place in the 110 acre land at Brahmapuram. In full compliance with the CPCB guidelines and the guidelines of the CPHEEO Solid waste management manual 2016 other land cannot be found in Brahmapuram as a minimum 100m clearance from water bodies is mandated.

11. Authorisation under the MSW Rules 2000 was obtained for the plant. Authorisation under SWM 2016 will be obtained soon.

12. Though the structure is completely collapsed, and there are issues related to available space, and storm water infiltration, Corporation has taken its earnest effort in operating the windrow compost plant. Biodegradable wastes are treated properly by forming windrows. The efficiency of the plant is maintained at 8% when compared to the standard 12% efficiency of windrow composting plants. It may be noted that the Regional Monitoring Committee vide its minutes dated 1/02/2019 has observed that Corporation has made considerable improvement over a period in the windrow composting plant. Repair of trommels and many other maintenance works were carried out in the plant in March 2019. On an average 250Tonnes of biodegradable wastes are processed in the plant daily and about 20 tonnes of finished 6mm sieved manure is produced which are sold to planters in idukki, Theni, Kambam and other parts of Tamil Nadu, Krishi Bhavans and Kannur Municipal Corporation. It is also to be noted that this dilapidated plant is taking care of the entire waste generated out of Kochi city.

    Construction of the waste to energy project is delayed for reasons beyond the control of Corporation as the State Environmental Impact Appraisal Committee (SEIAC) that recommends environmental clearance was not constituted by the Government of India and has now obtained the Environmental Clearance for the waste to energy project on 05/10/2019. The only pending clearance is the building permit which is expected in the last week of October 2019. Construction works will be started in November 2019.

13. Bio-methanation of wastes will require about 140m^3 of digester volume for processing 1 ton of wastes as a minimum Hydraulic Retention Time of 45 days is to be provided, and for processing 2 tonnes 275 m^3 and for the maximum capacity of 5 tonnes 400m^3 which is practically difficult to treat 228 tonnes of biodegradable waste generated in Kochi Corporation. It will be explored whether it can be made use of for public utilities like markets.

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Considering the consistency and advances of Kochi Corporation in waste management and treatment even with the problem ridden plant since 2009 and switching over to the waste to energy plant, the action of the Board to recover environmental compensation may kindly be waived and I assure that the directions that are left to be complied will be completed immediately.

Yours faithfully,

28/10/19

Secretary

Enclosed: Detailed Action taken report

Copy submitted to:

1. The Chairman SLMC-NGT
2. Additional Chief Secretary, LSGD
3. The District Collector
4. Director – Urban Affairs
5. Chief Environmental Engineer, Regional Office Ernakulam
6. Environmental Engineer – District Office Ernakulam

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ACTION TAKEN REPORT –KOCHI MUNICIPAL CORPORATION

28/10/2019

(GIVEN IN BOLD ARE ACTION TAKEN AFTER THE MEETING OF SLMC-NGT ON 03/08/2019)

To comply with the directions of the Hon'ble National Green Tribunal on 22/10/2018 Corporation had prioritized the works that were to be carried out in Brahmapuram into: *works that are to be carried out immediately on war footing basis, short-term basis* (in 2-3months), *Mid – term basis (3-6 months) and long term basis*. The action taken is as given in the table below:

Immediate (Completed on 18/12/2018)

1. *Formation of windrows*

For scientific processing of the waste the wastes have been re-arranged to form windrows. 23 such windrows could be formed.

2. *Clearing and cleaning of existing drains*

The drains that carry the leachate were cleaned for the free flow of leachate into collection tanks.

3. *Identification of collection point and fixing of collection tanks for leachate*

Two collection points for leachate were identified; one to the southwest of the plant and one to the eastern side of the plant. 2 precast collection tanks of capacity 3500 litres each were placed in southwest portion and 1 collection tank of 3500litres was kept in the lowest point in the eastern side.

4. *Installation of Leachate treatment plant on trial run basis*

A prefabricated leachate treatment plant based on electro-coagulation technology was installed on a trial run basis. The plant has been installed in the pre-sorting shed situated in the south-east side of the plant. The leachate collected in the collection tanks are pumped into the collection tanks of the treatment unit and taken for treatment.

5. Channelizing leachate to drains & collection tanks

Half cut 8" pipes were laid in existing drain/trenches from where leachate is oozing out from the windrows to the main peripheral drains to avoid infiltration of leachate into the soil and for channelizing the flow. Later concrete drains were constructed.

SHORT TERM

1. **Ensuring proper segregation (to be completed in March 2019)**

- Responsibility of proper segregation of waste at source level assigned to Health Inspectors of respective health circles.
- HI's shall ensure that source level segregation is in place or shall enforce wherever necessary and from the waste transfer points plastic wastes are not loaded into the truck that carries food waste/Biodegradable waste.
- In the meeting with the Kudumbasree and the workers of Corporation associated with waste collection held on 14/01/19 it was clearly informed that no mixed waste shall be collected or loaded into trucks. Also in the meeting with the HI/JHI's of all Health circles on 14/01/2019 it was reiterated to ensure proper segregation of waste.
- The matter of segregating the waste at source level itself is being rolled out through the Kudumbasree and health workers of Corporation. Kochi Corporation will stop collecting mixed waste after March 2019
- Direction issued in the form of proceedings (dated 05/02/19) of Secretary that the HI/JHI's of respective health circles shall certify/issue pass to trucks transporting waste stating that the truck load contains only food waste/wet waste/bio-degradable waste. JHI of the plant shall acknowledge the passes and shall let to tip wastes certified as biodegradable waste by HI/JHI's of respective health circles.
- An amount of Rs. 120000 imposed as fine since 10/05/2019 to defaulters
- Orientation meeting conducted on 22/03/2019 for HI/JHIs by Chairman Health Committee
- Orientation meeting/ follow up meeting conducted on 12/04/2019 for HI/JHIs
- About 50% of wastes brought to the plant are now segregated as on 02/05/19

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- Ward level orientation meetings and awareness campaigns conducted by Health Standing Committee Chairperson and concerned Health Circles.
- A rapid survey was conducted in June-July'19 to know the status of segregation of waste. About 88% of the households are covered in door to door collection of waste and in households where door to door collection is in practice the wastes generated are stored separately – Biodegradable waste in plastic buckets or bins and non-biodegradable waste in plastic bags. 76% of the commercial establishments are covered under door to door collection and such establishments store waste in segregated form. Corporation is mobilizing the Haritha Karma Sena to streamline the activities.
- **This was re-assessed in September 2019 as follows:**
- **Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy –Kacheripadi wards of Edakochi area and few wards in Kaloor.**

2. Repair of trommels (to be completed in March 2019)

Completed all the repair works related to the trommels including re-fixing of the sieves on 11/01/2019 itself.

3. Setting up proper drainage system (to be completed in March 2019)

- Completed construction of drains to a length of 300m in areas of earthen drain and connected to the existing concrete drains.(Completed in 12/03/2019).
- **Status of cover slabs laid over the drains:**
  Total length of drains: 630m
  Length of new drains: 330m
  Length of old drains: 300m
  Total length of drains covered with slabs: 480

Remaining length of drains to be covered: 150m (as the area has become slushy due to rain it can be completed only after the receding of continuous rain)

4. Establishing semi-permanent Leachate Treatment System (to be completed in March 2019)

- Hon'ble Mayor suggested taking advice from Suchitwa Mission also regarding the specification that shall be adopted for the leachate treatment plant. Accordingly Suchitwa Mission was requested on 31/01/19.

- Vide letter dated 13/02/2019 received on 20/02/2019 Suchitwa Mission informed that the work of installation of leachate treatment plant shall be tendered after preparation of DPR based on electro-coagulation technology with pre-treatment systems from agencies empanelled by Suchitwa Mission.

- Tender for preparation of DPR was floated on 06/03/2019 with closing date on 13/03/2019. Closing date extended to 21/03/2019 as no tenders were received and extended again to 27/03/2019 as only one tender was received. Tenders were opened on 29/03/19. Two tenders were received, one from M/s Sens wasser solutions(L1) and one from M/s Ram Biologicals.

- (Meanwhile as directed by Hon'ble Mayor GIZ, the German cooperation agency was engaged to do a rapid study on leachate generation and apt technology that can be adapted. The work will be awarded after getting their technical inputs also. Two rounds of sampling for testing the leachate characteristics done, based on the report they are to submit the technical note by 05/08/2019.

- Council that met on 29/07/2019 has given approval to award the work to the lowest bidder M/s Senswasser Solutions.

- **GIZ submitted the report on 27/08/2019 and made a presentation of the report on 28/09/2019. GIZ has proposed to design the plant for 400m^3/hr including storm water or with provision of septage treatment or for the leachate alone.**

- **As decision regarding the volume of leachate to be treated the minutes of the meeting has been referred to Council through Health Standing Committee.**

- To avoid ad-hoc hiring of trucks and reduce cost, tender was floated on 12/07/2019 to hire septage collecting trucks to operate continuously for 3 months. Assessing that the amount quoted by the lowest bidder @ Rs. 5,54,400 as higher and cost per trip coming to Rs. 1,232 Health Standing Committee that met on 29/07/2019 decided to re-tender the work. Work has been retendered and placed before Health Standing Committee for approval.

- **Work re-tendered and is placed with the Health Standing Committee for approval on 07/10/2019 and is due for approval.**

5. **Setting up fully functional plastic shredding system/Capacity addition (to be completed in March 2019)**
   Establishing MRFs in 6 wards and MCFs in all wards

- Plastic shredding unit is operational as of January'19
- Baling unit installed (the contractor who collects the plastic waste for recycling installed the baling unit) in January 2019
- Purchase order given to Clean Kerala Company for purchase of 2 shredding units on 13/05/2019.
- Clean Kerala Company has over phone informed that they are yet to empanel the new shredding unit providers, and they will be able to supply the shredding units in August 2019 only. Yet there is no communication from their end.
- **The health standing committee that met on 29/07/2019 has given approval to float tenders for *engaging agencies capable of operating* the MRFs in Corporation area *independent of other facilities including provision to recover, recycle, and bale the waste for making Refuse Derived fuel which could be sent to cement kilns. This is to avoid taking the bio-degradable waste to Brahmapuram. Due for approval of council.***

6. **Inviting tenders for remediation of legacy waste and reclamation of land(to be completed in March 2019)**

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- M/s Zonta Infratech who has done capping of waste in Tirunelveli and Salem of Tamil Nadu was contacted and one of their experts Mr. Zenthil visited the site on 2/02/2019.

- Mr. Senthil opined that the wastes that are spread over 16 acres of land can be compressed and brought together in 4 acres of land and can be capped.

- Recovery of waste is not economically viable as there is no market for purchasing such huge amount of plastic waste as per the view of M/s Zonta Infratech.

- EOI invited on 21/02/2019 with closing date on 07/03/2019. 3 EOI's received, each from M/s Zonta infratech Bangalore(for capping of waste), M/s Zigma Erode(for biomining of waste) and M/s CED Trivandrum (for capping of waste after recovery of waste). Evaluation of EOIs completed on 11/03/19. In the 2nd meeting of state level monitoring committee of NGT held at TVM on 15/03/19 it was directed to consult Pollution control Board, CUSAT for advice. Professor from CUSAT visited Brahmapuram on 25/03/19. PCB had called a meeting on 26/3/19 at their regional office EKM and has asked the Corporation to send the proposals received for processing the legacy waste to PCB for getting their advice. Proposals were sent on 29/03/2019. It was insisted in the meeting of SMC-NGT on 6/04/19 to go ahead with bio-mining only.

- Request for Proposal prepared for tendering the work of bio-mining as decided in the RMC_NGT meeting on 06/04/2019

- As decided in the meeting of SLMC-NGT on 14/06/2019, the tender document was submitted to Pollution Control Board for vetting on 01/07/2019 after approval of the Health Standing Committee and council. After incorporating the suggestions of PCB the bid document was sent to PCB on 30/07/2019 for final vetting.

- M/s Planet Saviors, a Pondicherry based firm was consulted in disposing the legacy wastes and they have expressed their willingness to take the legacy wastes

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after baling for burning in cement kilns without financial commitment to the Corporation. Corporation council that met on 29/07/2019 has approved the proposal. Work to commence from 7/08/2019. After awarding the work the firm did not turn up.

- **Tender for BIOMINING of legacy waste was floated on 14/08/2019 with closing date on 04/09/2019. As nobody participated in tender the closing date was extended to 20/06/2019. Even then nobody participated in the tender. TO BE RETENDERED AFTER ASSEMBLY BYE-ELECTION.**

7. Disposal of flood waste(to be completed in March 2019)

- Started disposing the flood waste through Clean Kerala Company from 18/01/19.
- Due to issues between the waste transporting contractor and clean Kerala company regarding the dues to be paid, the work was temporarily stopped after 2/2/19.
- Work resumed on 8/02/2019
- Work stopped again after 18/2/19 due to issues regarding payment of dues to the contractor and non-availability of trucks as informed by Clean Kerala Company
- Work resumed on 27/03/2019
- After completing the disposal of about 2800 tonnes of flood waste in the first week of April, the work was stopped as the agreed amount of waste disposal is complete.

Mid-term basis (To be completed in 3-6 months before 15/06/2019)

Item	Action taken/To be taken
Sanitary land fill for rejects to be constructed.	**Design sent to CET for vetting. Meanwhile as directed by NGT in its meeting on 03/08/2019 Pollution control Board visited the site on 17/08/2019 and assessed that the land identified by Corporation is not suitable and another land may be identified. As per the guidelines issued by the CPHEEO it is difficult to find another land in Brahmapuram. For reporting this to the Govt./NGT the matter was placed before Health Standing Committee.**

Proper segregation of wastes in place	• **Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy –Kacheripadi wards of Edakochi area and few wards in Kaloor.**
Fully functional leachate treatment plant	Work for preparation of DPR awarded to M/s Senswasser solutions GIZ submitted the report on 27/08/2019 and made a presentation of the report on 28/09/2019.(GIZ was requested to do a rapid study on leachate treatment technology that can be adopted) As decision is to be taken regarding the volume of leachate to be treated matter referred to Council through HSC
Remediation of legacy waste and reclamation of land.	• **Tender for BIOMINING of legacy waste was floated on 14/08/2019 with closing date on 04/09/2019. As nobody participated in tender the closing date was extended to 20/06/2019. Even then nobody participated in the tender. RETENDERED on 26/10/2019 after Assembly bye-elections.**

Long-term basis (To be completed till commissioning of the waste to energy plant)

Item	Action taken/To be taken
Sanitary land fill for rejects to be constructed.	**Design sent to CET for vetting. Meanwhile as directed by NGT in its meeting on 03/08/2019 Pollution control Board visited the site on 17/08/2019 and assessed that the land identified by Corporation is not suitable and another land may be identified. As per the guidelines issued by the CPHEEO it is difficult to find another land in Brahmapuram. For reporting this to the Govt./NGT the matter was placed before Health Standing Committee.**
Proper segregation of wastes in place	**Households covered under door to door collection: 150730(90%)** **HHs segregating wastes: 143202(85%)** **No. of wards where wastes are fully segregated: 28(38%)**

ACTION TAKEN

On the Directions of the State Level monitoring committee of NGT in the meeting on 01/03/2019

- As part of strengthening the security of the plant 5 additional security men are deployed in addition to the 4 security men working at the plant.

- 3Nos of 5 HP pumps are fixed near the southern boundary for pumping water to the dump yard to control the heat buildup and to prevent further chances of fire.

- Wastes laying near the southern side cleared so as to form roads for easy access to fire tenders in case of emergency
- Wastes cleared so as to form road along the centre portion of the waste heap, along the river side, along plastic shredding unit to make fire breakers.

- Installed 2 cameras for surveillance 1 at the entry and the other at area of core activity near the weigh bridge

- Expression of Interest/EoI for biomining/capping the waste was invited on 21/02/2019.

- Deployed 20 additional health workers for the activities associated with the dumping yard.

- Deployed engineering staff on shift basis for technical support.

- Completed lighting of the road coming to the waste dumping yard utilizing the existing electric posts of KSEB. 34 lamps fixed

- **New security men deployed from 15/07/2019. Camera surveillance included under their scope of work. Total 9 cameras are in operation at different points for surveillance.**

ACTION BEING TAKEN

- **Formation of roads inside the waste dumping yard using GSB/Granular Sub Base tendered. The council that met on 29/07/2019 approved to award the work to the lowest bidder.**
- Construction of watch tower/over head water tank for proper surveillance of the entire waste dumping yard and the premises of waste treatment plant. Estimate prepared.
- Installation of mini-high mast light near the waste dumping yard

2nd Meeting of State Level monitoring committee of NGT on 15/03/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. The legacy waste shall be disposed of part by part by means of bio-mining
2. Corporation shall keep escrow account for handling emergency situation
3. Vehicle transporting waste shall be provided with adequate cover, leachate collection system and proper log book.
4. Ex-service armed security shall be deployed at the plant site

5. Sahodaran Ayyappan road, Banerji road and NH bypass roads are to be waste free
6. Door to door collection of waste shall be insisted upon. Segregation of waste shall be ensured
7. Plastic carry bags of thickness below the prescribed limit shall be banned.
8. Health workers shall be given personal protective equipments when working on waste related activities.
9. It shall be explored whether the ex-service men society that carried bio-mining of waste in Adimaly/Munnar belts can be engaged at Brahmapuram for processing the legacy waste

3rd Meeting of State Level monitoring committee of NGT on 06/04/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. Kochi Corporation shall dispose legacy waste part by part means of bio-mining as per the guidelines of CPCB involving a technical expert. Necessary arrangements for addressing the present environmental issues shall be taken till the waste to energy plants comes into existence. A compliance report shall be filed before the next meeting of the committee.

2. Directions issued to Kochi Corporation vide minutes of the 2nd meeting of SMC-NGT may be forwarded to District collector to oversee the implementation of directions.

4th Meeting of State Level monitoring committee of NGT on 08/05/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. 100% segregation of solid waste is to be ensured within 40 days (before 17/06/2019)

2. The following roads also shall be declared waste free

   (i) Subhash Chandra Bose Road

   (ii) K.V Jacob Road

(iii) BOT Bridge to Alexander Parmabithara Road

3. To complete the previous directions

5th Meeting of State Level monitoring committee of NGT on 14/06/2019 at Govt. guest house Thiruvananthapuram.

Directions:

1. Corporation shall submit an action plan on the activities that will be carried out immediately.
2. The drains constructed for draining leachate shall be covered with slabs to avoid rain water getting mixed with the leachate.
3. A collection tank for leachate shall be constructed
4. To submit the ward level details of waste segregation.
5. Details of RRFs, MCFs in Corporation area and other waste management options in practice.
6. To submit the tender document of Bio-mining to Pollution Control Board for vetting.
7. To identify the bulk waste generators and issue notice to them to make own arrangements for disposal of plastic and other non-biodegradable wastes.

7th Meeting of SLCMC of NGT on 03/08/2019 at Thiruvananthapuram

Directions:

To complete the directions already given

ACTION TAKEN SO FAR

1. EOI invited on 21/02/2019 with closing date on 07/03/2019. 3 EOI's received each from M/s Zonta infratech Bangalore(for capping of waste), M/s Zigma Erode(for biomining of waste) and M/s CED Trivandrum (for capping of waste after recovery of waste). Evaluation EOIs completed on 11/03/19.

   In the 2nd meeting of state level monitoring committee of NGT held at TVM on 15/03/19 it was directed to consult Pollution control Board, CUSAT for advice. Professor from CUSAT visited Brahmapuram on 25/03/19.

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Professor from CUSAT visited Brahmapuram on 25/03/19 and had advised to carry out bio-mining of waste manually.

CUSAT was requested to conduct a rapid study to determine the composition of wastes in the plastic and non-biodegradable waste dumping yard, **but they denied.**

PCB had called a meeting on 26/3/19 at their regional office EKM and has asked the Corporation to send the proposals received for processing the legacy waste to PCB for getting their advice. Proposals were sent on 29/03/2019. It was insisted in the meeting of SMC-NGT on 6/04/19 to go ahead with bio-mining.

Ex-service men society personnel Sri Varghese visited Brahmapuram on **29/03/2019** as requested by Corporation for bio-mining of the legacy waste in part by part. He has informed that he will submit a proposal in consultation with the Government. (*Orally he informed that it is not possible to recover 80% of the waste. It can only be land filled. If the work is awarded to them they will carry the waste to a landfill area in Mysore and dispose it there and that would incur a cost of Rs.40000 per truck load of waste (~15 tonnes) in addition of Rs. 5.25 per kg for recovering it from the dump yard.*)**Later Ex-Service men society did not turn up.**

Request for Proposal prepared for tendering the work of bio-mining as decided in the RMC_NGT meeting on 06/04/2019

- As decided in the meeting of SLMC-NGT on 14/06/2019, the tender document for Bio-mining was submitted to Pollution Control Board for vetting on 01/07/2019 after approval of the Health Standing Committee and council. After incorporating the suggestions of PCB the bid document was sent to PCB on 30/07/2019 for final vetting. Tender was floated on

- **M/s Planet Saviors, a Pondicherry based firm was consulted in disposing the legacy wastes and they have expressed their willingness to take the legacy**

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wastes after baling for burning in cement kilns without financial commitment to the Corporation. Corporation council that met on 29/07/2019 has approved the proposal. Work was to commence from 07/08/2019, but they did not turn up.

- **Legacy waste composition study conducted in association with M/s Aggrezzo Industries Pvt Ltd on 22/05/2019**

2. **About 84 vehicles are deployed for transporting waste of which only 20% of the vehicles that were owned by the Corporation alone had full cover body and provision for leachate collection. Now 80% of the fleet of vehicles used for transporting the wastes are having full cover and provision for collecting leachate**
3. **New team of security personnel deployed from May 15 2019. (Camera surveillance is done by them on their own. About 9 cameras have been installed)**

4. The following roads have been declared as zero waste roads:

   (i) Sahodaran Ayyappan road,
   (ii) Banerji road
   (iii) NH Bypass roads
   (iv) Subhash Chandra Bose Road
   (v) K.V Jacob Road
   (vi) BOT Bridge Thoppumpady to Alexander Parambithara road

Sl.No	Road	Length (km)	Waste dumping points	Remarks
1	Bypass road	8.6	4	Major dumping points
2	Sahodaran Ayyappan road	4.8	0	CLEAR
3	Banerji road	7.2	0	CLEAR
4	BOT Bridge - Alexander Parambithara bridge	3.3	2	Clear
5	KB Jacobs road	2	0	CLEAR

6	Subhash Chandra bose road	3.7	0	Clear

As the Bypass road is having many intersections it is really challenging to maintain that road as waste free. Lack of adequate employees is also a major issue.

5. Orientation meeting conducted on 22/03/2019 and 12/04/2019 for HI/JHIs to ensure proper segregation of wastes

6. Ward level orientation meetings and awareness campaign held by Health Standing Committee Chairperson in June 2019

7. It is ensured that about 75% of the waste collected are in segregated form as of 14/06/2019

8. ***Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs/Flats (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy –Kacheripadi wards of Edakochi area and few wards in Kaloor.***

9. It is strictly enforced at grass root level to segregate waste at source and strict directions are given not to load mixed waste in trucks carrying waste into Brahmapuram plant.

10. Plastic manufacturers association, merchants associations were called for a meeting on 15/04/2019 to bring them on board and to cooperate with the Corporation in the drive to completely ban plastic carry bags of size less than 50 microns.

11. **Strict action was taken by Corporation in enforcing the ban of plastic carry bags below 50 microns. About 2.42 tonnes of plastic carry bags were seized by the Health Inspectors and Junior Health Inspectors and an amount of Rs.52000 was imposed as fine during March – August 2019 period.**

12. Use of personal protective equipments (PPE) by health workers enforced.

13. 3, 5 HP pumps are fixed near the southern boundary for pumping water to the dump yard to control the heat buildup and to prevent further chances of fire.

14. 2 Cameras are fixed, the surveillance area to be expanded by adding more cameras. Included under the scope of work of the new security to be deployed. **New Security deployed from 15/07/2019 and 9 cameras have been installed.**

15. About 11 heaps are formed in the legacy waste dumping area to make fire breakers and easy access to fire tenders.

16. Completed lighting of the road coming to the waste dumping yard utilizing the existing electric posts of KSEB. 34 lamps fixed

17. Application made with KSEB for HT connection to the leachate treatment plant. Estimate to be prepared and Technical sanction to be given by the committee constituted for electrical works at District Panchayat level. It is under the consideration of the committee. **Obtained TS for the work. Work to be tendered**

18. **Of the 611 m of drains around the plant, about 430metres are covered with slabs. Old discarded slabs from various wards of Corporation were brought to Brahampuram and used for covering the drains. 150m drains are to be covered and is pending due to incessant rain.**

19. **Work for constructing leachate collection tank tendered on 27/07/2019 and the work has been awarded.**

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20. **Work for constructing damaged compound wall and grill tendered on 27/07/2019**

21. **Ward level details of waste segregation, RRFs, MCFs already submitted to SLMC-NGT on 27/07/2019.**

22. **Tender document for Biomining of waste submitted to Pollution Control Board on 01/07/2019 and after getting the suggestion from PCB the revised tender document was sent to PCB on 30/07/2019 for final vetting of the document. *Tender for BIOMINING of legacy waste was floated on 14/08/2019 with closing date on 04/09/2019. As nobody participated in tender the closing date was extended to 20/06/2019. Even then nobody participated in the tender. RETENDERED THE WORK ON 26/10/2019 AFTER THE ASSEMBLY BYE-ELECTION CODE OF CONDUCT.***

23. **About 35 bulk waste generators were identified and have issued notice to make own arrangements for disposal of non-biodegradable wastes including plastic.**

24. **A rapid survey was conducted in June-July'19 to know the status of segregation of waste. About 88% of the households are covered in door to door collection of waste and in households where door to door collection is in practice the wastes generated are stored separately – Biodegradable waste in plastic buckets or bins and non-biodegradable waste in plastic bags. 76% of the commercial establishments are covered under door to door collection and such establishments store waste in segregated form.**

25. **As reassessed in September'19, of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy – Kacheripadi wards of Edakochi area and few wards in Kaloor**

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26. Corporation council that met on 29/07/2019 approved to invite tenders for fixing fire hydrants. Work to be tendered.

WASTE TO ENERGY PROJECT IMPLEMENTATION STATUS

1. Contract/concession agreement signed on 17/02/2016
2. Government have accorded sanction for conversion of land allocated for waste to energy project vide G.O(MS)No.39//2018/Revenue on 03/02/2018
3. District Collector made Nodal Officer for waste to energy project Vide G.O(Rt) No.488/2018/LSGD dated 20/02/2018
4. Land transferred to the Concessionaire on 26/2/2018
5. Hon'ble chief Minister laid the foundation stone on 09/04/2018
6. Site office commissioned on 27/04/2018
7. Government accorded sanction Vide G.O (MS) No. 108/2018/LSGD dated 08/08/2018 to hand over additional 3.44 acres of land to the concessionaire in lieu of the 3.66 acres of land to be set aside for water conservation and maintaining the natural flow of water in the site already handed over for the project.
8. Additional land handed over on 19/11/2018
9. Public hearing of the waste to energy plant conducted on 10/06/2019
10. Revised Environmental Impact Assessment report submitted to SEIAA and a presentation was also given to SEIAA on 01/08/2019.
11. Power Purchase Agreement signed between GJ Ecopower and KSEB on 19/06/2019

STATUS OF CLEARANCES AND PERMITS REQUIRED AND OBTAINED

I. Consent to Establish the plant from KSPCB (Obtained on 30/08/2018)

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II. Factories and Boilers(Obtained on18/04/2018)

III. Forests and Wildlife/Social Forestry (Obtained on 11/06/2018)

IV. NOC from Aviation department (Obtained)

V. License from DMO(Obtained on 15/3/2018)

VI. Clearance from the Chief Town Planner (Obtained on 6/7/2018)

VII. NOC from Fire and Rescue

VIII. Development permit

IX. Environmental Clearance from SEIAA granted on 26/09/19

(Environmental clearance delayed as the State Environmental Impact Appraisal Committee was not constituted by the Central Government after its dissolution)

Clearance to be obtained:

X. Building permit from the Puthencruz Grama panchayath (under consideration of the GP and will be issued in October 2019 itself)

The civil works of the waste to energy plant will be started in November 2019.

ANNEXURE - X7

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KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE, GANDHI NAGAR, ERNAKULAM – 682 020
www.keralapcb.org

PCB/RO-EKM/GEN-221/19 18.10.2019

From

The Chief Environmental Engineer

To

The Chairman
SLMC

Sub:- O A No 533-535 of 2018 & O A 514 of 2018-Brahmapuram solid waste dumping yard– Reg.

Ref: - 1. Inspection Conducted on 16.10.2019 along with the Chairman, SLMC

2. Order of the Hon'ble NGT dated 23.09.2019 in O.A 585 of 2018.

Sir,

I may invite your kind attention to the inspection conducted along with your good self at Solid waste dumping yard of Kochi Corporation at Brahmapuram and discussion had on 16.10.2019. As discussed I may submit a brief report on the inspection findings and subsequent actions to be initiated as per relevant provisions of solid waste management rule 2016.

The said inspection is done as a follow up action to verify the updated status on the solid waste management facilities provided by the Kochi Corporation and to report to Hon'ble National Green Tribunal before the hearing proposed to be conducted soon on O.A 514 of 2019 and O.A 533-535 of 2018. Kindly note that reports on this application had already been submitted before the Hon'ble NGT on 04.09.2019 and 06.09.2019 respectively.

During inspection following observations were made. These observations in addition to the earlier findings are illustrated as follows.

They have provided 9 Nos of cameras additionally along different locations inside this plant. It is highly required that all the cameras shall be connected

O/C

to SPCB so that our surveillance team will be able to close watch all day to day operations of this solid waste management facility and to initia necessary follow up actions.

No actions were taken to install proper Effluent Treatment facilities at the site and the ETP installed just before the Regional Monitoring Committee (NGT) visit is now in a dilapidated condition where as the environmental engineer who is in charge of day to day operations of this facility reported that they are transferring waste water to nearby common septage treatment facility as suggested during last SLMC meeting. It is sad to note that all the windrow sheds also are in a dilapidated condition and the drain provided are found to be blocked with hard slurry flowing from these "windrow compost yards' and primary bio degradable dumping area. Though they have reported that drain works around the facility are almost completed, the drain is found to be partially open and there is every chance of oozed slurry from open dump sites and storm water intrusion in to these drains.

It is already identified and reported before the Hon'ble NGT that 7 other local bodies also transferring wastes to this solid waste management facility and quantity wise waste transfer details. It was also reported that these local bodies are transferring their bio degradable wastes to solid waste management facility at Brahmapuram. Kindly note that Directions as per section 5 of the Environment Protection Act have been issued by the Chairman, KSPCB to all 5 municipalities which are transferring waste to Brahmapuram yard.

It is important to note that the Corporation had submitted a proposal for Bio Mining of the Legacy waste deposited for technical advice and necessary guidance was given noting the discrepancies observed through email dated 12.07.2019 from the Board. Another proposal for the disposal of rejects was made by the Corporation for necessary guidance from the Board for which an inspection was conducted from Regional Office, Ernakulam along with the Environmental Engineer, Kochi Corporation on 17.08.2019. During enquiry on acquisition of alternate land for inert disposal, it was informed by the Environmental Engineer that the Corporation is proposing a common bio medical treatment and disposal facility (CBMWTDF) near to this solid waste

management facility in addition to the waste to energy plant already proposed for which they have already obtained Environmental Clearance. Hence alternate land at this site complying with all norms for inert disposal stipulated by the CPCB will be too difficult.

During earlier inspections it was noticed that they are producing manure called "City compost" the quantity of which is seems to be marginal compared to the daily waste collected at the plant. No records were seen provided for assessing the quantity of manure production. An interesting fact is that the manure called "City compost" they produced was analyzed for its fertilizer value and found that the same is not meeting the standards stipulated in Solid waste management rules 2016. Apart from this there is presence of heavy metals in exceeding concentration in the "manure".

Though several decisions were taken during several SLMC forums to rectify the defects noticed, still the Corporation is not able to undertake any proper rectification measures. It may be pertinent to note that a specific suggestion was put forward by the Board to introduce anaerobic digesters which could be advantageously used to treat solid waste generated at Brahmapuram plant which will definitely help to reduce considerable quantity of waste till waste to energy plant is installed.

It can be seen that as per the order dated 23.10.2018 of the Hon'ble NGT in O.A. 533- 535/2018 imposed a penalty of Rs. 1 crore upon the Corporation (50% of which shall be deposited to State Pollution Control Board and 50 % to Central Pollution Control Board) and to submit a performance guarantee of Rs. 3 crores to SPCB within a period of 15 days from the order. But the Corporation had filed a WP(C) No.36204/2018(A) before the Hon'ble High Court of Kerala against the order of the Hon'ble NGT and the Hon'ble Court had issued a stay order dated 09.11.2018 for 2 months on a condition that the petitioners shall provide bank guarantee for an amount of Rs. 1 core. Based on the above order, Corporation had submitted a bank guarantee of Rs. 50,00000/- to KSPCB and Rs. 50,00000/- to CPCB. Now it was reported by the Environmental Engineer that this stay order has been extended vide order dated 09.01.2019 of the Hon'ble High Court of Kerala in W P(C) no.36204/2018.

However, this facility is under operation without the authorization of the Board as per solid waste management rules 2016 for the last 9 years and no improvements or sufficient rectification measures have been found to be initiated by the Kochi Corporation and an amount of Rs. 1005.11 lakhs which include Capital cost, Operation and maintenance cost and Environmental externality is assessed as Environmental Compensation by considering the average waste generation as 365.19 ton/day [period of assessment is 9th April 2019 to 31st October 2019 and average quantity calculated based on the quantity of waste collected for the months of May, June and July 2019] presuming that Kochi Corporation has provided waste management facility for 10% only of the total waste generation (Considering that they are disposing some part of the plastic waste to recyclers) as per the formula derived by the CPCB and as directed by the Hon'ble NGT during last hearing conducted on 14.10.2019 in O.A 533-535 of 2018 and as per the order dated 23.09.2019 in O.A 585 of 2018. It may also be kindly noted that preliminary actions on the assessment of environmental damage due to the unscientific and unauthorized operation of this solid waste management facility will be done during next meeting of the committee constituted as per the order of the Honble NGT in the Application 585 of 2018 which consist of experts in the field of environment related studies and official from CPCB.

CHIEF ENVIRONMENTAL ENGINEER

Copy to:
1. The Member Secretary, SLMC
2. The Member Secretary, Thiruvananthapuram
3. The Environmental Engineer, DO-2, Perumbavoor

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ANNEXURE - X8

State Level Monitoring Committee of NGT
ACTION TAKEN REPORT –KOCHI MUNICIPAL CORPORATION

10/12/2019

(GIVEN IN BOLD ARE ACTION TAKEN AFTER THE MEETING OF SLMC-NGT ON 08/11/2019)

To comply with the directions given by the Hon'ble National Green Tribunal on 22/10/2018, Corporation had prioritized the works that were to be carried out in Brahmapuram into: *works that are to be carried out immediately on war footing basis, short-term basis* (in 2-3months), *Mid – term basis (3-6 months) and long term basis*. The action taken is as given in the table below:

Immediate (Completed on 18/12/2018)

1. *Formation of windrows*

For scientific processing of the waste the wastes have been re-arranged to form windrows. 23 such windrows could be formed.

2. *Clearing and cleaning of existing drains*

The drains that carry the leachate were cleaned for the free flow of leachate into collection tanks.

3. *Identification of collection point and fixing of collection tanks for leachate*

Two collection points for leachate were identified; one to the southwest of the plant and one to the eastern side of the plant. 2 precast collection tanks of capacity 3500 litres each were placed in southwest portion and 1 collection tank of 3500litres was kept in the lowest point in the eastern side.

4. *Installation of Leachate treatment plant on trial run basis*

A prefabricated leachate treatment plant based on electro-coagulation technology was installed on a trial run basis. The plant has been installed in the pre-sorting shed situated in the south-east side of the plant. The leachate collected in the collection tanks are pumped into the collection tanks of the treatment unit and taken for treatment.

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5. Channelizing leachate to drains & collection tanks

Half cut 8" pipes were laid in existing drain/trenches from where leachate is oozing out from the windrows to the main peripheral drains to avoid infiltration of leachate into the soil and for channelizing the flow. Later concrete drains were constructed.

SHORT TERM

1. **Ensuring proper segregation (to be completed in March 2019)**

- Responsibility of proper segregation of waste at source level assigned to Health Inspectors of respective health circles.
- HI's shall ensure that source level segregation is in place or shall enforce wherever necessary and from the waste transfer points plastic wastes are not loaded into the truck that carries food waste/Biodegradable waste.
- In the meeting with the Kudumbasree and the workers of Corporation associated with waste collection held on 14/01/19 it was clearly informed that no mixed waste shall be collected or loaded into trucks. Also in the meeting with the HI/JHI's of all Health circles on 14/01/2019 it was reiterated to ensure proper segregation of waste.
- The matter of segregating the waste at source level itself is being rolled out through the Kudumbasree and health workers of Corporation. Kochi Corporation will stop collecting mixed waste after March 2019
- Direction issued in the form of proceedings (dated 05/02/19) of Secretary that the HI/JHI's of respective health circles shall certify/issue pass to trucks transporting waste stating that the truck load contains only food waste/wet waste/bio-degradable waste. JHI of the plant shall acknowledge the passes and shall let to tip wastes certified as biodegradable waste by HI/JHI's of respective health circles.
- An amount of Rs. 120000 imposed as fine since 10/05/2019 to defaulters
- Orientation meeting conducted on 22/03/2019 for HI/JHIs by Chairman Health Committee
- Orientation meeting/ follow up meeting conducted on 12/04/2019 for HI/JHIs
- About 50% of wastes brought to the plant are segregated as on 02/05/19

- Ward level orientation meetings and awareness campaigns conducted by Health Standing Committee Chairperson and concerned Health Circles.
- A rapid survey was conducted in June-July'19 to know the status of segregation of waste. About 88% of the households are covered in door to door collection of waste and in households where door to door collection is in practice the wastes generated are stored separately – Biodegradable waste in plastic buckets or bins and non-biodegradable waste in plastic bags. 76% of the commercial establishments are covered under door to door collection and such establishments store waste in segregated form. Corporation is mobilizing the Haritha Karma Sena to streamline the activities.
- This was re-assessed in September 2019 as follows:
- Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy – Kacheripadi wards of Edakochi area and few wards in Kaloor.
- Corporation has published the details of waste management on the website of kochi corporation and published on the new web interface of the public utility for waste management: www.clickforkochi.kerala.gov.in
- **Kochi Corporation has as part of the smart city mission distributed 30000 waste storage bins in the wards 1-5 in Fort Kochi area with directions to compulsorily segregate waste.**
- **Awareness campaigns were conducted to the Kudumbasree volunteers and flyers/brochures/pamphlets were distributed.**
- **Vide decision no.3 dated 28/11/19 Health Standing Committee has decided to conduct extensive awareness campaigns in all wards in association with the Legal Services Authority**

2. Repair of trommels (to be completed in March 2019)

Completed all the repair works related to the trommels including re-fixing of the sieves on 11/01/2019 itself.

3. Setting up proper drainage system (to be completed in March 2019)

- Completed construction of drains to a length of 300m in areas of earthen drain and connected to the existing concrete drains.(Completed on 12/03/2019).
- **Status of cover slabs laid over the drains:**
  Total length of drains: 630m
  Length of new drains: 330m
  Length of old drains: 300m
  Total length of drains covered with slabs: 480m
  Remaining length of drains to be covered: 150. Laying of slabs – ***work in progress. When the drains in the city were reconstructed under AMRUT schemes and Smart City Mission for drain improvement and beautification the slabs that were removed are taken to Brahmapuram as part of adaptive re-use to prevent construction and demolition waste getting disposed elsewhere and used to***

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cover the drains. This also helps in easy removal of the slabs and cleaning of the drains when it gets choked with the leachate.

Establishing semi-permanent Leachate Treatment System (to be completed in March 2019)

- Hon'ble Mayor suggested taking advice from Suchitwa Mission also regarding the specification that shall be adopted for the leachate treatment plant. Accordingly Suchitwa Mission was requested on 31/01/19.

- Vide letter dated 13/02/2019 received on 20/02/2019 Suchitwa Mission informed that the work of installation of leachate treatment plant shall be tendered after preparation of DPR based on electro-coagulation technology with pre-treatment systems from agencies empanelled by Suchitwa Mission.

- Tender for preparation of DPR was floated on 06/03/2019 with closing date on 13/03/2019. Closing date extended to 21/03/2019 as no tenders were received and extended again to 27/03/2019 as only one tender was received. Tenders were opened on 29/03/19. Two tenders were received, one from M/s Sens wasser solutions(L1) and one from M/s Ram Biologicals.

- (Meanwhile as directed by Hon'ble Mayor GIZ, the German cooperation agency was engaged to do a rapid study on leachate generation and apt technology that can be adapted. The work will be awarded after getting their technical inputs also. Two rounds of sampling for testing the leachate characteristics done, based on the report they are to submit the technical note by 05/08/2019.

- Council that met on 29/07/2019 has given approval to award the work to the lowest bidder M/s Senswasser Solutions.

- GIZ submitted the report on 27/08/2019 and made a presentation of the report on 28/09/2019. GIZ has proposed to design the plant for 400m^3/hr including storm water or with provision of septage treatment or for the leachate alone.

- **As decision regarding the volume of leachate to be treated is to be taken the matter has been referred to Council through Health Standing Committee. Council that met on 8/11/19 deferred decision on the matter. It is now placed with the council scheduled on 13/12/19**

- The leachate generated and collected in a pit behind the plant is taken to the septage treatment plant of Corporation at Brahmapuram itself. To avoid ad-hoc hiring of trucks and reduce cost, tender was floated on 12/07/2019 to hire septage collecting trucks to operate continuously for 3 months. Assessing that the amount quoted by the lowest bidder @ Rs. 5,54,400 as higher and cost per trip coming to Rs. 1,232 Health Standing Committee that met on 29/07/2019 decided to re-tender the work. Work has been retendered and placed before Health Standing Committee for approval.

- Work re-tendered and the Health Standing Committee approved the tender on 07/10/2019. **Council that met on 08/11/2019 approved the tender.**

- **Agreement signed and work started.**

4. Setting up fully functional plastic shredding system/Capacity addition (to be completed in March 2019)
Establishing MRFs in 6 wards and MCFs in all wards

- Plastic shredding unit is operational as of January'19
- Baling unit installed (the contractor who collects the plastic waste for recycling installed the baling unit) in January 2019
- Purchase order given to Clean Kerala Company for purchase of 2 shredding units on 13/05/2019.
- Clean Kerala Company has over phone informed that they are yet to empanel the new shredding unit providers, and they will be able to supply the shredding units in August 2019 only. Yet there is no communication from their end.
- The health standing committee that met on 29/07/2019 has given approval to float tenders for *engaging agencies capable of operating* the MRFs in Corporation area *independent of other facilities including provision to recover, recycle, and*

bale the waste for making Refuse Derived fuel which could be sent to cement kilns. This is to avoid taking the bio-degradable waste to Brahmapuram. Due for approval of council.

5. **Inviting tenders for remediation of legacy waste and reclamation of land(to be completed in March 2019)**

- M/s Zonta Infratech who has done capping of waste in Tirunelveli and Salem of Tamil Nadu was contacted and one of their experts Mr. Zenthil visited the site on 2/02/2019.

- Mr. Senthil opined that the wastes that are spread over 16 acres of land can be compressed and brought together in 4 acres of land and can be capped.

- Recovery of waste is not economically viable as there is no market for purchasing such huge amount of plastic waste as per the view of M/s Zonta Infratech.

- EOI invited on 21/02/2019 with closing date on 07/03/2019. 3 EOI's received, each from M/s Zonta infratech Bangalore(for capping of waste), M/s Zigma Erode(for biomining of waste) and M/s CED Trivandrum (for capping of waste after recovery of waste). Evaluation of EOIs completed on 11/03/19. In the 2nd meeting of state level monitoring committee of NGT held at TVM on 15/03/19 it was directed to consult Pollution control Board, CUSAT for advice. Professor from CUSAT visited Brahmapuram on 25/03/19. PCB had called a meeting on 26/3/19 at their regional office EKM and has asked the Corporation to send the proposals received for processing the legacy waste to PCB for getting their advice. Proposals were sent on 29/03/2019. It was insisted in the meeting of SMC-NGT on 6/04/19 to go ahead with bio-mining only.

- Request for Proposal prepared for tendering the work of bio-mining as decided in the RMC_NGT meeting on 06/04/2019

- As decided in the meeting of SLMC-NGT on 14/06/2019, the tender document was submitted to Pollution Control Board for vetting on 01/07/2019 after

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approval of the Health Standing Committee and council. After incorporating the suggestions of PCB the bid document was sent to PCB on 30/07/2019 for final vetting.

- M/s Planet Saviors, a Pondicherry based firm was consulted in disposing the legacy wastes and they have expressed their willingness to take the legacy wastes after baling for burning in cement kilns without financial commitment to the Corporation. Corporation council that met on 29/07/2019 has approved the proposal. Work to commence from 7/08/2019. After awarding the work the firm did not turn up.

- Tender for BIOMINING of legacy waste was floated on 14/08/2019 with closing date on 04/09/2019. As nobody participated in tender the closing date was extended to 20/06/2019. Even then nobody participated in the tender. RETENDERED AFTER ASSEMBLY BYE-ELECTION ON 26/10/19 WITH CLOSING DATE ON 18/11/19

- **Last date of submission was extended till 26/11/2019. Only 1 bidder participated in the tender. Bid evaluation report submitted to council scheduled on 13/12/2019 to take a suitable decision.**

(NOTE: As per tender condition the bidder should have carried out similar works in the last 3 years directly on contract with the client, but the bidder has undertaken similar works as a sub-contractor)

6. Disposal of flood waste(to be completed in March 2019)

- Started disposing the flood waste through Clean Kerala Company from 18/01/19.
- Due to issues between the waste transporting contractor and clean Kerala company regarding the dues to be paid, the work was temporarily stopped after 2/2/19.
- Work resumed on 8/02/2019

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- Work stopped again after 18/2/19 due to issues regarding payment of dues to the contractor and non-availability of trucks as informed by Clean Kerala Company
- Work resumed on 27/03/2019
- After completing the disposal of about 2800 tonnes of flood waste in the first week of April, the work was stopped as the agreed amount of waste disposal is complete.

Mid-term basis (To be completed in 3-6 months before 15/06/2019)

Item	Action taken/To be taken
Sanitary land fill for rejects to be constructed.	Design sent to CET for vetting. Meanwhile as directed by NGT in its meeting on 03/08/2019 Pollution control Board visited the site on 17/08/2019 and assessed that the land identified by Corporation is not suitable and another land may be identified. As per the guidelines issued by the CPHEEO it is difficult to find another land in Brahmapuram. ***The matter has been reported to the Government on 04/11/2019 as decided by Health Standing Committee and Council to grant special permission for construction of landfill as no other land could be found in Kochi.***
Proper segregation of wastes in place	• Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy –Kacheripadi wards of Edakochi area and few wards in Kaloor. • **Under the Smart city mission distributed 30000 storage bins for all HHs in Fort Kochi area.**

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	• **Vide decision No. 3 dated 28/11/19 Health Standing Committee decided to conduct extensive awareness campaigns in all wards in association with the Legal Services Authority.**
Fully functional leachate treatment plant	• Work for preparation of DPR awarded to M/s Senswasser solutions • GIZ submitted the report on 27/08/2019 and made a presentation of the report on 28/09/2019.(GIZ was requested to do a rapid study on leachate treatment technology that can be adopted) • As decision is to be taken regarding the volume of leachate to be treated; matter referred to Council through HSC. • **Council that met on 08/11/2019 deferred the decision which has been again placed before the council scheduled to meet on 13/12/2019.**
Remediation of legacy waste and reclamation of land.	• Tender for BIOMINING of legacy waste was floated on 14/08/2019 with closing date on 04/09/2019. • As nobody participated in tender the closing date was extended to 20/06/2019. Even then nobody participated in the tender. • RETENDERED on 26/10/2019 after Assembly bye-elections with closing date on 18/11/19. • **Last date of submission extended upto 26/11/2019.** • **Only 1 bidder participated in the tender. Bid evaluation report submitted to the Council.** *Note: The bidder has experience in doing bio-mining as sub-contractor only. As per bid condition the contractor should have executed the work in direct contract with the client.*

Long-term basis (To be completed till commissioning of the waste to energy plant)

Item	Action taken/To be taken
Sanitary land fill for rejects to be constructed.	Design sent to CET for vetting. Meanwhile as directed by NGT in its meeting on 03/08/2019 Pollution control Board visited the site on 17/08/2019 and assessed that the land identified by Corporation is not suitable and another land may be identified. As per the guidelines issued by the CPHEEO it is difficult to find another land in Brahmapuram. **The matter has been reported to the Government on 04/11/2019 for granting special sanction.**
Proper segregation of wastes in place	**Households covered under door to door collection: 150730(90%)** **HHs segregating wastes: 143202(85%)** **No. of wards where wastes are fully segregated: 28(38%)** **No. of wards where wastes segregation is above 80%: 59 (80%)**

ACTION TAKEN

On the Directions of the State Level monitoring committee of NGT in the meeting on 01/03/2019

- As part of strengthening the security of the plant 5 additional security men are deployed in addition to the 4 security men working at the plant.
- 3Nos of 5 HP pumps are fixed near the southern boundary for pumping water to the dump yard to control the heat buildup and to prevent further chances of fire.
- Wastes laying near the southern side cleared so as to form roads for easy access to fire tenders in case of emergency

- Wastes cleared so as to form road along the centre portion of the waste heap, along the river side, along plastic shredding unit to make fire breakers.

- Installed 2 cameras for surveillance 1 at the entry and the other at area of core activity near the weigh bridge

- Expression of Interest/EoI for biomining/capping the waste was invited on 21/02/2019.

- Deployed 20 additional health workers for the activities associated with the dumping yard.

- Deployed engineering staff on shift basis for technical support.

- Completed lighting of the road coming to the waste dumping yard utilizing the existing electric posts of KSEB. 34 lamps fixed

- **New security men deployed from 15/07/2019. Camera surveillance included under their scope of work. Total 9 cameras are in operation at different points for surveillance.**

ACTION BEING TAKEN

- **Formation of roads inside the waste dumping yard using GSB/Granular Sub Base tendered. The council that met on 29/07/2019 approved to award the work to the lowest bidder. Work under progress.**
- Construction of watch tower/over head water tank for proper surveillance of the entire waste dumping yard and the premises of waste treatment plant. **To be tendered.**
- Installation of mini-high mast light near the waste dumping yard

2nd Meeting of State Level monitoring committee of NGT on 15/03/2019 at Govt. guest house Thiruvananthapuram

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Directions:

1. The legacy waste shall be disposed of part by part by means of bio-mining
2. Corporation shall keep escrow account for handling emergency situation
3. Vehicle transporting waste shall be provided with adequate cover, leachate collection system and proper log book.
4. Ex-service armed security shall be deployed at the plant site
5. Sahodaran Ayyappan road, Banerji road and NH bypass roads are to be waste free
6. Door to door collection of waste shall be insisted upon. Segregation of waste shall be ensured
7. Plastic carry bags of thickness below the prescribed limit shall be banned.
8. Health workers shall be given personal protective equipments when working on waste related activities.
9. It shall be explored whether the ex-service men society that carried bio-mining of waste in Adimaly/Munnar belts can be engaged at Brahmapuram for processing the legacy waste

3rd Meeting of State Level monitoring committee of NGT on 06/04/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. Kochi Corporation shall dispose legacy waste part by part means of bio-mining as per the guidelines of CPCB involving a technical expert. Necessary arrangements for addressing the present environmental issues shall be taken till the waste to energy plants comes into existence. A compliance report shall be filed before the next meeting of the committee.

2. Directions issued to Kochi Corporation vide minutes of the 2nd meeting of SMC-NGT may be forwarded to District collector to oversee the implementation of directions.

4th Meeting of State Level monitoring committee of NGT on 08/05/2019 at Govt. guest house Thiruvananthapuram

Directions:

1. 100% segregation of solid waste is to be ensured within 40 days (before 17/06/2019)

2. The following roads also shall be declared waste free

   (i) Subhash Chandra Bose Road

   (ii) K.V Jacob Road

   (iii) BOT Bridge to Alexander Parmabithara Road

3. To complete the previous directions

5th Meeting of State Level monitoring committee of NGT on 14/06/2019 at Govt. guest house Thiruvananthapuram.

Directions:

1. Corporation shall submit an action plan on the activities that will be carried out immediately.
2. The drains constructed for draining leachate shall be covered with slabs to avoid rain water getting mixed with the leachate.
3. A collection tank for leachate shall be constructed
4. To submit the ward level details of waste segregation.
5. Details of RRFs, MCFs in Corporation area and other waste management options in practice.
6. To submit the tender document of Bio-mining to Pollution Control Board for vetting.
7. To identify the bulk waste generators and issue notice to them to make own arrangements for disposal of plastic and other non-biodegradable wastes.

7th Meeting of SLCMC of NGT on 03/08/2019 at Thiruvananthapuram

Directions:

To complete the directions already given

10th Meeting of SLCMC of NGT on 03/11/2019 at Thiruvananthapuram

Directions:

1. To complete the directions already given
2. To install bio-digester to bring down the quantity of solid waste taken to Brahmapuram for processing in the composting plant.

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ACTION TAKEN SO FAR

1. EOI invited on 21/02/2019 with closing date on 07/03/2019. 3 EOI's received each from M/s Zonta infratech Bangalore(for capping of waste), M/s Zigma Erode(for biomining of waste) and M/s CED Trivandrum (for capping of waste after recovery of waste). Evaluation EOIs completed on 11/03/19.

   In the 2nd meeting of state level monitoring committee of NGT held at TVM on 15/03/19 it was directed to consult Pollution control Board, CUSAT for advice. Professor from CUSAT visited Brahmapuram on 25/03/19.

   Professor from CUSAT visited Brahmapuram on 25/03/19 and had advised to carry out bio-mining of waste manually.

   CUSAT was requested to conduct a rapid study to determine the composition of wastes in the plastic and non-biodegradable waste dumping yard, **but they denied.**

   PCB had called a meeting on 26/3/19 at their regional office EKM and has asked the Corporation to send the proposals received for processing the legacy waste to PCB for getting their advice. Proposals were sent on 29/03/2019. It was insisted in the meeting of SMC-NGT on 6/04/19 to go ahead with bio-mining.

   Ex-service men society personnel Sri Varghese visited Brahmapuram on **29/03/2019** as requested by Corporation for bio-mining of the legacy waste in part by part. He has informed that he will submit a proposal in consultation with the Government. (*Orally he informed that it is not possible to recover 80% of the waste. It can only be land filled. If the work is awarded to them they will carry the waste to a landfill area in Mysore and dispose it there and that would incur a cost of Rs.40000 per truck load of waste (~15 tonnes) in addition of Rs. 5.25 per kg for recovering it from the dump yard.*)**Later Ex-Service men society did not turn up.**

Request for Proposal prepared for tendering the work of bio-mining as decided in the RMC_NGT meeting on 06/04/2019

- As decided in the meeting of SLMC-NGT on 14/06/2019, the tender document for Bio-mining was submitted to Pollution Control Board for vetting on 01/07/2019 after approval of the Health Standing Committee and council. After incorporating the suggestions of PCB the bid document was sent to PCB on 30/07/2019 for final vetting. Tender was floated on

- **M**/s Planet Saviors, a Pondicherry based firm was consulted in disposing the legacy wastes and they have expressed their willingness to take the legacy wastes after baling for burning in cement kilns without financial commitment to the Corporation. Corporation council that met on 29/07/2019 has approved the proposal. Work was to commence from 07/08/2019, but they did not turn up.

- Legacy waste composition study conducted in association with M/s Aggrezzo Industries Pvt Ltd on 22/05/2019

2. About 84 vehicles are deployed for transporting waste of which only 20% of the vehicles that were owned by the Corporation alone had full cover body and provision for leachate collection. Now 80% of the fleet of vehicles used for transporting the wastes are having full cover and provision for collecting leachate
3. New team of security personnel deployed from May 15 2019. (Camera surveillance is done by them on their own. About 9 cameras have been installed)

4. The following roads have been declared as zero waste roads:

   (i) Sahodaran Ayyappan road,
   (ii) Banerji road
   (iii) NH Bypass roads
   (iv) Subhash Chandra Bose Road
   (v) K.V Jacob Road

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(vi) BOT Bridge Thoppumpady to Alexander Parambithara road

Sl.No	Road	Length (km)	Waste dumping points	Remarks
1	Bypass road	8.6	4	Major dumping points
2	Sahodaran Ayyappan road	4.8	0	CLEAR
3	Banerji road	7.2	0	CLEAR
4	BOT Bridge - Alexander Parambithara bridge	3.3	2	Clear
5	KB Jacobs road	2	0	CLEAR
6	Subhash Chandra bose road	3.7	0	Clear

As the Bypass road is having many intersections it is really challenging to maintain that road as waste free. Lack of adequate employees is also a major issue.

5. Orientation meeting conducted on 22/03/2019 and 12/04/2019 for HI/JHIs to ensure proper segregation of wastes

6. Ward level orientation meetings and awareness campaign held by Health Standing Committee Chairperson in June 2019

7. It is ensured that about 75% of the waste collected are in segregated form as of 14/06/2019

8. *Of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs/Flats (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy –Kacheripadi wards of Edakochi area and few wards in Kaloor.*

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9. **Kochi Corporation has as part of the smart city mission distributed waste storage bins in the wards 1-5 in Fort Kochi area with directions to compulsorily segregate waste.**
10. **Vide decision no.3 dated 28/11/19 Health Standing Committee has decided to conduct extensive awareness campaigns in all wards in association with the Legal Services Authority.**

11. It is strictly enforced at grass root level to segregate waste at source and strict directions are given not to load mixed waste in trucks carrying waste into Brahmapuram plant.

12. Plastic manufacturers association, merchants associations were called for a meeting on 15/04/2019 to bring them on board and to cooperate with the Corporation in the drive to completely ban plastic carry bags of size less than 50 microns.
13. Strict action was taken by Corporation in enforcing the ban of plastic carry bags below 50 microns. About 2.42 tonnes of plastic carry bags were seized by the Health Inspectors and Junior Health Inspectors and an amount of Rs.52000 was imposed as fine during March – August 2019 period.
14. Use of personal protective equipments (PPE) by health workers enforced.

15. 3, 5 HP pumps are fixed near the southern boundary for pumping water to the dump yard to control the heat buildup and to prevent further chances of fire.
16. 2 Cameras are fixed, the surveillance area to be expanded by adding more cameras. Included under the scope of work of the new security to be deployed. New Security deployed from 15/07/2019 and 9 cameras have been installed.

17. About 11 heaps are formed in the legacy waste dumping area to make fire breakers and easy access to fire tenders.

18. Completed lighting of the road coming to the waste dumping yard utilizing the existing electric posts of KSEB. 34 lamps fixed.

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19. Application made with KSEB for HT connection to the leachate treatment plant. Estimate to be prepared and Technical sanction to be given by the committee constituted for electrical works at District Panchayat level. It is under the consideration of the committee. **Obtained TS for the work. Work to be tendered. Placed before council scheduled on 8/11/19 for approval. Council decided to reconsider this with the DPR of leachate treatment plant.**

20. Of the 611 m of drains around the plant, about 430metres are covered with slabs. Old discarded slabs from various wards of Corporation were brought to Brahampuram and used for covering the drains. 150m drains are to be covered and is pending due to incessant rain. **Work of covering the drains is in progress.**

21. **Work for constructing leachate collection tank tendered on 27/07/2019 and the work has been started.**

22. Work for constructing damaged compound wall and grill tendered on 27/07/2019. Under negotiation as the rates quoted are in excess of estimate.

23. Work of laying Granular Sub-Base (GSB) awarded. **Work started.**

24. Ward level details of waste segregation, RRFs, MCFs already submitted to SLMC-NGT on 27/07/2019.

25. Tender document for Bio-mining of waste submitted to Pollution Control Board on 01/07/2019 and after getting the suggestion from PCB the revised tender document was sent to PCB on 30/07/2019 for final vetting of the document. *Tender for BIOMINING of legacy waste was floated on 14/08/2019 with closing date on 04/09/2019. As nobody participated in tender the closing date was extended to 20/06/2019. Even then nobody participated in the tender. RETENDERED THE WORK ON 26/10/2019 AFTER THE ASSEMBLY BYE-ELECTION CODE OF CONDUCT.*

26. About 35 bulk waste generators were identified and have issued notice to make own arrangements for disposal of non-biodegradable wastes including plastic.

27. A rapid survey was conducted in June-July'19 to know the status of segregation of waste. About 88% of the households are covered in door to door collection of waste and in households where door to door collection is in

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practice the wastes generated are stored separately – Biodegradable waste in plastic buckets or bins and non-biodegradable waste in plastic bags. 76% of the commercial establishments are covered under door to door collection and such establishments store waste in segregated form.

28. As reassessed in September'19, of the 1,67,935 Households in Kochi Corporation door to door collection of waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%) keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. The last mile coverage of 5% is to be achieved from the wards of Kalvathy, Earaveli in Fort Kochi, Edakochi north, Edakochi south, Perumbadappu, Konam, Palluruthy – Kacheripadi wards of Edakochi area and few wards in Kaloor.

29. **Kochi Corporation has as part of the smart city mission distributed waste storage bins in the wards 1-5 in Fort Kochi area with directions to compulsorily segregate waste.**
30. **Vide decision no.3 dated 28/11/19 Health Standing Committee has decided to conduct extensive awareness campaigns in all wards in association with the Legal Services Authority.**
31. Corporation council that met on 29/07/2019 approved to invite tenders for fixing fire hydrants. **EOI invited on 10/12/2019**
32. Estimate prepared for the work of over head storage tank and watch tower. **To be tendered**
33. For construction of a pond inside the legacy waste site in dry rubble for use in case required for dousing fire spread placed with the council scheduled on 8/11/19 for approval. **Council approval obtained. To be tendered**
34. Starting ESCROW account to meet contingencies and other urgent works in Brahmapuram placed with the council scheduled on 8/11/19. **ESCROW account opening in progress.**
35. Concrete road construction in the Brahmapuram plant estimated at a cost of Rs. 1.86 crore and is placed before the council scheduled on 8/11/19. Council approved. **To be tendered**

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36. Construction of new office building for JHI/HI placed before council scheduled on 8/11/19. **Council approved. To be tendered**
37. Work for Installation of additional high mast light awarded **work in progress.**
38. ***The matter of construction of bio-digesters/Biogas plants has been placed before the Council scheduled to meet on 13/12/2019.***

WASTE TO ENERGY PROJECT IMPLEMENTATION STATUS

1. Contract/concession agreement signed on 17/02/2016
2. Government have accorded sanction for conversion of land allocated for waste to energy project vide G.O(MS)No.39//2018/Revenue on 03/02/2018
3. District Collector made Nodal Officer for waste to energy project Vide G.O(Rt) No.488/2018/LSGD dated 20/02/2018
4. Land transferred to the Concessionaire on 26/2/2018
5. Hon'ble chief Minister laid the foundation stone on 09/04/2018
6. Site office commissioned on 27/04/2018
7. Government accorded sanction Vide G.O (MS) No. 108/2018/LSGD dated 08/08/2018 to hand over additional 3.44 acres of land to the concessionaire in lieu of the 3.66 acres of land to be set aside for water conservation and maintaining the natural flow of water in the site already handed over for the project.
8. Additional land handed over on 19/11/2018
9. Public hearing of the waste to energy plant conducted on 10/06/2019
10. Revised Environmental Impact Assessment report submitted to SEIAA and a presentation was also given to SEIAA on 01/08/2019.

11. Power Purchase Agreement signed between GJ Ecopower and KSEB on 19/06/2019.

STATUS OF CLEARANCES AND PERMITS REQUIRED AND OBTAINED

I. Consent to Establish the plant from KSPCB (Obtained on 30/08/2018)

II. Factories and Boilers(Obtained on18/04/2018)

III. Forests and Wildlife/Social Forestry (Obtained on 11/06/2018)

IV. NOC from Aviation department (Obtained)

V. License from DMO(Obtained on 15/3/2018)

VI. Clearance from the Chief Town Planner (Obtained on 6/7/2018)

VII. NOC from Fire and Rescue

VIII. Development permit

IX. Environmental Clearance from SEIAA obtained on 26/09/19

X. Building permit from the Puthencruz Grama panchayath obtained on 06/11/19

Clearing, leveling of site started on 11/11/2019.

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ANNEXURE-X9

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
E-mail: ms.kspcb@gov.inFAX: 0471 – 2318134, 2318152 web: www.keralapcb.nic.in

KERALASTATE POLLUTION CONTROL BOARD
കേരളസംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം – 695 004

PCB/HO/SEE2/KOCHI CORPN/2019 Date: 11/12/2019

Regd. with A/D

NOTICE UNDER SECTION 5 OF THE ENVIRONMENTAL PROTECTION ACT, 1986

Sub: Non-compliance of Solid Waste Management Rules, 2016.

Ref:
1. The Hon'ble NGT order dated16/01/2019 in OA no. 606/2018.
2. The Hon'ble NGT order dated 22/11/2018 in O.A. No. 353/2016.
3. The Hon'ble NGT order dated 20/11/2018 in O.A No. 117/2014, 499/2014 and 102/2014.
4. Letter No. PCB/HO/SEE2/RMC- Meeting/2018 dated 09/10/2018, 22/10/2018 and 24/10/2018.
5. This office notice of even No.PCB/HO/EE4/NGT/SWM DIRECTIONS TO LB/2019 dated 17/04/2019.
6. Minutes of the 4th meeting of the State Level Monitoring Committee.
7. This office notice of even No.PCB/HO/EE4/AG/2019 dated 09/05/2019.
8. Letter No. MOE2/10948/2017 dated 27/05/2019.
9. Letter No. MOE2/10948/2017 NGT/Vol.II dated 19-07-2019.
10. Annual Report No.PCB/HO/SWM/AR/18/2019 dated 23/07/2019.
11. This office letter No. PCB/HO/RULES/SWM-ERNAKULAM/2018 dated 13-02-2019.
12. This office letter No. PCB/HO/RULES/SWM-ERNAKULAM/2018 dated 04-04-2019.
13. Minutes of the second and fifth meeting of the State Level Monitoring Committee constituted by the Hon'ble NGT on 15-3-2019 and 14-6-2019.
14. Inspection conducted on 16/10/2019 by SLMC Chairman
15. Letter no. PCB/RO/EKM/GEN-221/19 dated 18/10/2019
16. This office notice No. PCB/HO/RULES/SWM-ERNAKULAM/2018 dated 12-10-2019
17. Your office letter No. MOE2/10948/2017 dated 25/07/2019 received on 06-11-2019

WHEREAS the Central Government notified the Environmental (Protection) Act, 1986 for the protection and improvement of environment and for matters connected therewith;

WHEREAS as per Section 3, 6, and 25 of the Environment (Protection) Act, 1986, the Central Government re-notified the Solid Wastes Management Rules, 2016 (herein after referred as SWM Rules) vide notification S.O. 1357(E) dated 8-4-2016;

WHEREAS as per Rule 22 (1) of the SWM Rules, suitable sites for setting up solid waste processing facilities are to be identified;

WHEREAS as per Rule 22(3) of the SWM Rules, suitable sites for setting up solid waste processing facility and sanitary landfill facilities are to be procured;

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WHEREAS as per Rule 22 (5) of the SWM Rules, door to door collection of segregated waste and its transportation in covered vehicles to processing or disposing facility shall be ensured by 8-4-2019;

WHEREAS as per Rule 22 (7) of the SWM Rules, solid waste processing facilities for the complete quantity of waste generated from the local body at 0.4 to 0.5 kg/person/day, shall be set up by 8-4-2019;

WHEREAS facilities with the technologies specified in CPHEEO manual and SWM Rules are to be in place for the effective treatment and disposal of the solid waste generated in the local body;

WHEREAS as per Rule 22 (6) of the SWM Rules, separate storage, collection and transportation of construction and demolition waste shall be provided;

WHEREAS as per Rule 22(11) of the SWM Rules, bio-remediation or capping of old and abandoned dump site shall be ensured;

WHEREAS repeated instructions were issued vide the communications read above, for the compliance of the SWM Rules;

WHEREAS during the second meeting of the State Level Monitoring Committee constituted by the Hon'ble NGT on 15/03/2019, the resolutions were made to conduct bio mining of legacy waste part by part; keep ESCROW amount for handling emergency situation; provide adequate cover, leachate collection tank and log book for waste transporting vehicles and allow waste transportation only by those vehicles by Health Supervisor; engage Ex-service armed security at the segregation in the dump yard; to make the roads, NH Bypass, Sahodaran Ayyappan Road and Banerjee Road as Zero Waste road; to insist door to door collection and prohibit the deposition of waste on roads and other public places and insist for segregation of waste before disposal; ban the plastic carry bags below the prescribed limit and to proceed against violators under the law of penalization; to give adequate protective equipment namely gumboots, gloves, masks etc., proceed against the violators disposing sewage, septage and chicken waste in the water resources; apartments, hospitals, hospitals which are not operating their sewage treatment plants and to evolve methods for the effective disposal of plastics and not to dispose plastic by burning;

WHEREAS Chairman SLMC during their 4th meeting on 08/05/19 directed to submit specific and detailed time bound action plan to the Kerala State Pollution Control Board, to adopt mechanized system for the disposal of legacy waste, to implement heavy fining/ surveillance cameras/ strict squad to prevent waste dumping on roads, to insist on segregation of wastes at source, to transport vehicles with adequate cover, leachate collection tank and logbook, to provide adequate personal protective equipments to workers and they should be compelled to wear the same, to prohibit deposit of wastes on roads and other public places, to deploy haritha karma sena for door to door collection, to report on the action taken shall be submitted to the SLMC.

WHEREAS during the fifth meeting of the State Level Monitoring Committee on 14/06/2019, noticed with distress that a good number of directions issued are yet to be complied with and therefore expressed displeasure over the same and it was again directed to issue directions by the Corporation to the bulk generators to take steps to channelize their own wastes as the same is

homogenous and clean, channelization can be done easily; to submit the details of wards, in which segregation is complete; segregated plastic waste for shredding is to be stored in areas attached to the zonal office of the Corporation; and to submit action plan in each ward for solid waste management, projects to be implemented and to improve the existing water management facility, existing material collection facility and resource recovery facility; to publish the information on waste management in the website; to take legal action against open burning of non-biodegradable waste and dumping of waste in water bodies; to take steps to establish MCFs in all wards and RRF at least in six wards; issue identity card to all workers engaged in waste management and to prepare action plan for developing a business model for effective treatment of waste;

WHEREAS the Hon'ble National Green Tribunal, Principal Bench, New Delhi in the order dated 22/11/2018 in O.A. No. 353/2016 clarified that apart from prosecution, the statutory authorities under the Environment (Protection) Act, 1986, the Air (Prevention and Control of Pollution) *Act,* 1981 and the Water (*Prevention and Control of Pollution*) Act, 1974, must, in exercise of their incidental powers, prescribed scale of compensation to be collected from the polluters on the "Polluter Pay's Principle". Such scale which may be laid down at various levels, having regard to the local condition or as per direction in the hierarchy of the authorities. In various other application also, the Hon'ble NGT passed similar orders, for instance, in the Order dated 20/11/2018 in O.A No. 117/2014, 499/2014 and 102/2014 the Hon'ble NGT noted as; "Needless to say that statutory authorities under the Environment (Protection) Act, 1986, Air (Prevention and Control of Pollution) *Act,* 1981 and the Water (*Prevention and Control of Pollution*) Act, 1974 are entitled to assess and recover damages as "Polluter Pay's Principle" in exercise of incidental powers to protect environment".

WHEREAS it is noted that you have not fully complied with the above directions of Hon'ble SLMC, Solid Waste Management Rules and also not obtained authorization under SWM Rules, 2016;

WHEREAS the SLMC Chairman along with the Chief Environmental Engineer, Regional Office, Ernakulam inspected solid waste dumping yard of Kochi Corporation at Brahmapuram on 16/10/2019 for verifying the updated status on SWM facilities provided by the Kochi Corporation and to report to the Hon'ble NGT before the hearing proposed to be conducted on O.A 514 of 2019 and O.A 533-535 of 2018;

WHEREAS it was reported by the Chief Environmental Engineer, Regional office Ernakulam vide letter No. PCB/RO-EKM/GEN-221/19 dated 18/10/2019 that no action was taken to install proper Effluent Treatment facilities at the site and the ETP installed just before the Regional Monitoring Committee (NGT) visit and is now in a dilapidated condition, all the windrow sheds also are in a dilapidated condition and the drain provided are found to be blocked with thick slurry flowing from these windrow compost yard and the primary bio degradable dumping area, it was noticed during inspection that the quantity of manure called "City compost" seems to be marginal compared to the daily waste collected at the plant, manure was analysed for its fertilizer

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value and found that the same is not meeting the standard stipulated in Solid Waste Management Rules, 2016;

WHEREAS Chief Environmental Engineer reported that the windrow composting plant at Brahmapuram is not working properly and the food wastes taken to the plant are not treated properly;

WHEREAS it is noted that you have not reported the action plan for providing biomethenation plant so far;

WHEREAS it is noted that you have not identified the land for managing Construction and Demolition waste and sanitary landfill;

WHEREAS you have not provided effluent treatment plant for the leachate generated so far and thereby carrying it into the Kadambrayar which is a polluted stretches identified by Hon'ble NGT;

WHEREAS notice was issued to you to take steps to provide biomethanation plant for the food wastes generated within Kochi Corporation and to report compliance of all above directions;

WHEREAS the reply vide letter no. MOE2/10948/2017 dated 25/07/2019, the action to be taken in providing of biomethanation plant was not reported;

WHEREAS the Kochi Corporation has commenced with a project for establishment of a waste to energy plant for disposal of solid waste and Corporation has in place a collection system of waste and provided vehicles, but the leachate treatment facility is not provided;

WHEREAS as per Hon'ble NGT order O.A 585/2018 dated 23/09/2019, if the rules are violated, the Pollution Control Board can independently proceed against local bodies who are not complying with the rules including institution of prosecution of those person who are not complying with the same and assessment of damage caused to the Environment;

WHEREAS any delay in implementation of Waste-to Energy plant, legacy waste biomining, biomethanation plant shall be viewed as failure to comply with SWM -2016 and directions of Hon'ble SLMC and the Board and shall incur Environmental Compensation assessed as per formula developed for municipal bodies.

WHEREAS in pursuant to Hon'ble National Green Tribunal, in the CPCB matter of O.A.593 of 2017, CPCB has developed a Methodology for Assessing Environmental compensation;

WHEREAS the Board is constrained to assess the Environmental Compensation from 22/11/2018 to 30/11/2019 (Days = 374) for not providing leachate treatment plant for the treatment of leachate generated;

EC = PI x N x Rx S x LF
= 80 x 374 x 250 x 1.5 x 1
= Rs. 1,12,20,000

PI is pollution index of industrial sector and R is factor in Rupees and suggested to consider as 250 in case on violation, S is the factor of scale of operation, LF is the location factor based on population of city/town;

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WHEREAS an amount of Rs. 112.2 Lakhs (Rupees One Crore Twelve Lakh Twenty Thousand) is assessed as environmental compensation from 22/11/2018 to 30/11/2019,

AND WHEREAS continued failure to comply with SWM Rules shall incur Environmental Compensation at rates that are multiples of the rates assessed above;

NOW THEREFORE, in exercise of the powers vested under Section 5 of the Environment Protection Act, 1986, you are directed to show cause within 15 days why the Board shall not recover Environmental Compensation of Rs 1,12,20,000 (Rupees One Crore Twelve Lakh Twenty Thousand) from 22/11/2018 to 30/11/2019 against you for not taking steps to provide leachate treatment plant and biomethanation plant and the non-compliance of Rule 22 of the SWM Rules, 2016.

Ajit Haridas

CHAIRMAN

To

The Secretary,
Kochi Corporation

Copy to:

1. The Chairman
   State Level Monitoring Committee.
2. The Additional Chief Secretary
   Local Self Government Department.
3. The District Collector, Ernakulam.
4. The Director, Urban Directorate.
5. The Chief Environmental Engineer, Regional Office, Ernakulam.
6. The Environmental Engineer, District Office, Ernakulam.

ANNEXURE - X10

KOCHI MUNICIPAL CORPORATION

Phone { 2369007, 2369196
2369143, 2369149
2369197, 2369069

Fax : 91-484-2369023

Corporation Office
P.B.No.1016
Ernakulam, Cochin 682 011

01/01/2020

No.MOE2/10948/2017

From

Secretary

To

The Chairman
Kerala State Pollution Control Board
Pattom P.O, Thiruvananthapuram
695004

Sir,

Sub: Reply to the Notice issued under Section 5 of Environmental Protection Act 1986
Ref. PCB/HO/SEE2/KOCHICORPN/2019 dated 11/12/2019

In compliance with the Rule 22(1),22(2) Kochi Corporation had identified, constructed, commissioned and is operating a 250 tonnes per day capacity Windrow compost plant at Brahmapuram for treating the biodegradable fraction of the waste since April 2008. Corporation has also entered into an agreement for construction of a waste to energy plant.

Corporation had identified land for solid waste processing facility way back in 2004 and had established a windrow composting plant in 2008. Vide letter No. PCB/RO-EKM/GEN-97/12 dated 22/08/2019 Chief Environmental Engineer, Regional Office Ernakulam had informed that the land identified by Corporation in Brahmapuram for construction of scientific landfill behind the security cabin is not suitable as per the guidelines of CPCB as 2m clearance to the ground water table from the bottom liner of the landfill cannot be ensured and to find some other place in the 110 acre land at Brahmapuram. In full compliance with the CPCB guidelines and the guidelines of the CPHEEO Solid waste management manual 2016 other land cannot be found in Brahmapuram as a minimum 100m clearance from water bodies is mandated. A request has been placed with the Government vide letter no. MOE2/3760/18 dated 19/11/2019 to waive the conditions of siting landfill and to grant special permission as no other suitable land could be found in Kochi Corporation area or nearby areas.

Of the 1,67,935 Households in Kochi Corporation door to door collection of segregated waste is practiced in about 1,50,730 HHs (90%) and of this about 1,43,202 HHs (85%)

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keep their wastes in segregated form. About 7262HHs (4.32%) process the waste generated on their own and in about 8204 HHs (4.88%) CREDAI a real estate developers association is taking care of the waste management. For the last mile coverage of 5% Corporation had conducted extensive campaigns and distributed about 30000 bins in Fort Kochi area where people were reluctant to keep their waste in segregated form.

The total solid waste generated in Kochi Municipal Corporation area is 326 tonnes per day. Of this biodegradable waste is quantified to be 228 tonnes. As mentioned in the above paragraph Corporation had set up a 250 tonnes per day capacity Windrow composting plant for treating biodegradable wastes in 2008 itself.

Windrow composting plant of Corporation was constructed as per the CPHEEO guidelines.

In compliance with the construction and demolition waste management rules 2016, the C&D wastes are not collected nor mixed with the other wastes collected, transported and treated by Corporation. C&D wastes are reused for filling of basement areas and for construction of pavement tiles and kerb stones. A proposal for setting up construction and demolition waste processing plant is placed with the Corporation council for approval.

To comply with the Rule 22(11) of the SWM Rules a large portion of the dump site was capped in 2011 itself, and on 21/02/2019 Expression of Interest was called for capping the wastes in the dumping yard with closing date on 07/03/2019, later as per the direction of the State Level Monitoring Committee of NGT in its meeting on 06/04/2019 to bio-mine the legacy waste instead of capping, the EOIs obtained for capping were cancelled and fresh tender for bio-mining the legacy wastes was floated on 14/08/2019 after vetting of the tender document by Pollution Control Board and with closing date on 04/09/2019. As nobody participated in the tender the closing date was extended to 20/09/2019. Even then nobody participated in the tender. The work was re-tendered on 26/10/2019 with closing date on 18/11/2019; and was extended till 26/11/2019. Only one bidder participated in the tender, and the council that met on 13/12/2019 approved the bid evaluation report. Financial bid was opened on 24/11/2019. Placed before the council meeting scheduled on 10/01/2020 for approval of the financial bid with quoted rate of Rs. 597/m^3. It is expected that the works could be started by 2nd week of January 2020.

Corporation Council that met on 13/11/2019 gave approval to start an ESCROW account for meeting emergency expenditures at Brahmapuram plant and the account is being opened. Construction of leachate collection tank started on 23/12/2019. Log book to record the vehicle entry to the plant is maintained at the plant, and the vehicles with the duly certified passes of Health Inspectors of the respective health circles from where wastes are brought to the plant are only permitted to tip wastes. New security men were deployed from 15/07/2019. NH-Bypass road, SA road, Subhash Chandra Bose road, Alexandar Parambithara – BOT Bridge, Banerji road, KB Jacobs road made waste free. Gum boots, and other protective gears were distributed to the health

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workers of Corporation and use of plastic carry bags below 50 microns were strictly banned. More than 2.68 tonnes of plastic carry bags were seized and over Rs. 72000 was imposed as fine since March 2019. In line with the Government decision to ban the usage of single use plastics from January 1 2020, Corporation is to take stringent action against the defaulters. Notices were served to apartments, hospitals and other commercial buildings where STPs are not installed or operated and outlets to the water bodies are being closed on war-footing basis.

Several rounds of attempts were made by Kochi Corporation for biomining of the legacy waste part by part and in mechanised way, but nobody turned up after visiting the site. On 29/03/2019 Ex-service men society personnel who did similar works in Munnar areas visited the site and a firm named M/s Planet Savers based in Pondicherry ready to take the legacy waste for burning it in cement kilns was awarded the work on 07/08/2019 but later they also did not turn up. *As mentioned in the above paragraph when tenders were floated a bidder has participated in the tender and their financial proposal is placed before the council meeting scheduled on 10/01/2020 for approval.*

About 38 bulk waste generators (generating non-biodegradable wastes over 50kg per day) were identified and notices were given to process wastes on their own by aligning with private agencies engaged in waste recovery and recycling and most of the bulk waste generators are disposing their wastes through external agencies. Segregated plastic wastes are collected at Zonal offices and Health Circle offices of Corporation at various places. 5 MRFs have already been constructed at Kaloor, Padiath, Mattanchery, Edapally and Brahmapuram. The details of solid waste management are published in the Kochi Municipal Corporation website and can also be accessed through www.clickforkochi.kerala.gov.in

Authorisation under the MSW Rules 2000 was obtained. To obtain authorisation under SWM Rules 2016, Corporation had filed application with the Ernakulam District Office – II of the Pollution Control Board on 15/10/2016. Environmental Engineer of DO-II PCB had directed to construct leachate treatment plant for issuing the authorisation.

The leachate treatment plant installed at the Brahmapuram plant prior to the visit of the Regional Monitoring Committee of the NGT was only on trial run basis for 2 months and the agency who installed the plant for free was not willing to operate it further due to heavy operational cost. Preparation of DPR for the installation of the leachate treatment plant is initiated and is expected to complete the installation of the LTP in March 2020. Now the leachate generated from the windrow composting plant is taken to the nearby septage treatment plant in tanker trucks and treated there on daily basis.

All blockages resulting out of the flow of leachate into the drains constructed around the plant shed are frequently cleaned and it is ensured that there is free flow of leachate through the drain into the collection pit.

Amid the operational difficulties of processing wastes in a dilapidated plant the city compost production capacity of the plant is maintained between 6-8% against the

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standard of 10-15% which is manifest from the production of finished compost at the plant.

Corporation council vide its decision no.224 dated 13/12/2019 has approved construction of biomethanation plants at markets, office complexes, schools after checking the feasibility and land availability. Places where biomethanation plants/biogas plants could be installed is being checked. An action plan in this regard will be send to the Board very soon.

Corporation has started the ground clearing works of the waste to energy plant on 11/11/2019. Regarding the collection of leachate in the waste transporting trucks, it is reported that provision for collecting the leachate in HDPE containers have been made.

Construction works of the waste to energy plant is to go on full swing by mid of January 2020 and will be commissioned by mid of 2022. Bio-mining of legacy waste was delayed as nobody was participating in the tender. In the re-tender an agency has quoted for the work. Technical bid evaluation report was approved by the council on 13/12/2019. The financial bid is placed before the approval of the council to award the work. It is expected that the work of biomining of legacy waste could be started by 2nd week of January 2020. Tendering the work for installation of biomethanation plant will be started in the 2nd week of January 2020.

Corporation has complied with all conditions of the Rule 22 of the SWM Rules 2016 except the construction of scientific land fill and biomining of legacy waste. Biomining of legacy waste will be started in the 2nd week of January 2020 and is expecting waiving of the landfill siting conditions and special permission from Government to commence construction of scientific land fill at Brahmapuram. Construction of Biomethanation plants has also been approved by the council that met on 13/12/19 and is to go ahead with the construction of biomethanation plants. Preparation of DPR for the installation of leachate treatment plant is initiated and would be able to complete the installation of pre-fabricated treatment plant by March 2020.

Considering the efforts of Corporation in the implementation of the SWM Rules 2016, collection, processing and treatment of the waste generated and efforts taken to upgrade the waste treatment by implementation of the waste to energy project it is requested to kindly exempt us from imposing the environmental compensation.

Yours faithfully,

Secretary

Copy submitted to:

1. The Chairman SLMC-NGT
2. Additional Chief Secretary, LSGD
3. The District Collector
4. Director – Urban Affairs
5. Chief Environmental Engineer, Regional Office Ernakulam
6. Environmental Engineer – District Office Ernakulam

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ANNEXURE - XII

REPORT FILED BY THE CHIEF ENVIRONMENTAL ENGINEER, REGIONAL OFFICE, KERALA STATE POLLUTION CONTROL BOARD, ERNAKULAM BASED ON THE JOINT INSPECTION CONDUCTED ALONG WITH THE CHAIRMAN, STATE LEVEL MONITORING COMMITTEE (NGT) ON 18.02.2020 AT BRAHMAPURAM SOLID WASTE MANAGEMENT PLANT.

A report was filed before the Hon'ble NGT on 04.09.2019 which was self explanatory that the Kochi Corporation is repeatedly evading from doing any rectification measures at the Solid waste management facility at Brahmapuram. Several meetings were convened by the State Level Monitoring Committee (NGT) to have clarifications on certain actions initiated by the Kochi Corporation to ensure that immediate actions are being carried out there for the safe management of solid waste. It is the sole responsibility of the Corporation to make sure that they are managing the entire waste brought to this plant while they are allowing other five municipalities and two Grama Panchayaths to transfer their waste to Brahmapuram plant. But it is unfortunate to note that they have not taken any earnest efforts to provide a suitable centralized facility to proper management of their wastes till date though they are transferring the solid waste from the mentioned local bodies also from 2012 onwards.

However, as a follow up on the actions already taken in O.A 514 of 2019 filed before the Hon'ble National Green Tribunal, Principal Bench, the Chairman, State Level Monitoring Committee had conducted a surprise visit on this facility on 18.02.2020 at about 11.00 am. During inspection the Chief Environmental Engineer, Regional Office of the Board and authorized officers of the Corporation also accompanied. It is pertinent to note that the Chairman inspected windrow composting yards, various drains, leachate collection pit, the ongoing works of a larger leachate collection facility, Plastic shredding plant, Earmarked legacy waste storage area etc. and made following observations.

Fig: 1&2. Dilapidated Windrow sheds & Legacy waste deposits

a. Windrow composting yards

All windrow composting yards are in a dilapidated state and the condition is worse than that noticed during earlier visits. No sufficient compost heaps are seen and the waste masses stocked there are of legacy nature. It is noticed that they are still using three trommels only, for bio mining activities and the manure thus produced is of no fertilizer qualities.

Fig:3. Uncovered Chocked Drains

b. Drains

Though they have been issued with specific directions to provide closed drains, they are not able to manage these drains closed and the same are seen covered with slabs of decrepit nature. These drains are not constructed scientifically and there are chances of percolation from them. It is also important to note that several drain segments are found, to where leachate cannot be properly diverted.

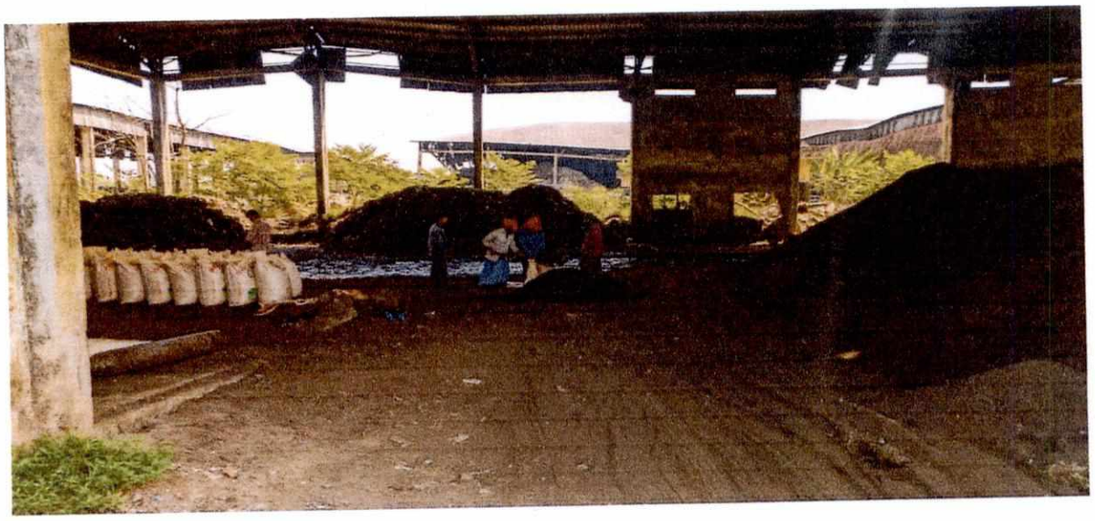

Fig:4. Manure named "City Compost"

c. Leachate collection pits

During several meetings, the SLMC had issued explicit directions to provide scientific leachate collection pits of impervious nature, still they are not able to provide the same and leachate in huge quantities are flowing through a small canal which in turn percolate down. Also it was noted that they are constructing a new collection pit in an unscientific manner by the side of existing pit and not intimated the Board till date. It was also noted that the oozed leachate is being pumped out to nearby land using suction pumps and hose which was seen spread over the area.

Fig:5. Leachate pit constructed Earlier

Fig: 6&7. Leachate collection pits and Hose used for pump out oozed waste water

d. Leachate Treatment Plant

As noticed during previous inspections, the leachate treatment plant is seen not operational and the responsible officers informed that this will not be viable

and they are planning to introduce another one. But no proper time bound proposals are submitted till date.

Fig; 8. Existing Leachate Treatment Plant in dilapidated condition.

e. Plastic waste shredding unit

This plant is seems to be closed and no segregation of plastic is being practiced there. The responsible officers are not able to comment on the exact date on which this shredder unit is put into closure.

Fig: 9 & 10. Plastic shredder and bundling unit not in use

f. Earmarked legacy waste storage area

The Corporation authorities are still not able to assess the quantum of legacy waste settled there and not proposing any surveys for the assessment though total station or drone surveys are specifically insisted as per the guidelines for the management of legacy waste.

Fig:11. Legacy waste dump site

g. Storage tanks

Though specific directions were given to Corporation to provide storage tanks having sufficient capacity to make available on an anticipated fire outbreak which is a usual phenomena experienced at Brahmapuram, no such facilities are seen provided there

h. Leachate transfer

It is with serious concern look in to the shortfall for not providing an effluent treatment plant exclusively for the Solid waste treatment plant and it is significant to note that the Corporation officials during several SLMC meetings demanded that they are able to manage waste water ooze out from windrow shed and other area by providing a leachate collection pit and using the septage treatment plant installed near to Brahmapuram solid waste dump site. During the inspection the Chairman visited the septage treatment plant also to verify whether such facilities are functioning properly.

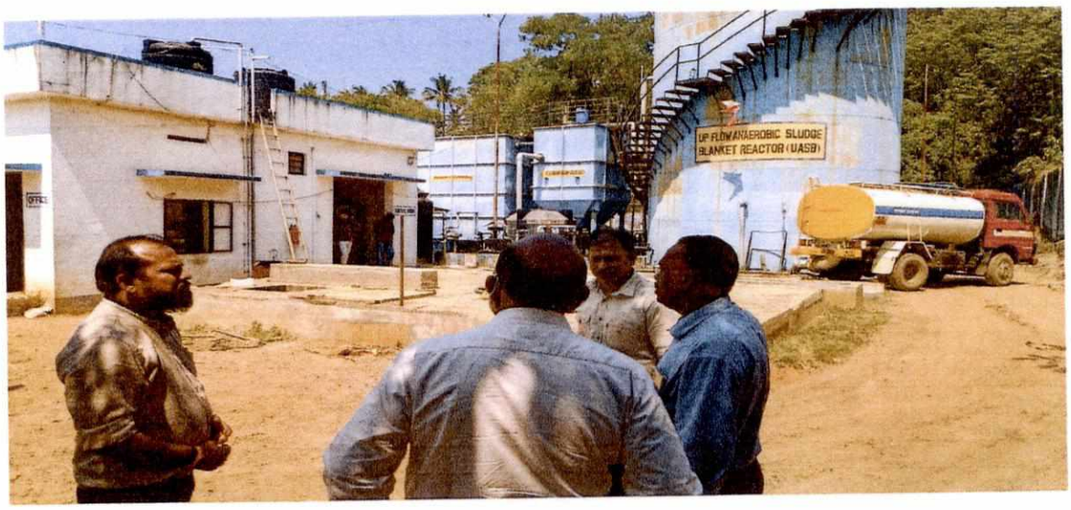

Fig:12. Septage Treatment Facility, Brahmapuram and vehicle used for transferring sewage.

Following observations were made during visit to Septage treatment plant

1. They are maintaining a logbook which shows 5 tanker lorries are transferring leachate on daily basis.

2. The flow meter provided is found to be faulty so that the actual quantity of leachate inflow could not be ascertained.

3. Only one camera is seen functional and the footage shows 12 vehicles were entered to this plant on 16.02.2020 and this include vehicle carrying septage from other parts of the District also.

4. The outlet portion of the facility is seen dirty as black coloured effluent were seen spread over there.

i. Waste to Energy Plant

At this juncture it is highly important to note that there is culpable inaction from the part of Kochi Corporation, especially the Secretary for not managing the waste generated from their area as well as from other local bodies. Though several meetings were convened by the SLMC and strict directions were issued to ensure the speedy implementation of the proposed waste to energy plant for which all clearances have already been obtained, no positive action are seen there at the site and the lethargy shown towards the directions of the Hon'ble SLMC as well as Board's shall may be viewed very seriously.

Fig:13. Proposed site for waste to energy plant

Fire outbreak at Brahmapuram

Actually the visit of the Chairman was concluded by about 01.00 PM on 18.02.2020 and then proceeded to Solid waste management facility of Kalamassery Municipality where plastic waste heaps are there, and a fire

outbreak was occurred on 17.02.2020 there also. After about 1 hour an intimation was received from local residents of Brahmapuram that a fire outbreak was observed and the Surveillance team of KSPCB rushed to the spot at once. During enquiry it was understood that the fire outburst took place at about 2.30 pm and fire and rescue teams from different part of the district virtually managed the situation. The team conducted monitoring using toxic gas analysers on which Ozone (O_3) Concentration was observed in exceeding concentrations (0.52 ppm where as the limiting concentration is 0.1 ppm).On subsequent monitoring the concentration was seen reduced considerably (0.18 ppm at 8.00 pm).

Fig: 14, 15 &16. Fire out break at Brahmapuram and monitoring team

The team managed to collect results of different parameters from CAAQMS Stations at Ambalamughal and Vyttila and exceeding concentrations obtained are tabulated as follows.

BRAHMAPURAM FIRE 18.02.2020				
Parameter	Ozone	Ozone		
Date	18.02.2020	18.02.2020		
Time	4.30 pm	8.00 pm		
Concentration	0.52 ppm	0.18 ppm		
Std	0.1 ppm	0.1 ppm		
CAAQMS - AMBALAMUGHAL				
Parameter	**PM10(µg/m³)**	**STD(µg/m³)**	**PM 2.5(µg/m³)**	**STD(µg/m³)**
18/02/2020 8 pm	114	100	45	60
19/02/2020 5 am	455	100	352	60

CAAQMS - VYTILA				
Parameter	**PM10(µg/m³)**	**STD(µg/m³)**	**PM 2.5(µg/m³)**	**STD(µg/m³)**
18/02/2020 7 pm	202	100	65	60
19/02/2020 1 am	533	100	525	60
19/02/2020 8 am	325	100	248	60

Table.1. Monitoring Results During Fire Out Break on 18.02.2020.

It may be noted that the Board is planning to conduct further monitoring to measure Dioxin, Furan if any due to the occurrence of this fire accident and the studies will be started on 20.02.2020.

At this juncture it is highly regretted to note that the repeated fire out breaks are regular phenomena and the Corporation is not taking any earnest steps to solve this issue which is a long pending case from the Corporation side

and environmental compensation may be once again assessed against this Civic body as done on 18.10.2019 which is now kept pending for having further clarifications and need reassessment. Copy of the same is produced herewith and marked as **Annexure 1**.

This is the 20th day of February 2020

Chief Environmental Engineer

Regional Office, KSPCB, Ernakulam

M. A. BAIJU
Chief Environmental Engineer

KERALA STATE POLLUTION CONTROL BOARD
GANDHI NAGAR
COCHIN-682 020
REGIONAL OFFICE

Annexure 1

CEE : 0484 2207782
Phone : 0484 - 2207783 - 86
Fax : 0484 – 2207782
e-mail:pcbroekm@gmail.com

KERALA

KERALA STATE POLLUTION CONTROL BOARD

REGIONAL OFFICE, GANDHI NAGAR, ERNAKULAM – 682 020

www.keralapcb.org

PCB/RO-EKM/GEN-221/19 18.10.2019

From

The Chief Environmental Engineer

To

The Chairman
SLMC

Sub:- O A No 533-535 of 2018 & O A 514 of 2018-Brahmapuram solid waste dumping yard– Reg.

Ref: - 1. Inspection Conducted on 16.10.2019 along with the Chairman, SLMC

2. Order of the Hon'ble NGT dated 23.09.2019 in O.A 585 of 2018.

Sir,

I may invite your kind attention to the inspection conducted along with your good self at Solid waste dumping yard of Kochi Corporation at Brahmapuram and discussion had on 16.10.2019. As discussed I may submit a brief report on the inspection findings and subsequent actions to be initiated as per relevant provisions of solid waste management rule 2016.

The said inspection is done as a follow up action to verify the updated status on the solid waste management facilities provided by the Kochi Corporation and to report to Hon'ble National Green Tribunal before the hearing proposed to be conducted soon on O.A 514 of 2019 and O.A 533-535 of 2018. Kindly note that reports on this application had already been submitted before the Hon'ble NGT on 04.09.2019 and 06.09.2019 respectively.

During inspection following observations were made. These observations in addition to the earlier findings are illustrated as follows.

They have provided 9 Nos of cameras additionally along different locations inside this plant. It is highly required that all the cameras shall be connected

O/C

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to SPCB so that our surveillance team will be able to close watch all day to day operations of this solid waste management facility and to initia necessary follow up actions.

No actions were taken to install proper Effluent Treatment facilities at the site and the ETP installed just before the Regional Monitoring Committee (NGT) visit is now in a dilapidated condition where as the environmental engineer who is in charge of day to day operations of this facility reported that they are transferring waste water to nearby common septage treatment facility as suggested during last SLMC meeting. It is sad to note that all the windrow sheds also are in a dilapidated condition and the drain provided are found to be blocked with hard slurry flowing from these "windrow compost yards' and primary bio degradable dumping area. Though they have reported that drain works around the facility are almost completed, the drain is found to be partially open and there is every chance of oozed slurry from open dump sites and storm water intrusion in to these drains.

It is already identified and reported before the Hon'ble NGT that 7 other local bodies also transferring wastes to this solid waste management facility and quantity wise waste transfer details. It was also reported that these local bodies are transferring their bio degradable wastes to solid waste management facility at Brahmapuram. Kindly note that Directions as per section 5 of the Environment Protection Act have been issued by the Chairman, KSPCB to all 5 municipalities which are transferring waste to Brahmapuram yard.

It is important to note that the Corporation had submitted a proposal for Bio Mining of the Legacy waste deposited for technical advice and necessary guidance was given noting the discrepancies observed through email dated 12.07.2019 from the Board. Another proposal for the disposal of rejects was made by the Corporation for necessary guidance from the Board for which an inspection was conducted from Regional Office, Ernakulam along with the Environmental Engineer, Kochi Corporation on 17.08.2019. During enquiry on acquisition of alternate land for inert disposal, it was informed by the Environmental Engineer that the Corporation is proposing a common bio medical treatment and disposal facility (CBMWTDF) near to this solid waste

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management facility in addition to the waste to energy plant already proposed for which they have already obtained Environmental Clearance. Hence alternate land at this site complying with all norms for inert disposal stipulated by the CPCB will be too difficult.

During earlier inspections it was noticed that they are producing manure called "City compost" the quantity of which is seems to be marginal compared to the daily waste collected at the plant. No records were seen provided for assessing the quantity of manure production. An interesting fact is that the manure called "City compost" they produced was analyzed for its fertilizer value and found that the same is not meeting the standards stipulated in Solid waste management rules 2016. Apart from this there is presence of heavy metals in exceeding concentration in the "manure".

Though several decisions were taken during several SLMC forums to rectify the defects noticed, still the Corporation is not able to undertake any proper rectification measures. It may be pertinent to note that a specific suggestion was put forward by the Board to introduce anaerobic digesters which could be advantageously used to treat solid waste generated at Brahmapuram plant which will definitely help to reduce considerable quantity of waste till waste to energy plant is installed.

It can be seen that as per the order dated 23.10.2018 of the Hon'ble NGT in O.A. 533- 535/2018 imposed a penalty of Rs. 1 crore upon the Corporation (50% of which shall be deposited to State Pollution Control Board and 50 % to Central Pollution Control Board) and to submit a performance guarantee of Rs. 3 crores to SPCB within a period of 15 days from the order. But the Corporation had filed a WP(C) No.36204/2018(A) before the Hon'ble High Court of Kerala against the order of the Hon'ble NGT and the Hon'ble Court had issued a stay order dated 09.11.2018 for 2 months on a condition that the petitioners shall provide bank guarantee for an amount of Rs. 1 core. Based on the above order, Corporation had submitted a bank guarantee of Rs. 50,00000/- to KSPCB and Rs. 50,00000/- to CPCB. Now it was reported by the Environmental Engineer that this stay order has been extended vide order dated 09.01.2019 of the Hon'ble High Court of Kerala in W P(C) no.36204/2018.

However, this facility is under operation without the authorization of the Board as per solid waste management rules 2016 for the last 9 years and no improvements or sufficient rectification measures have been found to be initiated by the Kochi Corporation and an amount of Rs. 1005.11 lakhs which include Capital cost, Operation and maintenance cost and Environmental externality is assessed as Environmental Compensation by considering the average waste generation as 365.19 ton/day [period of assessment is 9th April 2019 to 31st October 2019 and average quantity calculated based on the quantity of waste collected for the months of May, June and July 2019] presuming that Kochi Corporation has provided waste management facility for 10% only of the total waste generation (Considering that they are disposing some part of the plastic waste to recyclers) as per the formula derived by the CPCB and as directed by the Hon'ble NGT during last hearing conducted on 14.10.2019 in O.A 533-535 of 2018 and as per the order dated 23.09.2019 in O.A 585 of 2018. It may also be kindly noted that preliminary actions on the assessment of environmental damage due to the unscientific and unauthorized operation of this solid waste management facility will be done during next meeting of the committee constituted as per the order of the Honble NGT in the Application 585 of 2018 which consist of experts in the field of environment related studies and official from CPCB.

CHIEF ENVIRONMENTAL ENGINEER

Copy to:
1. The Member Secretary, SLMC
2. The Member Secretary, Thiruvananthapuram
3. The Environmental Engineer, DO-2, Perumbavoor

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ANNEXURE - X12

KERALA STATE POLLUTION CONTROL BOARD
DISTRICT OFFICE (ERNAKULAM –II), PERUMBAVOOR

1st Floor, Manna Residency, M.C Road, Perumbavoor
Telephone & Fax: 0484-2593747 E-mail: pcbdo2ekm@gmail.com

PCB/PBR/LAB/1/2013 Date: 30.11.2019

ANALYSIS REPORT

Source : Septage Treatment Plant, Brahmapuram
Sample Point : STP Outlet
Ref :
D.O.S : 23.11.2019
D.O. Rd : 26.11.2019
Collected by : AE2

Sample ID : PCB- 245

30 NOV 2019

Sl. No	Parameters	Unit	Value	Test Method	KSPCB Limit
1	pH		7.19	APHA, 4500 H+ B 22nd Edition 2012.	6.5-8.5
2	BOD	mg/l	9.0	APHA, 5210 B 22nd Edition 2012.	30
3	SS	mg/l	BDL	APHA, 2540-D 22nd Edition 2012.	100
4	OIL & GREASE	mg/l	BDL	APHA, 5520 B 22nd Edition 2012.	10

AE68 3/12/19

AE2/AS 2/12/19

SAJI K.N.
ASSISTANT SCIENTIST

SAJI. K.N
Assistant Scientist

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ANNEXURE - XIII

JUSTICE A.V. RAMAKRISHNA PILLAI
(Former Judge, High Court Of Kerala)
CHAIRMAN

State Level Monitoring Committee, Kerala
(An authority constituted by the
National Green Tribunal)
'AMPAZHAVELIL'
Rajeev Nagar, Elamakkara
Kochi-682026
Home Office: 0484-2408388
Mob: 9447090130
8139878758
e-mail: avrpillai@gmail.com

Madam,

Yesterday after noon, another fire incident occurred at the Brahmapuram Waste Dumping Yard in Ernakulam District.

I along with the Chief Environmental Engineer, Regional Office, KSPCB was there, till noon, to assess the present fact situation in the yard, before submitting a report to the Hon'ble National Green Tribunal in O.A.514/2019, which stand posted to 28.02.2020 for the appearance of the Secretary, Urban Development, Kerala. Allegedly, the fire occurred around 3 p.m. The cause is yet to be known.

After the fire incident during the last year, the dioxin level at the area was got assessed by the CSIR-NIIST, Thiruvananthapuram.

Therefore, the same authority may be requested to assess the present dioxin level at the site as well as the long term effect of such fire break out incidents using the previous report for comparative valuation.

Treat the matter as urgent.

Yours sincerely,

19/02/2020.

To

The Member Secretary,
Kerala State Pollution Control Board,
Thiruvananthapuram.

Copy to:

Mr.M.A.Baiju,
Chief Environmental Engineer,
Kerala State Pollution Control Board,
Regional Office, Ernakulam.