BEFORE THE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION NO. 673/2018

ORIGINAL APPLICATION NO. 426/2019

&

ORIGINAL APPLICATION NO. 829/2019

IN THE MATTER OF: -

NEWS ITEM PUBLISHED IN "THE HINDU" AUTHORED BY SHRI JACOB KOSHY TITLED "MORE RIVER STRETCHES ARE POLLUTED-CPCB"

MOHAMMAED NAYEEM PASHA & ANR. **APPLICANT(S)**

VS.

THE STATE OF TELANGANA & ORS. **RESPONDENT (S)**

&

LT.COL.SARVADAMAN SINGH OBEROI **APPLICANT**

VS.

UNION OF INDIA & ORS. **RESPONDENT(S)**

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DATE: 18.11.2019
PLACE: DELHI

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

O.A. NO.673 OF 2018 IN THE MATTER OF: "NEWS ITEM PUBLISHED IN 'THE HINDU' AUTHORED BY SHRI. JACOB KOSHY TITLED "MORE RIVER STRETCHES ARE NOW CRITICALLY POLLUTED: CPCB"

OA NO. 426 OF 2018 IN THE MATTER OF MOHAMMED NAYEEM PASHA & ANR VERSUS THE STATE OF TELANGANA & ORS

O. A. NO. 829 OF 2019 IN THE MATTER OF "LT. COL. SARVADAMAN SINGH OBEROI VS UNION OF INDIA & ORS"

CONSOLIDATED STATUS REPORT

Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change, Govt. of India)
Parivesh Bhawan, East Arjun Nagar,
Delhi – 110032
November 18, 2019

CONSOLIDATED STATUS REPORT

A. ON COMPLIANCE TO HON'BLE NGT ORDERS DATED 20.09.2018, 19.12.2018 AND 08.04.2019 IN OA NO. 673/2018, NEWS ITEM PUBLISHED IN 'THE HINDU' AUTHORED BY SHRI. JACOB KOSHY TITLED "MORE RIVER STRETCHES ARE NOW CRITICALLY POLLUTED: CPCB".

B. ON COMPLIANCE TO HON'BLE NGT ORDER DATED 17.09.2019 IN OA. NO. 829 OF 2019 IN THE MATTER OF "LT. COL. SARVADAMAN SINGH OBEROI VS UNION OF INDIA & ORS, AND

C. ON COMPLIANCE TO HON'BLE NGT ORDERS DATED 05.04.2019 IN OA NO. 426 OF 2018 IN THE MATTER OF MOHAMMED NAYEEM PASHA & ANR VERSUS THE STATE OF TELANGANA & ORS

A. OA NO. 673 OF 2018 IN THE MATTER OF NEWS ITEM PUBLISHED IN 'THE HINDU' AUTHORED BY SHRI. JACOB KOSHY TITLED "MORE RIVER STRETCHES ARE NOW CRITICALLY POLLUTED: CPCB".

A1. Introduction

Hon'ble National Green Tribunal (NGT) in O.A. No. 673/2018 in the matter of 'News item published in 'The Hindu' authored by Sh. Jacob Koshy - Titled "more river stretches are now critically polluted: CPCB" passed orders on 20.09.2018, 19.12.2018 and 08.04.2019.

Relevant portion of directions passed by Hon'ble NGT on 20.09.2018 which are reproduced as follows: -

Para 50. In view of above, we consider it necessary to issue the following directions:

(i) All States and Union Territories are directed to prepare action plans within two months for bringing all the polluted river stretches to be fit at least for bathing purposes (i.e. BOD < 3 mg/Land FC < 500 MPN/100 ml) within six months from the date of finalization of the action plans.

(ii) The action plans may be prepared by four-member Committee comprising, Director, Environment, Director, Urban Development., Director, Industries, Member Secretary, State Pollution Control Board of concerned State. This Committee will also be the Monitoring Committee for execution of the action plan. The Committee may be called "River Rejuvenation Committee" (RRC). The RRC

will function under the overall supervision and coordination of Principal Secretary, Environment of the concerned State/Union Territory.

(iii) The action plan will include components like identification of polluting sources including functioning/ status of STPs/ETPs/CETP and solid waste management and processing facilities, quantification and characterization of solid waste, trade and sewage generated in the catchment area of polluted river stretch. The action plan will address issues relating to; ground water extraction, adopting good irrigation practices, protection and management of Flood Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environmental flow of river and plantation on both sides of the river. Setting up of biodiversity parks on flood plains by removing encroachment shall also be considered as an important component for river rejuvenation. The action plan should focus on proper interception and diversion of sewage carrying drains to the Sewage Treatment Plant (STP) and emphasis should be on utilization of treated sewage so as to minimize extraction of ground or surface water. The action plan should have speedy, definite or specific timelines for execution of steps. Provision may be made to pool the resources, utilizing funds from State budgets, local bodies, State Pollution Control Board/ Committee and out of Central Schemes.

(iv) The Action Plans may be subjected to a random scrutiny by a task team of the CPCB.

(v) The Chief Secretaries of the State and Administrators/ Advisors to Administrators of the Union Territories will be personally accountable for failure to formulate action plan, as directed.

(vi) All States and Union Territories are required to send a copy of Action Plan to CPCB especially w.r.to Priority I & Priority II stretches for approval.

(vii) The States and the Union Territories concern are directed to set up Special Environment Surveillance Task Force, comprising nominees of District Magistrate, Superintendent of Police, Regional Officer of State Pollution Control Board and one person to be nominated by District Judge in his capacity as Chairman of Legal Services Authority on the pattern of direction of this Tribunal dated 07.08.2018, in Original Application No. 138/2016 (TNHRC), "Stench Grips Mansa's Sacred Ghaggar River (Suo-Motu Case).

(viii) The Task Force will also ensure that no illegal mining takes place in river beds of such polluted stretches.

(ix) The RRC will have a website inviting public participation from educational institutions, religious institutions and commercial establishments. Achievement

and failure may also be published on such website. The Committee may consider suitably rewarding those contributing significantly to the success of the project.

(x) The RRCs will have the authority to recover the cost of rejuvenation in Polluter Pays Principle from those who may be responsible for the pollution, to the extent found necessary. In this regard, principle laid down by this Tribunal in order dated 13.07.2017 in 0.A No. 200 of 2014, M.C Mehta Vs. Uol will apply. Voluntary donations, CSR contribution, voluntary services and private participation may be considered in consultation with the RRC.

(xi) The RRCs will send progress reports by e-mail at filing.ngt@gmail.com on or before 15. 12. 2018.

Relevant portion of directions passed by Hon'ble NGT on 19.12.2018 in OA No. 673 of 2019 which are reproduced as follows:

11. . ..... The said States/ UTs may now give revised reports on or before 31.01.2019 to CPCB after complying with the deficiencies. The CPCB shall examine the action plans and only if they meet the scientific and technical yardstick shall approve the same and convey it to the respective States/UTs. The States/ UTs after its approval shall place/host these action plans on the respective website giving clear timelines for its execution, agencies responsible for its execution along with the matching budgetary provisions.

12. By way of last opportunity, we extend the time for preparation of action plans till 31.01.2019 with the stipulation that for every delay thereafter, compensation for damage to the environment will be payable by each of the States/ UTs at the rate of Rs. One Crore per month for each of the Priority- I and Priority- II stretches, Rs.50 lacs per month for stretches in Priority- III and Rs. 25 lacs per month each for Priority- IV and Priority- V stretches. The payment will be the responsibility of the Chief Secretaries of the States/Administrators of the UTs and the amount may be recovered from the erring officers. The CPCB may prominently place the names of the defaulting States and UTs and a notice to this effect on its website.

13. The SPCBs and Pollution Control Committees of UTs may display the quality of the water of polluted river stretches on their respective websites within one month from today, along with action taken, if any, which may be revised every three months. The CPCB may also display the water quality of the river stretches and action/inaction by such States on its websites. It is made clear that BOD will not be the sole criteria to determine whether a particular river stretch is a polluted river stretch. Other parameters including Faecal Coliform (FC) bacteria will also be the criteria for classifying a stretch as polluted or otherwise. CPCB may devise

within two weeks a mechanism for classification wherein two criteria pollutants that is BOD and FC shall henceforth be basis of classification in Priority Classes.

14. The CPCB may also examine whether river Rangpo in Sikkim falls in the category of polluted river stretches and if it is so, CPCB may give appropriate directions with regard to the said river also.

15. Any incomplete action plan will be treated as non-compliance. Performance guarantees are to be furnished for implementation of action plans within the above stipulated time to the satisfaction of Central Pollution Control Board in the sum of: (i) Rs. 15 Crore for each of Priority I & II stretches (ii) Rs. 10 Crore for each of Priority III stretches (iii) Rs. 5 Crore for each of Priority IV & V stretches.

16. The CPCB will be at liberty to take further coercive measures against the States/UTs concerned and furnish a consolidated report to this Tribunal by 28.02.2019 by e-mail at ngt.filing@gmail.com.

In pursuance to Hon'ble NGT orders dated 20.09.2018 and 19.12.2018, consolidated status report covering recommendations on aspects relating to the following aspects were filed before Hon'ble NGT by CPCB on 05.04.2019: -

a) Timelines for compliance to Hon'ble NGT directions dated 20.9.2018 w.r.t preparation of action plans and for bringing all the polluted river stretches to be fit at least for Bathing purposes i.e. BOD < 3mg/l and FC <500 MPN/100ml within six months from the date of finalisation of the action plans;
b) Rivers which are perennial only to be taken up for the rejuvenation;
c) Achieving goals of bathing criteria after implementation of action plans;
d) Identification of polluted river stretches based on revised criteria;
e) Submission of Performance Guarantee for ensuring implementation of action plans within the stipulated timelines.

Further, Hon'ble National Green Tribunal (NGT) considered the matter and passed order on 08.04.2019. Relevant portion of the directions passed by the Hon'ble NGT on 08.04.2019, para-wise are reproduced as follows:

Para 32 and 41 :- We accept the proposal of CPCB to revise the scale of performance guarantee with regard to timeline. We also accept the suggestions of CPCB to extend the timeline for execution of action plans to the extent that upper limit for execution of the action plans will be two years from 01 .04.2019 and the monitoring of the action plans may be done not only at the level of the Chief Secretaries of the States/UTs but also by the CPCB. CPCB has further suggested that scale of performance guarantee should be: - for No. of Polluted River Stretches in a State/UT > 10; 5 to 10 & < 5, the performance guarantee in Rupees 15 Crore, 10 Crore & 5 Crore, respectively.

Para 38 :- States of Assam, Manipur and Uttar Pradesh are liable to pay compensation in terms of order dated 19.12.2018 for delay after 31 .1.2019 till the action plans are furnished for failing to submit action plan in respect of four river stretches. The said amount may be deposited with the CPCB within one month. CPCB may use the amount for restoration of environment as per law. It will be open to the States to recover the amount from the erring officers. For delay, interest @ 12% will be payable. Responsibility for payment will be of Chief Secretaries. CPCB is at liberty to seek enforcement of this order as decree of Civil Court by civil imprisonment of Chief Secretaries concerned or attachment of salary or assets as per Section 51 , Code of Civil Procedure read with Section 25 of the National Green Tribunal Act, 2010. It is also permissible to initiate prosecution under Section 26 of NGT Act, as noncompliance of order of NGT is a criminal offence.

Para 39:- The report of the CPCB further shows that 6 States have furnished incomplete action plan as given in Table 3 quoted above. The said six states i.e. Delhi, Meghalaya, Nagaland, Tamil Nadu, Uttar Pradesh and Uttarakhand are liable to pay compensation as per order dated 19.12.2018 for delay after 31 .1.2019 at the scale of 50% of the compensation payable by the States who have failed to submit any action plan. None of the above defaulting States except the State of Uttarakhand is represented before this Tribunal. There is no satisfactory explanation by any of the States, including the State of Uttarakhand who is represented by an officer. This part of order will be governed by earlier para for interest and enforcement. The requirement to pay compensation will continue till action plans are furnished or completed. The action plans may be uploaded on the websites of the CPCB as well as respective States/UTs and the MoEF&CC after former approval by the CPCB.

Para 40:- As regards 108 river stretches for which action plans have not still been furnished for Priority-III, Priority-IV and Priority-V river stretches, we direct that same scale of compensation will apply for failure to furnish action plans in further extended timeline up to 30.06.2019. The Action Plans not so far furnished, as required by earlier order of this Tribunal, may also now be furnished up to 30.06.2019.

Para 41 :- We also accept the suggestions of CPCB to extend the timeline for execution of action plans to the extent that upper limit for execution of the action plans will be two years from 01.04.2019 and the monitoring of the action plans may be done not only at the level of the Chief Secretaries of the States/UTs but also by the CPCB.

Para 42:- We direct that CPCB with SPCBs and PCCs to launch nationwide programme on biodiversity monitoring and indexing of the rivers to assess the efficacy of river cleaning programme. Further, for safety of human health and maintaining sanctity of the rivers, regular hygienic surveys of the rivers should be carried out with

reference to faecal coliform and faecal streptococci, as indicated in the primary water quality criteria for bathing waters. Nodal agency will be CPCB.

Para 43:- Having given due consideration to the serious issue and inadequacy of success achieved so far, we find it necessary to constitute a Central Monitoring Committee to undertake a national initiative by way of preparation and enforcement of a national plan to make river stretches pollution free comprising a senior representative of NITI Aayog, Secretaries Ministry of Water Resources, Ministry of Urban Development, Ministry of Environment, Forest and Climate Change, Director General, National Mission for Clean Ganga and Chairman CPCB. Chairman CPCB will be the nodal authority for coordination. Senior most among them will preside over the deliberations.

Para 44:- The Central Monitoring Committee will also co-ordinate with the RRCs of the States and oversee the execution of the action plans, taking into account the timelines, budgetary mechanism and other factors. Chief Secretaries of States will be the nodal agency at State level. The Chief Secretaries of the States may undertake review of progress of RRCs by involving concerned Secretaries of Department of Urban Development, Environment, Industries, Irrigation and Public Health, Health etc.

Para 46:- First meeting of the Central Monitoring Committee may be held by 30.06.2019. The Central Monitoring Committee may consider identifying experts, best practices and models for use of treated water, including plan to supply untreated sewage for a price or otherwise so that the concerned needy party can treat and utilize such water as is reportedly being done at Surat in Gujarat, Nagpur in Maharashtra and Bhiwadi in Rajasthan or any other place. Use of treated water for agriculture or other purpose may save potable surface and ground water.

Para 47: - The Central Monitoring Committee may give its report by 31.07.2019.

Further, Hon'ble National Green Tribunal (NGT) in IA No. 551/2019 in Original Application No. 673 of 2018, MA No. 1777/2018 filed by MoEF & CC for extension of time passed order on 04.09.2019. The matter was considered further on 18.07.2019 and O.A. No. 673/2018 is now listed for hearing on 29.11.2019.

Copies of Hon'ble NGT orders dated 20.09.2018, 19.12.2018, 08.04.2019 and 04.09.2019 are enclosed as Annexure-I to Annexure-IV.

A2. Actions taken by CPCB: Actions initiated by CPCB for ensuring compliance to Hon'ble NGT order is detailed below:

i) Status on Approval of Action Plans for Restoration of Identified Polluted River Stretches: -

For the purpose of scrutiny of action plans especially with regard to the Priority – I and Priority-II identified polluted river stretches submitted by the respective State/UT Administration in compliance to Hon'ble NGT order dated 20.09.2018, CPCB has constituted a 'Task Team' under the Chairmanship of 'Member Secretary, CPCB' comprising members from Ministry of Environment, Forest and Climate Change (MoEF & Cc), Ministry of Jal Shakti (National Mission for Clean Ganga-NMCG), Ministry of Housing and Urban Affairs (MoHUA), Dr.A.B.Akolkar, Former Member Secretary (CPCB) and Officials of CPCB vide CPCB Officer Order dated 14.11.2018.

Till date, CPCB has organised eight Task Team meetings in CPCB (i.e., 1st meeting held on 14.12.2018; 2nd meeting held on 05.01.2019; 3rd meeting held on 25.10.2018; 4th meeting held on 28.03.2019; 5th meeting held on 24.04.2019; 6th meeting held on 31.05.2019; 7th meeting held on 16.07.2019 and 8th meeting held on 06.09.2019). RRC approved action plans pertaining to P-I & P-II identified polluted river stretches as received from the respective State/UT were considered for random scrutiny by the CPCB Task Team.

61 out of 61 total action plans were received as on 06.09.2019 and 60 action plans have been approved along with the conditions. ***Revised action plan for restoration of River Yamuna within Delhi State is awaited from Delhi State Government.*** Minutes of all the eight Task Team meetings were also uploaded in CPCB website at https://cpcb.nic.in/mcngt-restoration/ . Also, minutes of all the eight task team meetings were also communicated to the concerned authorities for further necessary action at their end. State-wise status of action plans received, action plans approved with conditions by CPCB Task Team w.r.t Priority I & Priority II Polluted River Stretches are annexed at **Annexure-V, Annexure-VI and Annexure-VII.** All the action plans already approved by CPCB Task Team also uploaded by the concerned States/UTs and web links have been provided in CPCB website at https://cpcb.nic.in/mcngt-restoration/ for having access to the general public.

ii) **Criteria for Prioritization of Polluted River Location**

In pursuance to Hon'ble NGT order dated 19.12.2018 and to devise a mechanism for classification of polluted river stretch by considering two criteria pollutants such as Bio-chemical Oxygen Demand (BOD) and Faecal Coliform (FC), CPCB has prepared "draft criteria for prioritization of polluted river location". The draft criteria was circulated to all the concerned stakeholders mainly State Pollution Control Boards (SPCBs) and the Pollution Control Committees (PCCs) vide CPCB letter dated 09.01.2019, for providing comments or views by January 2019. Based on the comments received from stakeholders, the draft criterion has been finalised and appraised to Hon'ble NGT on 29.7.2019 (Copy enclosed as **Annexure-VIII).** Afore-said finalised criteria also uploaded in CPCB website at https://cpcb.nic.in/wqm/Guidelines_wqm-23.07.2019.pdf .

iii) **Submission of Performance Guarantee by the States/UTs for ensuring timely implementation of approved action plans for rejuvenation of identified polluted river stretches: -**

As per Hon'ble NGT order dated 8.4.2019, States/ UTs are required to submit performance guarantee as per revised scale i.e. No. of Polluted River Stretches in a State/UT > 10, 5 to 10 & < 5, the performance guarantee to be submitted in Rupees is 15 Crore, 10 Crore & 5 Crore respectively. ***Till date, 09 States (viz., Goa, Gujarat, Haryana, Jharkhand, Madhya Pradesh, Manipur, Odisha, Puducherry, West Bengal and 02 UTs (Viz., Daman, Diu and Dadra Nagar Haveli, Delhi) out of 31 States/UTs have submitted Performance/ Bank Guarantee to CPCB.*** State-wise details of performance guarantee or bank guarantees submitted is annexed at **Annexure-IX.**

iv) **Review meeting with 11 States/UTs for review of action plans falling under Priority III to V classes**

As per Hon'ble NGT Order dated 20.09.2018, all States and Union Territories are required to send a copy of RRC approved action plan to CPCB especially w.r.to only Priority I & Priority II stretches for approval. The Action Plans may be subjected to a random scrutiny by a task team of the CPCB.

The States/UTs which are not required to submit action plans to CPCB seeking approval, CPCB convened a review meeting on 12.09.2019 in CPCB with such 11 States/UTs for reviewing the RRC approved action plans for restoration of polluted river stretches falling under Priority III to V classes in the respective

States. 09 out of 11 States/UTs have attended the meeting. CPCB reviewed the action plans and suggested necessary improvements in light of the Hon'ble NGT order dated 20.09.2018. The minutes of the review meeting were also communicated to all the concerned States/UTs vide CPCB letter dated 14.10.2019 (Copy annexed as **Annexure-X**) with a request to take necessary actions.

Following general suggestions were made for incorporation in the prepared action plans and thereafter for taking approval of RRC constituted by the respective State Government or UT Administration for implementation of action plans in respect of P-III to P-V polluted river stretches: -

(i) Identification of polluting sources including drains contributing to river pollution

(ii) Map showing Polluted River, its tributaries, drains, major towns, industrial estates, location of STPs/CETPs

(iii) Functioning status of STPs/ETPs/CETPs and solid waste management and processing facilities in the catchment area of the identified polluted river stretch;

(iv) Detailed gap analysis w.r.t town-wise water consumption (including ground water consumption), sewage generation, existing infrastructure in the catchment area and the gap analysis;

(v) Detailed gap analysis w.r.t industrial water consumption, wastewater generation, existing infrastructure for treatment of industrial effluent (both captive ETPs/CETPs and their performance assessment), gap analysis;

(vi) Quantification and characterisation of waste (such as solid waste, industrial hazardous waste, bio-medical waste, E-Waste), STP sludge management, existing infrastructure and detailed gap analysis;

(vii) Latest water quality of polluted river, its tributaries, drains with flow details and ground water quality in the catchment of polluted river;

(viii) Aspects such as ground water extraction, adopting good irrigation practices, protection and management of Flood Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environmental flow of river (by having watershed management provisions), plantation on both sides of the river, setting up biodiversity parks on flood plains by removing encroachment., proper interception and diversion of sewage carrying drains to Sewage Treatment Plant (STP), upgradation of existing sewage treatment plants if not in a position to comply with effluent discharge norms, emphasis on utilization of treated sewage so as to minimize extraction of ground or surface water be included,

(ix) Speedy, definite or specific timelines for execution of action plans and the estimated budget including the monitoring agency

(x) Achievable goals with specific timelines for restoration of water quality of polluted rivers.

(xi) Organisation-wise action plans with timelines and the estimated budget for implementation of action plans.

v) Format for obtaining status on implementation of Action plans for restoration of polluted River Stretches

In order to assess the progress on implementation of action plans already approved by CPCB, a format seeking status on implementation of action plans for restoration of polluted river stretches has been communicated to the Chief Secretaries of concerned States/UTs and State Pollution Control Boards/ Pollution Control Committees, vide CPCB letter dated 26.9.2019. A copy of CPCB letter dated 26.09.2019 along with the format circulated is annexed at **Annexure-XI.** As on 06.11.2019, filled in formats have been received from 3 States/UTs viz Daman, Diu, Dadra & Nagar Haveli, Andhra Pradesh and Meghalaya.

B. Hon'ble NGT order dated 17.09.2019 in O. A. No 829 of 2019 in the matter of Lt. Col. Sarvadaman Singh Oberoi Vs Union of India & Ors.

Hon'ble NGT vide order dated 17.9.2019 in O. A. No 829/2019 in the matter of Lt. Col. Sarvadaman Singh Oberoi Vs Union of India & Ors referred to para 21 (iii) of the order passed in O. A. No 593/2017 in the matter of Paryavaran Suraksha Samiti & Anr versus Uol which is reproduced as follows: " The Tribunal has directed that no untreated sewage/industrial effluent be discharged into any water bodies (which includes coastal waters). Any violation is to result in compensation starting from 01.04.2020".

Further, main directions of Hon'ble NGT order dated 17.9.2019 in O. A. No 829/2019 in the matter of Lt. Col. Sarvadaman Singh Oberoi Vs Union of India & Ors, which are as follows:-

(i) No untreated sewage/industrial effluent be discharged into any water bodies (which includes coastal waters). Any violation is to result in compensation starting from 01.04.2020.

(ii) The CPCB has issued directions dated 15.12.2016, under Section 18(1)(b) of the Water (Prevention and Control of Pollution) Act, 1974 to all the State PCB/PCCs to ensure that no sewage or industrial pollution is discharged in coastal waters.

(iii) CPCB may file latest status report on the subject in O.A No. 673/2018.

A copy of Hon'ble NGT order dated 17.09.2019 is annexed as **Annexure –XII**.

B1. Actions taken by CPCB

In pursuance to Hon'ble NGT order dated 17.09.2019, CPCB has communicated a copy of the Hon'ble NGT order dated 17.9.2019 to all the Chief Secretaries of the States/UTs with a request to take necessary action and arrange to file compliance report on compliance to Hon'ble NGT order, vide CPCB letter dated 1.10.2019.

Further, CPCB vide letter dated 11.11.2019 **(Annexure-XIII to Annexure-XIV)** requested State Governments and Union Territory Administrations as well as State Pollution Control Boards and Pollution Control Committees in UTs to submit the action taken reports in compliance to CPCB directions dated 15.12.2016 issued under Section 18(1)(b) of the Water (Prevention and Control of Pollution) Act, 1974 as directed by Hon'ble NGT order dated 17.09.2019 in OA. No 829/2019 in the matter of Lt. Col. Sarvadaman Singh Oberoi Vs Union of India & Ors.

As on 06.11.2019, CPCB has received response from coastal States viz., Department of Environment, Government of Goa; and DD & DNH Pollution Control Committee. Response received from afore-said States/UT are annexed as **Annexure XV to Annexure-XVI**.

C. Hon'ble NGT order dated 05.04.2019 in OA No. 426 of 2018 the matter of Mohammed Nayeem Pasha & Anr Vs The State of Telangana & Ors.

C1. Introduction: -

Hon'ble National Green Tribunal in MA No. 986 of 2018 in Original Application No 426 of 2018 in the matter of Mohammed Nayeem Pasha & Anr Versus The State of Telangana & Ors. vide order dated 05.04.2019 directed as follows:-

- CPCB and Telangana State Pollution Control Board (TSPCB) to carry out a 'quick hygienic survey' of the river by engaging Professor Suman Kapur, Dean, International Programmes and Collaborations and Senior Professor, Department of Biological Sciences, BITS Pilani, Hyderabad campus, Jawahar Nagar, Shameer Pet, Hyderabad-500078, skapur@hyderabad.bits-pilani.ac.in and submit a report for river Musi and any other clean river in the state falling in the category of 'A' and or 'B'. For this survey we request Professor Suman Kapur to execute the survey at a total cost of 9.5 laks which will be paid by CPCB out of

its environmental compensation fund. The scientist of CPCB and TSPCB will be associated during the survey and field testing of pathogenic bacteria.

- Professor Suman Kapur will submit the report to CPCB before 31st July 2019. CPCB shall file its report on execution of such survey for other rivers. Expenses of the said survey in relation to the scientist of CPCB and SPCB shall be borne by the respective Boards. CPCB shall file its report on execution of such survey for other rivers identified as polluted river stretches in the country. Further they should give their opinion on adoption of field based testing and its validation etc.

- CPCB is also directed to report the status of operation of STPs in ans around Musi river.

Further, Hon'ble National Green Tribunal in MA No. 986 of 2018 in Original Application No 426 of 2018 in the matter of Mohammed Nayeem Pasha & Anr Versus The State of Telangana & Ors. vide order dated 01.07.2019 directed as follows:-

" List the matter along with OA No. 673 of 2018"

A copy of the Hon'ble NGT order dated 05.04.2019 are enclosed as **Annexure-XVII and Annexure-XVIII.**

C2. Actions Initiated by CPCB

In pursuance to Hon'ble NGT order dated 05.04.2019, actions taken by CPCB in afore-said matter are detailed below: -

(i) **Preliminary Meeting**: For ensuring compliance to Hon'ble NGT order dated 05.04.2019, a preliminary meeting was held on 02.05.2019 at TSPCB which was attended by the officials of CPCB, TSPCB and Prof. Suman Kapur to decide on sampling schedule, sampling locations on river Musi and river Krishna. Following decisions were taken in the afore-said meeting for ensuring compliance to Hon'ble NGT order dated 05.04.2019: -

- A team comprising of representatives from CPCB, TSPCB and BITS-Pilani, Hyderabad Campus be involved in collection of sample

- Samples be collected from 9 different locations namely

  - Upstream of River Musi at Gandipet (Osman Sagar),
  - River Musi at Nagole,

- River Musi at Pratapsingaram,
- River Musi at Pillaipalli,
- River Musi at Rudravelly,
- River Musi at Kasaniguda,
- River Musi at Wadapalli (before confluence),
- Krishna at Wadapalli (before confluence), and
- Musi+ Krishna at Wadapally (after confluence)

➢ Sampling be done fortnightly i.e. twice every month for a period of three months with the following schedule (9th and 23rd May, 2019; 13th and 26th June, 2019; 9th July and 23rd July, 2019).

➢ **Award of work:-** CPCB vide letter dated 09.05.2019 awarded the work to BITS Pilani-Hyderabad Campus, for carrying out "Quick Hygienic Survey of River Musi and Krishna" at a total cost of Rs. 9.5 Lacs excluding applicable taxes, for completion of the study by 31.07.2019 which later extended up to 31.08.2019 on request of Prof. Suman Kapur, for submission of final report.

C3. Assessment of Quick Hygienic Survey of River Musi and River Krishna using RightBiotic Method

(i) Major findings of the study carried out by BITS –Pilani, Hyderabad campus

Final report entitled "Quick Hygienic Survey of River Musi' carried out by BITS Pilani, Hyderabad Campus has been received by CPCB vide letter dated 04.09.2019 from Prof. Suman Kapoor, BITS PIlani. Comments on the report were communicated to Prof S.Kumar vide CPCB letter dated 17.10.2019 for incorporation. A copy of the quick hygienic survey of river Musi as received by CPCB from Prof. Suman Kapur, BITS Pilani, Hyderabad Campus vide letter dated 24.10.2019 is enclosed at **Annexure-XIX**. Salient features of the quick hygienic survey of river Musi and river Krishna are detailed below:

➢ Five out of the nine sites namely, Nagole, Pratapsingaram, Pillaipalli, Rudravelly, and Kasaniguda had higher diversity of pathogenic bacteria and overall load all through the study period (page 21 of the report under serial no. 6)

➢ Five pathogenic strains (such as E. *coli, Klebsiella spp., Pseudomonas spp., Staphlocoocus spp., and Enterococcus spp.*) were isolated in six sampling locations, and remaining 3 did not grow any bacteria which includes

sampling location on river Musi at Wadapally (before confluence), sampling location on river Krishna at Wadaplly (before confluence), Musi after joining Krishna at Wadapally (after confluence). (Details given at Page No. 103 and Table 40 of the assessment report)

- Profile of isolated pathogenic strains predominantly include gram negative organisms such as E. *Coli, Klebsiella spp. and Pseudomonas spp.* as well as gram positive organisms such as *Enterococcus spp.* and *Staphylococcus spp.*

- A panel of antibiotics (total 14) including major class of antibiotics relevant to water bodies and important representative from each class was tested for determining Anti-Microbial Resistance (AMR) pattern. Out of the 14 antibiotics tested, Multi Drug Resistance (resistance to 2 or more antibiotics) was observed at the rate of 29% at Nagole, in *Klebsiella spp.* (4/14 equivalent to 28.57%) to 93% at Pillaipalli in Pseudomonas spp. (13/14 equivalent to 93%) against frontline antibiotics. (Details given at Annexure - 13, Page No. 64 to 65 of the assessment report)

- Several strains of Staphylococcus spp. showed very high resistance ranging from 79% to 86% indicating an alarming pan-drug resistance like situation. (Details given at Annexure -13, Page No.67 of the assessment report)

- RightBiotic assay can be used for rapid and quick hygienic survey of river and other surface and ground water surveys for assessing presence of pathogens resistance to any given panel of antibiotics for assessing the health hazard posed by ABM with accuracy of >70% (Details given at Page No. 26 of the assessment report)

- Out of 90 bacterial strains isolated from 54 water samples all fall in multi drug resistance (MDR) and some even fall in Extensively Drug Resistance (XDR) category (as mentioned in Figure 19 of the assessment report)

(ii) Major Findings of General Parameters carried out by TSPCB during the study period

A Joint Team comprising RD, CPCB, Bengaluru, TSPCB have participated along with BITS-Pilani, Hyderabad Campus team and carried out sampling at 9 locations namely Gandipet, Nagole, Pratapsingaram, Pillaipalli, Rudravelly, Kasaniguda, Musi at Wadapally (before Confluence), Krishna at Wadaplly (before

Confluence), Musi+Krishna at Wadapally (after confluence) on 6 different visit dates during May to July 2019. Collected samples were stored at 4° C and sent to TSPCB Central Laboratory for investigation of general parameters. TSPCB submitted the report vide letter dated 28.08.2019 on the water quality data of river Musi at all 9 selected locations. A copy of the detailed report on the general parameters carried out by TSPCB is annexed as **Annexure-XX**. Main observations of TSPCB on the water quality of river Musi and River Krishna during the study period are as follows:-

- The compiled average BOD value throughout the stretch from Gandipet (Osmansagar) i.e., upstream of river Musi to river Krishna after confluence with river Musi at Wadapally during the period 9th May 2019 to 23rd July 2019 is ranging between 3 to 44 mg/L.

- The BOD of 3mg/L which falls under Class -B i.e., outdoor bathing quality was recorded at upstream of river Musi at Gandipet (Osmansagar), river Krishna before confluence and after confluence with river Musi at Wadapally.

- River Krishna water quality before confluence with river Musi and after confluence with river Musi at Wadapally falls in Class -C i.e., drinking water source after conventional treatment and disinfection.

- River Musi at Rudravalli at Kasaniguda and before confluence with river Krishna at Wadapally falls under Class –D (i.e., Propagation of Wild life and Fisheries) with BOD at 22, 34 and 8 mg/L respectively.

- River Musi at Nagole, Pratapasingaram, Pillaipally falls under Class – E, the BOD observed are 44, 27, 25 mg/L respectively.

- Musi river at Pratapasingaram has highest Total Coliform of 1250 MPN/100ml followed by Pillaipalli with 1133 MPN/100ml.

- It is observed that the Total Coliform count in river Musi stretch from Nagole to Kasaniguda (Monitoring locations at Sl. No. 2,3,4 &5) is more when compared to other part of river Musi stretch which could be due to discharge of treated and untreated sewage into river Musi.

(iii) One-day hands-on training on Quick Hygienic Survey of River Body using RightBiotic method

A one-day hands-on training on Quick Hygienic Survey of River Body using Right Biotic System for the officials of SPCBs/PCCs in association with BITS-Pilani, Hyderabad campus was organized on 26.08.2019 at BITS-Pilani Hyderabad Campus. 8 officials from different SPCBs attended the training programme at BITS-Pilani, Hyderabad campus.

(iv) Analysis of extracted water samples for pharmaceuticals

The extracted and vacuum dried water samples of river Musi and river Krishna (54 nos) which were collected during quick hygienic survey of river Musi and river Krishna by BITS -Pilani were also analyzed for 21 different pharmaceuticals in NRTOL laboratory in CPCB. The analysis results reveal that the concentration of 21 pharmaceuticals in all the 54 samples is observed as 'below detection limit (BDL). The analysis results of 21 pharmaceuticals in all the 54 samples is enclosed at **Annexure-XXI**

(v) Views of CPCB on Quick Hygienic Survey of River using RightBiotic System

Broadly, the most prevalent methods used to detect E.-Coli or Fecal Coliforms are based on Membrane Filter technique or Multiple Tube Fermentation techniques (or Most Probable Number method). However, both the methods are having its own advantages and disadvantages. Other than available methods for detection of pathogenic bacteria, there are rapid methods available for identification of pathogenic bacteria including fecal coli and fecal streptococci which include (a) Radiometric methods, (b) Glutamate decarboxylase, (c) Electrochemical, (d) Impedance, (e) Gas Chromatographic assay, (f) Colorimetric, and (g) Potentiometric. These methods generally take time ranging from 3 hrs to 15 hours with varying sensitivity (0.1 to > 10^7 cells /mL), but are very costly, require lab setup & expertise for analysis of the assay and are lab based only.

Quick Hygienic Survey of river Musi using RightBiotic method involves Optical Detection System which converts the optical signal into electrical signal. Optical density is used as a measure of the concentration of bacteria in a suspension. As visible light passes through a cell suspension the light is scattered. Greater scatter indicates that more bacteria or other material is present. RightBiotic Platform neither work on the principle of Multiple Tube Fermentation (MPN

method) nor Membrane Filtration Technique (MF). RightBiotic method utilises disposable membrane filters of 0.45nm for filtering the water sample in initial steps of sample preparation before incubation at the ambient temperature and thus associated with quick measurement utilizing Optical Density of the pathogenic bacteria in short duration (4-5 hours).

Quick Hygienic study of river Musi carried out during 9th May, 2019 - 23rd July, 2019 (over 10-week period) reveals presence of pathogenic (diseases causing) bacteria apart from pathogenic indicator bacteria i.e. fecal coli & fecal Streptococci. Majority of the selected sampling locations i.e. 5 out of 9 selected sampling locations namely Nagole, Pratapsingaram, Pillaipalli, Rudravelly and Kasaniguda showed higher diversity of pathogenic bacteria which were multi drug resistant (resistance to atleast one agent in three or more antimicrobial class of antibiotics) showing 4 out of 14 antibiotics tested

RightBiotic Method developed by BITS-Pilani, Hyderabad extended for carrying out quick hygienic survey of river require further validation jointly in association with at least 2 independent agencies having similar facilities for comparison with the analysis results of conventional methods being followed for assessment of Fecal Coli and Fecal Streptococci with different water samples with species both sensitive (non-acclimatizing) and non-sensitive (acclimatizing) for estimating Fecal Coli and Fecal Streptococci. Applicability of RightBiotic method in turbid waters also needs to be assessed as suspended solids matter present in water sample may clog the pores and thereby inhibits free passage of specific volume of water sample.

RightBiotic method also be compared in terms of sensitivity and specificity by utilizing commonly available conventional methods such as Multiple Tube Fermentation (MPN- most trusted method) and other approved rapid and automated methods.

Quick Hygienic Survey of River using RightBiotic System developed by BITS-Pilani, Hyderabad campus enable to analyse microbial profile of a water body just in 4 to 6 hours. However, for wide use and applicability of RightBiotic method for quick assessment of hygienic survey of rivers, it would be advisable if it is validated and or approved by Department of Science and Technology, Government of India, for its adoption in the Country.

CPCB would be abiding by any order passed by the Hon'ble National Green Tribunal, Principal Bench, New Delhi.

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ANNEXURE – I

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 673/2018

IN THE MATTER OF:

NEWS ITEM PUBLISHED IN 'THE HINDU' AUTHORED BY SHRI. JACOB KOSHY
Titled
"More river stretches are now critically polluted: CPCB"

CORAM: HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

DATED: 20TH SEPTEMBER, 2018.

ORDER

1. This application has been registered on the basis of a news item dated 17.09.2018 in 'The Hindu" under the heading "More river stretches are now critically polluted: CPCB"[1].

2. According to the news item, 351 polluted river stretches have been noted by the Central Pollution Control Board (CPCB). 117 such stretches are in the States of Assam, Gujarat, and Maharashtra. The CPCB has apprised the concerned States of the extent of pollution in the rivers. According to the news item, most polluted stretches are from Powai to Dharavi – with Biochemical Oxygen Demand (BOD) 250 mg/L; the Godavari - from Someshwar to Rahed – with BOD of 5.0-80 mg/L; the Sabarmati – Kheroj to Vautha – with BOD from 4.0-147 mg/L; and the Hindon – Saharanpur to Ghaziabad – with a BOD of 48-120 mg/L. The CPCB has a programme to monitor the quality of rivers by measuring BOD. BOD greater than or equal to 30mg/L is termed as 'Priority I', while that between 3.1-6 mg/L is 'Priority V'. The CPCB considers a BOD less than 3mg/L an indicator of a healthy river. In its 2015 Report[2], the CPCB had identified 302 polluted stretches on 275 rivers, spanning 28 States and six Union Territories. The number of such stretches has now been found to be 351.

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[1] https://www.thehindu.com/news/national/more-river-stretches-critically-polluted cpcb/article24962440.ece

[2] http://cpcb.nic.in/cpcbold/RESTORATION-OF-POLLUTED-RIVER-STRETCHES.pdf

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3. The question for consideration is whether any direction is necessary by this Tribunal, if river stretches are polluted as per the report of CPCB, which is a statutory body under the Water (Prevention and Control of Pollution) Act, 1974, (the Water Act).

4. The matter has been considered by the Hon'ble Supreme Court and this Tribunal in several cases to which reference will be made at appropriate place in the order. The matter was recently reviewed in a Chamber Meeting held on 10.09.2018 amongst all the Members of the Tribunal and the representatives of the CPCB, the Department of Water Resources, the Ministry of Environment, Forest & Climate Change, the Niti Ayog, the National Mission for Clean Ganga, Ministry of Housing and Urban Affairs, the representatives of the States of Maharashtra, Gujarat, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Bihar, Punjab, Uttar Pradesh, NCT of Delhi and the Union Territory of Daman & Diu. The object of the meeting was to discuss as to how the level of fitness for bathing in all the rivers must be achieved at the earliest. The Tribunal was open to consider the matter on judicial side. Accordingly, we proceed to consider the same in the light of inputs available in public domain.

5. There is no dispute with the proposition that the water is the lifeline for existence. Shortage of clean water is a matter of serious concern. Checking of pollution in the rivers is integrally linked not only to the availability of clean potable water but also to the protection of environment.

6. Article 48A of the Constitution casts a duty on the State to protect and improve the environment. Article 51A imposes a fundamental duty on every citizen to protect and improve the environment. The Stockholm Declaration (1972) recommended prevention of pollution by adopting the 'Precautionary Principle', the 'Polluter Pays Principle' and the principle of 'Sustainable Development'.

7. The Water Act was enacted to provide for prevention and control of water pollution. The Central and State Boards have been established under the said Act. The Act

prohibits use of any stream or well for disposal of polluting matter. Standards to be maintained can be laid down. The Parliament has passed the Environment (Protection) Act, 1986 to protect and improve the quality of environment. The Central Government is authorized to issue appropriate directions for protection of environment to the concerned authorities.

8. Considering the issue of pollution in River Ganga by the leather industry at Kanpur, the Hon'ble Supreme Court of India in *M.C. Mehta Vs. Union of India &Ors.*[3], held that the discharge of the pollutants in Ganga could not be permitted directly or indirectly.

9. Again, in *M.C. Mehta Vs. Union of India &Ors.*[4], directions to enforce the statutory provisions by the municipal bodies and the industries by stopping discharge of untreated sewage and effluents in River Ganga were issued. It was noted that the water pollution caused serious diseases, including Cholera and Typhoid. Water pollution could not be ignored and adequate measures for prevention and control are necessary. It was also observed that the educational institutions must teach atleast for one hour in a week lessons relating to protection and improvement of environment. Awareness should be created by organizing suitable awareness programs. In the same matter, the issue of Calcutta tanneries was considered in *M.C Mehta Vs. Union of India And Ors.*[5], *(Calcutta Tanneries' Matter)*. The tanneries were directed to be shifted by adopting the 'Precautionary Principle' so as to prevent discharge of effluents in the River Ganga.

10. Dealing with the control of pollution in river Pallar in Tamil Nadu, the Hon'ble Supreme Court in *Vellore Citizen' Welfare Forum Vs. Union of India*, (1996) 5 SSC 647 observed:

> *"13. The Precautionary Principle and the Polluter Pays Principle have been accepted as part of the law of the land. Article 21 of the Constitution of India guarantees protection of life and personal liberty. Articles 47, 48-A and 51-A(g) of the Constitution are as under:*

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[3] (1987) 4 SCC 463 ¶14
[4] (1988) 1 SCC 471
[5] (1997) 2 SSC 411

"47. Duty of the State to raise the level of nutrition and the standard of living and to improve public health.—The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties and, in particular, the State shall endeavour to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health.
48-A. Protection and improvement of environment and safeguarding of forests and wildlife.—The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country.

51-A. (g) to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures."

Apart from the constitutional mandate to protect and improve the environment there are plenty of post-independence legislations on the subject but more relevant enactments for our purpose are: the Water (Prevention and Control of Pollution) Act, 1974 (the Water Act), the Air (Prevention and Control of Pollution) Act, 1981 (the Air Act) and the Environment (Protection) Act, 1986 (the Environment Act). The Water Act provides for the constitution of the Central Pollution Control Board by the Central Government and the constitution of the State Pollution Control Boards by various State Governments in the country. The Boards function under the control of the Governments concerned. The Water Act prohibits the use of streams and wells for disposal of polluting matters. It also provides for restrictions on outlets and discharge of effluents without obtaining consent from the Board. Prosecution and penalties have been provided which include sentence of imprisonment. The Air Act provides that the Central Pollution Control Board and the State Pollution Control Boards constituted under the Water Act shall also perform the powers and functions under the Air Act. The main function of the Boards, under the Air Act, is to improve the quality of the air and to prevent, control and abate air pollution in the country. We shall deal with the Environment Act in the latter part of this judgment.

16. The constitutional and statutory provisions protect a person's right to fresh air, clean water and pollution-free environment, but the source of the right is the inalienable common law right of clean environment. It would be useful to quote a paragraph from Blackstone's commentaries on the Laws of England (Commentaries on the Laws of England of Sir William Blackstone) Vol. III, fourth edition published in 1876. Chapter XIII, "Of Nuisance" depicts the law on the subject in the following words:
"Also, if a person keeps his hogs, or other noisome animals, or allows filth to accumulate on his premises, so near the house of another, that the stench incommodes him and makes the air unwholesome, this is an injurious nuisance, as it tends to deprive him of the use and benefit of his house. A like injury is, if one's neighbour sets up and exercises any offensive trade; as a tanner's, a tallow-chandler's, or the like; for though these are lawful and necessary trades, yet they should be exercised in remote places; for the rule is, 'sic uteretuo, utalienum non leadas'; this therefore is an actionable nuisance. And on a similar principle a constant ringing of bells in one's immediate neighbourhood may be a nuisance.

... With regard to other corporeal hereditaments; it is a nuisance to stop or divert water that used to run to another's meadow or mill; to corrupt or poison a watercourse, by erecting a dye-house or a lime-pit, for the use of trade, in the upper part of the stream; to pollute a pond, from which another is entitled to water his cattle; to obstruct a drain; or in short to do any act in common property, that in its consequences must necessarily tend to the prejudice of one's neighbour. So closely does the law of England enforce that excellent rule of gospel-morality, of 'doing to others, as we would they should do unto ourselves'."

11. The Central Government was directed to constitute an Authority under section 3 (3) of the Environment Act which can take measures to reverse the damage and recover the cost from the individuals responsible.

12. In *S. Jagannath Vs. Union of India &Ors.*[6], effluents discharged by commercial shrimp culture farms were directed to be controlled. An authority was directed to be constituted headed by former Judge of the High Court to protect fragile coastal areas.

13. In the news item published in Hindustan Times titled "And Quiet Flows The Maily Yamuna"[7], steps were directed to be taken to check pollution in river Yamuna.

14. In *Tirupur Dyeing Factory Owners Association Vs. Noyyal River Ayacutdars Protection Association &Ors.*[8], directions were issued to check pollution in river Noyyal in the State of Tamil Nadu. A Committee headed by a former Judge of the High Court was appointed to assess the extent of damage and to identify the victims and based on the said report direction to cover damages and to stop pollution were issued by the High Court. Upholding the said directions, it was observed that if the pollution is not checked, the industrial activity has to be closed; cost for restoration has to be covered from those responsible for the pollution.

15. Inspite of directions in several Judgments, discharge of untreated sewage and industrial effluents in rivers and water bodies is continuing at a large scale. Sewage treatment capacity is disproportionate to the sewage generated. Reports have

[6] (1997) 2 SCC 87
[7] (2009) 17 SSC 720
[8] (2009) 9 SSC 737

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found high level of Coliform in water bodies. According to some estimates, 75 to 80 % water is polluted in India. Number of polluted river stretches is on the increase. It is patent that statutory framework is inadequate or those who man the statutory authorities are not able to perform the duties assigned to them. This aspect has to be reviewed by the concerned Governments.

16. We may also refer to some of orders of this Tribunal on the subject.

17. In *Manoj Mishra Vs. Union of India*[9], the Tribunal dealt with the pollution of river Yamuna in the light of directions of the Hon'ble Supreme Court. The Tribunal noted that right to clean and healthy environment was a Fundamental Right of the inhabitants. In violation of the said Right, the debris and solid waste were being dumped on the river bed. Encroachments have taken place, resulting in damage to the environment. Storm water drains which were polluted, were meeting the river at several points without being cleaned. The failure to manage extraction of ground water and diverting the river water for irrigation and other purposes beyond reasonable norms was resulting in obstructing the flow of the river. Dumping of untreated sewerage and industrial effluents was a major source of pollution.

18. An Expert Committee was appointed which suggested setting up of STPs to tackle this problem. It was seen that on account of pollution, vegetables grown in the area, irrigated by the polluted water were a health hazard and caused diseases like cancer. The Committee appointed by the Tribunal recommended that solid waste dump should be removed from the flood plains and construction activities on the flood plains should be stopped. All Settlements on the flood plains should be relocated. Construction of new barrages and roads, railways and metro bridges, and embankments and bunds should not be permitted. In exceptional cases, if it is permitted, a critical assessment of their potential impact should be assessed. Environmental clearance should be made necessary. High level of lead was found in 23% of the children as a result of pollution adversely affecting their health. The food crops were contaminated. The ground water was contaminated. Mercury

[9] O.A. No. 6/2012, 2015 ALL(I) NGT REPORTER (1) (DELHI) 139

concentration was 200 times the standards on account of location of thermal power plant. The Faecal Coliform- bacteria were 30 times the standards. There was presence of high level of pesticides, heavy metals and other harmful matters in the vegetables/vegetation grown on the river bank.

19. Accordingly, the Tribunal issued several directions for cleaning the river and protecting the flood plains. The implementation of above directions was monitored from time to time in the last three years.

20. On 26.07.2018, the Tribunal recorded that there was a failure of the Administration in complying with the directions, even after more than three years, which made it necessary for the Tribunal to exercise power as an Executing Court under Section 25 of the National Green Tribunal Act, 2010. The Tribunal directed constitution of a two-member Monitoring Committee, comprising a former Chief Secretary of Delhi and a former Expert Member of the Tribunal so that the said Committee could prepare a time bound action plan and closely oversee the execution of the order of this Tribunal on a regular basis.

21. The Tribunal also dealt with the problem of level of pollution in river Ganga which is 2025 km. The two main sources of pollution, which were noted, are the industrial pollution and the municipal sewage. Apart from this, diversion of water and extraction of groundwater reduced the flow of the river which adversely affected its eco-system and vitality. The serious industrial pollution was caused by the leather industries at Jajmau, Kanpur and Unnao. The Tribunal considered the initiatives taken by the Central Government by way of Ganga Action Plan-I and Ganga Action Plan-II. It was also noted that the said initiatives had failed to bring about the desired results. The Tribunal disposed of the matter on 10.12.2015 with regard to Phase-I, Segment-A i.e. from Gaumukh to Haridwar. The rest of the matter was dealt with by subsequent Judgement dated 13.07.2017 in *M.C. Mehta Vs. Union of India*[10].

[10]O.A No. 200 of 2014, 2017 NGTR (3) PB 1

The directions issued by the Tribunal included regulation of dumping of municipal solid waste and other wastes, prevention and control of sewage and industrial effluents, encroachments of floodplains, regulation of diversion of water and extraction of groundwater, cleaning of the drains meeting the river Ganga, maintaining environmental flow of the river, checking constructions on floodplains, setting up of regulating or stopping industrial activity of polluting nature, checking mining activities and disposal of bio-medical and other wastes, etc.

22. The implementation of the above directions was taken up from time to time. It was found that inspite of huge expenditure already incurred and efforts of the Committees monitoring the directions of this Tribunal as well as initiatives of the Government authorities, the requisite result has not been achieved. The water did not meet the requisite standards. The Tribunal had to appoint a Committee headed by a former High Court Judge vide order dated 06.08.2018.

23. On an earlier date on 27.07.2018, the Tribunal directed that the results of tests of water samples at various locations should be displayed on the website of Central Pollution Control Board (CPCB). It was noted that water from Haridwar to Kanpur was unfit for drinking and with few exceptions, even unfit for bathing. There was dumping of Chromium at and around Jajmau and Kanpur. There was violation of provisions of the Water Act, 1974 requiring closing of industries and prosecution. The Tribunal hoped that at one point of time the red sign in the map which was displayed on the website of the CPCB will be converted to green with the improvement in water quality. Till then, the progress could not be held to be satisfactory.

24. On 13.07.2018, in *Mahendra Pandey Vs. Union of India &Ors.*[11], pollution in river Ramganga was considered. River Ramganga is a tributary of River Ganga. It was found that in surface water samples, there was presence of heavy metals like Iron (Fe), Zinc (Zn), Copper (Cu) and Mercury (Hg). The level of Mercury was found above the screening levels (i.e. Indian Drinking Water standard). The stand of the

[11] O.A. No. 58/2017

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Uttar Pradesh Pollution Control Board was that there was difficulty in locating the site for construction of secured landfill. The Tribunal noted that the hazardous waste was required to be disposed of in a scientific manner. Illegal dumping of e-waste was required to be stopped. It was noted that pollution was being caused by electronic waste processing which was generating Milled Black Powder. This resulted in contamination of water with heavy metals.

25. On 24.07.2018 in *Sobha Singh &Ors. Vs. State of Punjab &Ors.*[12], the Tribunal considered the issue of pollution of River Sutlej and River Beas. The pollution resulted in toxicity and accumulation of Chromium, Nickel, Zinc and pesticides. The polluted drains were found meeting River Sutlej. The untreated industrial waste as well as the domestic waste was being dumped without any adequate action being taken by the Pollution Control Boards. Failure to check pollution was established by various inspections. Inspite of steps taken in four years, with almost fifty adjournments and the directions of the Tribunal, the situation did not improve as expected. Accordingly, the Tribunal constituted an Independent Monitoring Committee which included a social activist to oversee the execution of directions of the Tribunal.

26. On 31.07.2018 in *Nityanand Mishra Vs. State of M.P. &Ors.*[13], pollution of Son river was considered. Illegal sand mining activity was found to be resulting in affecting the flow of the river. Construction of barrage and operation of industries were affecting the habitat and breeding of *Gharials*. The Tribunal issued directions to stop illegal pollution for protection of the river and the wildlife near the Bansagar Dam and constituted a Committee to oversee the compliance of the directions of the Tribunal.

27. As already noted, on 06.08.2018, after reviewing the progress in the matter of River Ganga and finding that the progress did not meet the expectations of the Tribunal, the Tribunal exercised its jurisdiction under Section 25 of the National Green Tribunal Act, 2010 and constituted a Monitoring Committee headed by a former

[12]O.A.No. 101/2014
[13]O.A. No. 456/2018

Judge of the High Court to execute the directions already issued in a time bound manner. It was also observed that public education and public involvement were required to be considered.

28. On 07.08.2018 in "Stench Grips Mansa's Sacred Ghaggar River (Suo-Moto Case)[14]", this Tribunal considered pollution of river Ghaggar and failure of the authorities to check the same. The report of the Joint Inspection Committee showed that the pollution in the river was beyond the prescribed standards. There was failure on the part of the Pollution Boards in checking the pollution. Inspite of several directions in the last four years by the Tribunal, the situation has not improved. The Tribunal directed that a Special Task Force (STF) must be constituted in every District and in every State. In a District, the STFs should comprise of District Magistrate, Superintendent of Police, Regional Officer of the State Pollution Control Boards in concerned District and one person to be nominated by the District Judge in every District in his capacity as Head of the District Legal Services Authority. At the State level, it was to comprise of the Chief Secretary, the Environment Secretary, the Secretary of Urban Development and Secretary of Local Bodies. The STFs were required to publish reports on the website. The Tribunal also constituted a Committee headed by a former Judge to oversee the compliance of the directions.

29. On 08.08.2018, in *Doaba Paryavaran Samiti Vs. State of U.P. &Ors.*[15], pollution in river Hindon was the subject matter of consideration. The matter was taken up on the allegation that 71 persons in Baghpat district died and more than 1000 persons were affected by diseases on account of pollution. The Tribunal noted that there was contamination of groundwater on account of pollution caused by sugar, paper, distilleries and tannery industries. An inspection team, appointed by the Tribunal, found that 124 industries were causing pollution. It was noted that no punitive action has been initiated. The pollution caused included discharge of Mercury. The Tribunal observed that sources of contaminated water are required to be closed. The victims of diseases are required to be rehabilitated. A statement that there are

[14] O.A. No. 138/2016 (T_{NHRC})
[15] O.A. No. 231/2014

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302 river stretches in the country was noted and the CPCB was directed to identify atleast 10 most critical stretches and prepare an action plan, in similar format as that of river Hindon.[16] The directions issued by the Tribunal include making functionaries of the statutory authorities accountable for their failure, making potable water available, sources of contamination being closed, action plans being prepared at District, State and National levels for restoration of water quality and reversing the damage. The Committee headed by a former Judge of High Court was also constituted to oversee the execution of the directions.

30. On 17.08.2018, in *Arvind Pundalik Mhatre Vs. Ministry of Environment, Forest and Climate Change &Ors.*[17], the matter of pollution of River Kasardi was considered and directions were issued to remedy the situation and the Tribunal appointed a Committee headed by a former Judge of the High Court to oversee the compliance of the directions.

31. On 23.08.2018 *in Meera Shukla Vs. Municipal Corporation, Gorakhpur &Ors.*[18], pollution of Ramgarh Lake, Ami River, Rapti River and Rohani River in and around District Gorakhpur on account of discharge of untreated sewage and industrial effluents was considered. It was noted that there was no proper management of solid waste disposal, leading to vector borne diseases and health problems. The pollution was caused, inter-alia, by sugar industries and other factories. The underground water was contaminated with arsenic. In the year 2012, 557 persons died with encephalitis deaths. In the last 30 years, 50,000 people had died. A financial package of Rs. 4,000 crore was given by the Central Government to fight the said diseases but there is no proper utilization of the amount. Apart from the 557 death in Gorakhpur District, more deaths had taken place in the area as stated in the news report dated 16.07.2013. The total deaths reported were 1256 in the year 2012. The Tribunal accordingly directed necessary steps to be taken to remedy

[16] Hindon action plan prepared by CPCB is explained in para 46
[17] O.A. No. 125/2018,
[18] O.A. No. 116/2014,

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the situation and also appointed a Committee headed by a former Judge of the High Court to oversee the compliance of directions of the Tribunal.

32. On 24.08.2018, in *Amresh Singh Vs. Union of India &Ors.*[19], the matter of pollution of the Chenab and Tawi Rivers was considered and directions were issued to remedy the situation which was to be overseen by a Committee headed by a former High Court Judge.

33. Similarly, in respect of river *Subarnarekha in Sudarsan Das Vs. State of West Bengal &Ors.*[20], this Tribunal considered the matter and also appointed a Committee headed by a former Judge of the High Court to oversee the compliance of the directions.

34. There are instances of many other cases involving pollution of rivers which have come up for consideration before this Tribunal. It is not necessary to refer to all the cases.

35. We are of the view that the situation is far from satisfactory and action is required to be taken on war footing. Once statutory framework in the form of Water Act and the Environment Act is in place and the standards have been laid down by the Central Pollution Control Board, the matter cannot rest at ascertaining and identification of polluted stretches. There has to be meaningful further action to restore the minimum prescribed standards for all the rivers of the country. The polluter has to pay the cost of restoring the damage.

36. Without casting any aspersions on the statutory bodies, it is an acknowledged fact that the Pollution Control Boards have not been able to take adequate steps for keeping the standards of water within the prescribed limits. They have not been able to stop dumping of wastes, discharge of municipal or industrial effluents in rivers and water bodies. One of the reasons which has been frequently highlighted is the unsatisfactory manning of the Pollution Control Boards. This aspect was

[19] Execution Application No. 32/2016 in O.A. No. 295/2016,
[20] O.A.No. 173 of 2018

considered by the Hon'ble Supreme Court in *TechiTagi Tara Vs. Rajendra Singh Bhandari &Ors.* [21] as follows:

> *"33. Unfortunately, notwithstanding all these suggestions, recommendations and guidelines the SPCBs continue to be manned by persons who do not necessarily have the necessary expertise or professional experience to address the issues for which the SPCBs were established by law. The Tata Institute of Social Sciences in a Report published quite recently in 2013 titled "Environmental Regulatory Authorities in India: An Assessment of State Pollution Control Boards" had this to say about some of the appointments to the SPCBs: "An analysis of data collected from State Pollution Control Boards, however, gives a contrasting picture. It has been observed that time and again across state governments have not been able to choose a qualified, impartial, and politically neutral person of high standing to this crucial regulatory post. The recent appointments of chairpersons of various State Pollution Control Boards like Karnataka (A a senior BJP leader), Himachal Pradesh (B a Congress party leader and former MLA), Uttar Pradesh (C appointed on the recommendation of SP leader X), Arunachal Pradesh (D a sitting NCP party MLA), Manipur Pollution Control Board (E a sitting MLA), Maharashtra Pollution Control Board (F a former bureaucrat) are in blatant violation of the apex court guidelines. The apex court has recommended that the appointees should be qualified in the field of environment or should have special knowledge of the subject. It is unfortunate that in a democratic set up, key enterprises and boards are headed by bureaucrats for over a decade. In this connection, it is very important for State Governments to understand that filling a key regulatory post with the primary intention to reward an ex-official through his or her appointment upon retirement, to a position 9 Item Nos. 07-08 July 20, 2018 dv for which he or she may not possess the essential overall qualifications, does not do justice to the people of their own states and also staffs working in the State Pollution Control Boards. The primary lacuna with this kind of appointment was that it did not evoke any trust in the people that decisions taken by an ex-official of the State or a former political leader, appointed to this regulatory post through what appeared to be a totally non-transparent unilateral decision. Many senior environmental scientists and other officers of various State Pollution Control Boards have expressed their concern for appointing bureaucrats and political leader as Chairpersons who they feel not able to create a favourable atmosphere and an effective work culture in the functioning of the board. It has also been argued by various environmental groups that if the government is unable to find a competent person, then it should advertise the post, as has been done recently by states like Odisha. However, State Governments have been defending their decision to appoint bureaucrats to the post of Chairperson as they believe that the vast experience of IAS officers in handling responsibilities would be easy. Another major challenge has been appointing people without having any knowledge in this field. For example, the appointment of G with maximum qualification of Class X as Chairperson of State Pollution Control Board of Sikkim was clear violation of Water Pollution and Prevention Act, 1974."*
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> *34. The concern really is not one of a lack of professional expertise – there is plenty of it available in the country – but the lack of dedication and willingness to take advantage of the resources available and instead benefit someone close to the powers that be. With this couldn't care-less attitude, the environment and public trust are the immediate casualties. It is unlikely that with such an attitude, any substantive effort can be made to*

[21] (2018) 11 SCC 734

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tackle the issues of environment degradation and issues of pollution. Since the NGT was faced with this situation, we can appreciate its frustration at the scant regard for the law by some State Governments, but it is still necessary in such situations to exercise restraint as cautioned in State of U.P. v. Jeet S. Bisht.

35.. Keeping the above in mind, we are of the view that it would be appropriate, while setting aside the judgment and order of the NGT, to direct the Executive in all the States to frame appropriate guidelines or recruitment rules within six months, considering the institutional requirements of the SPCBs and the law laid down by statute, by this Court and as per the reports of various committees and authorities and ensure that suitable professionals and experts are appointed to the SPCBs. Any damage to the environment could be permanent and irreversible or at least long-lasting. Unless (2007) 6 SCC 586 corrective measures are taken at the earliest, the State Governments should not be surprised if petitions are filed against the State for the issuance of a writ of quo warranto in respect of the appointment of the Chairperson and members of the SPCBs. We make it clear that it is left open to public spirited individuals to move the appropriate High Court for the issuance of a writ of quo warranto if any person who does not meet the statutory or constitutional requirements is appointed as a Chairperson or a member of any SPCB or is presently continuing as such."

37. This Tribunal also considered this matter in order dated 20.07.2018,in the case of *Satish Kumar vs. U.O.I &Ors.,*[22]and observed as follows: -

"Accordingly, we suggest that the Central Government as well as State Governments may appoint persons with judicial background to deal with the issues which may require the knowledge of legal and judicial system in the Pollution Control Boards and the local authorities. Such persons can also advise such bodies on manner of compliance of law so that such bodies can be saved from unnecessary litigation and charges of failure to comply with law.

24. Presence of a person with judicial background will help the Pollution Control Boards as well as local bodies to effectively discharge their administrative and judicial functions in an efficient manner. We are informed that in some of the Pollution Control Boards and Local Bodies, Judicial officers are already being engaged.

25. We thus call upon the Central Government and all the State Governments to take a call on this issue consistent with the observation of the Hon'ble Supreme Court in Techi Tagi Tara (Supra)"

38. In order to do so, an officer of Superior Judicial Services may have to be taken on deputation by requesting the concerned High Court on the pattern of Law Secretaries of States.

39. As already noted, well known causes of pollution of rivers are dumping of untreated sewage and industrial waste, garbage, plastic waste, e-waste, bio-medical waste, municipal solid waste, diversion of river waters, encroachments of catchment areas and floodplains, over drawl of groundwater, river bank erosion on account of illegal sand mining. Inspite of directions to install Effluent Treatment Plants (ETPs),

[22]O.A No. 56 (T_{HC}) of 2013

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Common Effluent Treatment Plants (CETPs), Sewage Treatment Plants (STPs), and adopting other anti-pollution measures, satisfactory situation has not been achieved. Tough governance is the need of the hour. If pollution does not stop, the industry has to be stopped. If sewage dumping does not stop, locals have to be made accountable and their heads are to be prosecuted. Steps have to be taken for awareness and public involvement.

40. River Water is considered to be fit for bathing when it meets the criteria of having Bio-chemical Oxygen Demand (BOD) less than 3.0 mg/L, Dissolved Oxygen more than 5.0 mg/L and Faecal Coliform bacteria to be less than 500 MPN/100 ml.

41. According to the "Restoration of Polluted River Stretches- Concept & Plan" published by CPCB in January, 2018, 30,042 million litres per day (MLD) of domestic sewage is generated from urban areas along the polluted river stretches. The installed sewage treatment capacity is about 16,846 MLD, leaving a gap of about 13,196 MLD (43.9%). There is a large gap in sewage treatment capacity and generation of sewage in urban areas.

42. As already noted, according to latest assessment by the CPCB, there are 351 polluted river stretches in India i.e. where the BOD content is more than 3mg/L. The plan of CPCB is to target enhancement of river flow. The plan for restoration of polluted river stretches is proposed to be executed through two-fold concepts. One concept is to target enhancement of river flow through interventions on the water sheds/catchment areas for conservation and recharge of rain water for subsequent releases during lean flow period in a year. This concept will work on dilution of pollutants in the rivers and streams to reduce concentration to meet desired level of water quality. Other concept is of regulation and enforcement of standards in conjunction with the available flow in rivers /streams and allocation of discharges with stipulated norms.

43. The water quality assessment of aquatic resources by CPCB, on long term basis, has provided information on the segments of rivers that are not meeting water quality

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criteria and have been identified as polluted. Assessment studies carried out on the sources of Restoration of Polluted River Stretches pollution in the rivers has highlighted the need for creation of infrastructure facilities (STPs /CETPs/ETPs) for management of wastewater in line with low flow or no flow of fresh water in the rivers and streams. In order to have a practical solution to augment non-monsoon availability of water, CPCB has suggested four phases for full scale water shed management in the upper reaches of catchment of the rivers and streams. The suggested phases for water shed management may be (a) Recognition phase (b) Restoration phase (c) Protection phase (d) Improvement phase.

(a) Recognition Phase is identification and recognition of the problem, analysis of the cause of the problem and its effect and development of alternative solutions of problem.

(b) Restoration Phase includes two main steps viz. selection of best solution to problems identified and application of the solution to the problems of the land.

(c) Protection Phase takes case of the general health of the watershed and ensures normal functioning. The protection is against all factors, which may cause determined in watershed condition.

(d) Improvement Phase deals with overall improvement in the watershed and all land is covered.

44. Attention is paid to agriculture and forest management and production, forage production and pasture management, socio-economic conditions to achieve the objectives of watershed management.

45. The river action plans are designed for control of pollution and to restore the water quality of the rivers. The infrastructure development for treatment of sewage always remains short of the waste water generation. The ever growing population and increasing water use in the urban centres has outpaced the plan for creation of infrastructure. The river action plans although have not improved the quality of the

water resources, however in absence of such plans, the quality of aquatic resources would have been further deteriorated.

46. River Hindon has been taken up as a model for preparation of action plan for restoration of water quality.[23] Salient features of the Action Plan are:

i. Execution of field surveys to assess pollution load generated by industries and sewage generated in a city or town discharging sewage and trade effluent into river Hindon and its tributaries.

ii. Collating water quality monitoring data of Hindon and its tributaries and assigning the class as per primary water quality criteria.

iii. Water quality assessment of river in context of sewage/industrial drain outfalls with dilution and distance factors.

iv. Laying time-limes for regulating industrial pollution control by ensuring consent compliance and closing the defaulting industries till they comply with the norms stipulated to them.

v. Setting up of STPs in towns located in the river-catchment and emphasis on utilization of treated sewage.

vi. Adopting water conservation practices, ground water regulation, flood plain zone management and maintaining environmental flow.

47. The polluted river stretches have been divided in five priority categories i.e., I, II, III, IV, V depending upon the level of BOD. Following are the parameters for assessing the criteria:

I. **<u>Criteria for Priority I</u>**

(a) Monitoring locations exceeding BOD concentration 30 mg/L has been considered as it is the standard of sewage treatment plant and in river it appears without dilution.(River locations having water quality exceeding discharge standards for BOD to fresh water sources)

(b) All monitoring locations exceeding BOD concentration 6 mg/L on all occasions.

(c) Monitoring locations exceeding 3 mg/L BOD are not meeting desired water quality criteria but does not affect to Dissolved

[23] http://cpcb.nic.in/NGT/CPCB-Reply-Affidavit-Report-on-Hindon-Action-Plan.pdf

Oxygen level in water bodies. If BOD exceeds 6mg/L in water body, the Dissolved Oxygen is reduced below desired levels.

(d) The raw water having BOD levels upto 5 mg/L are does not form complex chemicals on chlorination for municipal water supplies. Hence the water bodies having BOD more than 6 mg/L are considered as polluted and identified for remedial action.

II. Criteria for Priority II

(a) Monitoring locations having BOD between 20-30 mg/L.

(b) All monitoring locations exceeding BOD concentration 6 mg/L on all occasions.

III. Criteria for Priority III

(a) Monitoring locations having BOD between 10-20 mg/L.

(b) All monitoring locations exceeding BOD concentration 6 mg/L on all occasions.

IV. Criteria for Priority IV

(a) Monitoring locations having BOD between 6-10 mg/L.

V. Criteria for Priority V

(a) Monitoring locations having BOD between 3-6 mg/l.

(b) The locations exceeding desired water quality of 3mg/l BOD.

Polluted River Stretches- State wise-Priority wise

STATE	I	II	III	IV	V	Grand Total
ANDHRA PRADESH				2	3	5
ASSAM	3	1	4	3	33	44
BIHAR			1		5	6
CHHATTISGARH				4	1	5
DAMAN, DIU AND DADRA NAGAR HAVELI	1					1
DELHI	1					1
GOA			1	2	8	11
GUJARAT	5	1	2	6	6	20
HARYANA	2					2
HIMACHAL PRADESH	1	1	1		4	7
JAMMU & KASHMIR		1	2	2	4	9
JHARKHAND				3	4	7
KARNATAKA			4	7	6	17
KERALA	1			5	15	21
MADHYA PRADESH	3	1	1	3	14	22
MAHARASHTRA	9	6	14	10	14	53
MANIPUR		1			8	9
MEGHALAYA	2			3	2	7
MIZORAM			1	3	5	9
NAGALAND	1		1	2	2	6
ODISHA	1		3	2	13	19
PUDUCHERRY				1	1	2

PUNJAB	2			1	1	4
RAJASTHAN			1		1	2
SIKKIM					4	4
TAMIL NADU	4			1	1	6
TELANGANA	1	2	2	2	1	8
TRIPURA					6	6
UTTAR PRADESH	4		1	2	5	12
UTTARAKHAND	3	1	1	4		9
WEST BENGAL	1	1	3	4	8	17
Grand Total	**45**	**16**	**43**	**72**	**175**	**351**

Polluted River Stretches- Priority I & Priority II				
STATE	**RIVER NAME**	**RIVER STRETCH**	**BOD RANGE/ MAX VALUE (mg/L)**	**PRIORITY**
ASSAM	BHARALU	GUWAHATI TO CHILARAI NAGAR	52.0	I
	BORSOLA	ALONG SARABBHATTI, GUWAHATI	34.0	I
	SILSAKO	ALONG CHACHAL, GUWAHATI	34.0	I
	SORUSOLA	ALONG PALTAN BAZAR, GUWAHATI	30.0	II
DAMAN, DIU AND DADRA NAGAR HAVELI	DAMANGANGA	SILVASSA TO DAMAN JETTY, MOTI DAMAN	10 - 80	I
DELHI	YAMUNA	WAZIRABAD TO ASGARPUR	9 - 80	I
GUJARAT	AMLAKHADI	PUNGUM TO BHARUCH	40 - 45	I
	BHADAR	JETPUR VILLAGE TO SARAN VILLAGE	426.0	I
	BHOGAVO	SURENDRANAGAR TO NANA KERALA	67.0	I
	KHARI	LALI VILLAGE TO KASHIPURA	235.0	I
	SABARMATI	KHEROJ TO VAUTHA	4 - 147	I
	VISHWAMITRI	VADODARA TO ASOD	6 - 21	II
HARYANA	GHAGGAR	RORKI TO SIRSA	6 - 482	I
	YAMUNA	PANIPAT TO SONEPAT	4 - 55	I
HIMACHAL PRADESH	SUKHANA	SUKHNA TO PARWANOO	54.0	I
	MARKANDA	KALA AMB TO NARAYANPUR	3.2 - 24	II
JAMMU & KASHMIR	DEVIKA	GURU RAVIDAS TEMPLE TO NAINSU	3.4-22	II
KERALA	KARAMANA	MALEKKDU TO THIRUVALLAM	56.0	I
MADHYA PRADESH	CHAMBAL	NAGDA TO RAMPURA	12 - 80	I
	KHAN	KABIT KHEDI TO KHAJRANA	30.8 - 80	I
	KSHIPRA	SIDDHAWAT TO TRIVENISANGAM	4 - 38	I
	BETWA	MANDIDEEP TO VIDISHA	3.3 - 20.2	II
MAHARASHTRA	GODAVARI	SOMESHWAR TEMPLE TO RAHED	5.0-88	I
	KALU	ALONG ATALE VILLAGE	75.0	I
	KUNDALIKA	SALAV TO ROHA	3.8-65	I
	MITHI	POWAI TO	250.0	I

		DHARAVI	-	
	MORNA	AKOLA TO TAKALIJALAM	52.8	I
	MULA	BOPODI TO AUNDH GAON	33-35	I
	MUTHA	SHIVAJI NAGAR TO KHADAKWASLA DAM	5.0-42.5	I
	NIRA	SANGAVI TO SHINDEWADI	12.5-35	I
	VEL	NHAVARE TO SHIKARPUR	30.2	I
	BHIMA	VITHALWADI TO TAKLI	8.0-22.0	II
	INDRAYANI	MOSHIGAON TO ALANDIGAON	12.5-22	II
	MULA-MUTHA	THEUR TO MUNDHWA BRIDGE	14-22	II
	PAWANA	DAPODI TO RAVET	15.5-24	II
	WAINGANGA	TUMSA TO ASHTI	10.4-22.4	II
	WARDHA	GHUGHUS TO RAJURA	7.0-22.0	II
MANIPUR	NAMBUL	SINGDA DAM TO BISHNUPUR	3.6-23.7	II
MEGHALAYA	UMKHRAH	MAWLAI TO SHILLONG	30-90.2	I
	UMSHYRPI	UMSHYRPI BRIDGE TO DHANKETI	38.5-95.0	I
NAGALAND	DHANSIRI	CHECK GATE TO DIPHU BDG	7.0-50.0	I
ODISHA	GANGUA	D/S BHUWANESHWAR	14-39	I
PUNJAB	GHAGGAR	SARDULGARH TO MUBARAKPUR	9.0-380	I
	SATLUJ	RUPNAGAR TO HARIKA BRIDGE	3.8-108	I
TAMIL NADU	CAUVERY	METTUR TO MAYILADUTHURAI	3.3-32	I
	SARABANGA	THATHAYAMPATTI TO T.KONAGAPADI	78.0	I
	THIRUMANIMUTHAR	SALEM TO PAPPARAPATTI	190.0	I
	VASISTA	MANIVILUNDHAN TO THIYAGANUR	675.0	I
TELANGANA	MUSI	HYDRABAD TO NALGONDA	4.0-60.0	I
	MANJEERA	GOWDICHARLA TO NAKKAVAGU	5.0-26	II
	NAKKAVAGU	GANDILACHAPET TO SEVALAL THANDA	26.0	II
UTTAR PRADESH	HINDON	SAHARANPUR TO GHAZIABAD	48-120	I
	KALINADI	MUZAFFAR NAGARTO GULAOTHI TOWN	8 - 78	I
	VARUNA	RAMESHWAR TO CONF WITH GANGA, VARANASI	4.5-45.2	I
	YAMUNA	ASGARPUR TO ETAWAH SHAHPUR TO ALLAHABAD (BALUA GHAT)	12.0-55	I
UTTARAKHAND	BHELA	KASHIPUR TO RAJPURA ATNDA	6.0-76.0	I
	DHELA	KASHIPUR TO GARHUWALA, THAKURDWARA	12 - 80	I
	SUSWA	MOTHROWALA TO RAIWALA	37.0	I
	KICHHA	ALONG KICHHA	28.0	II
WEST BENGAL	VINDHADHARI	HAROA BRIDGE TO MALANCHA BURNING GHAT	26.7-45.0	I
	MAHANANDA	SILIGURI TO BINAGURI	6.5-25	II

Polluted River Stretches- Priority III, IV & V				
STATE	RIVER NAME	RIVER STRETCH	BOD RANGE/ MAX VALUE (mg/L)	PRIORITY
ANDHRA PRADESH	KUNDU	NANDYAL TO MADDURU	7.7	IV
	TUNGABHADRA	MANTHRALAYAM TO BAVAPURAM	3.2 - 6.7	IV
	GODAVARI	RAYANPETA TO RAJAHMUNDRI	3.1 - 3.4	V
	KRISHNA	AMRAVATHI TO HAMSALA DEEVI	3.2	V
	NAGAVALI	ALONG THOTAPALLI	3.2	V
ASSAM	DEEPAR BILL	DEEPAR BILL TO GUWAHATI	10.6	III
	DIGBOI	LAKHIPATHE, RESERVE FOREST	14.0	III
	KAMALPUR	ALONG KAMALPUR	18.6	III
	PANCHNAI	ORANG TO BORSALA	11.4	III
	BRAHAMPUTRA	KHERGHAT TO DHUBRI	3.2 - 6.4	IV
	KHARSANG	ASSAM-ARUNANCHAL BORDER TO LONGTOM-1	7.2	IV
	PAGLDIA	NALBARI TO KHUDRA SANKARA	8.2	IV
	BARAK	PANCHGRAM TO SILCHAR	3.5 - 4.2	V
	BAROI	DOWNSTREAM OF BRIDGE AT NH-52	3.6	V
	BEGA	ALONG MANGALDOI	4.5	V
	BEKI	BARPETA ROAD TO JYOTI GAON	3.5	V
	BHOGDOI	JORHAT TO DULIAGAON	4.5	V
	BOGINADI	LAKHIMPUR TO DIBRUGARH	4.2	V
	BORBEEL	ALONG RAMNAGAR, DIGBOI	3.8	V
	BORDOIBAM BEELMUKH	ALONG BEELMUKH BIRD SANCTUARY, DHEMAJI	5.2	V
	BURHIDIHING	MARGHERITA TO TINSUKIA	4 - 4.6	V
	DHANSIRI	GOLAGHAT TO KATHKETIA	4.3 - 5.6	V
	DIKHOW	NAGINI MORA TO DIKHOMUKH	3.2	V
	DIKRONG	ALONG BANDARDEWA	3.2	V
	DIPLAI	ALONG SILGARA, KOKRAJHAR	3.2	V
	DISANG	DILLIGHAT TO GUNDAMGHAT	4.2	V
	GABHARU	ALONG TUMIUKI, SONITPUR	5.4	V
	HOLUDUNGA	ALONG SOMARAJAN, DHEMA JI	4.8	V
	Jai Bharali	ALONG SONITPUR	3.1	V
	JHANJI	JORHAT TO CHAWDANG	3.8	V
	KALONG	NAGAON TO MORI KALONG	3.7 - 4.3	V
	KAPILI	NAGAON TO KAMPUR TOWN	5.5	V
	KILLING	ALONG MOREGAON	5.8	V
	KOHORA	KOHORA TO MOHPARA	4.4	V
	KULSI	ALONG CHAYGAON	3.6	V
	MALINI	ALONG RAMNAGAR, SILCHAR	5.3	V
	MORA BHARALI	ALONG TEZPUR	5.2	V

	PARASHALI	ALONG DEMORIA	4.0	V
	PUTHIMARI	ALONG PUTHIMARI	4.8	V
	RANGA	ALONG GERAMUKH	3.8	V
	SAMAGURI	ALONG SAMAGURI, NAGAON	4.0	V
	SANKOSH	ALONG GOLAKGANJ	3.3	V
	SON	ALONG DEODHAR, KARIMGANJ	4.3	V
	SONAI	SONAI TO DAKSHIN MOHANPUR	4.4	V
	TENGA PUKHURI	ALONG KUKURACHOWA GAON	4.0	V
BIHAR	SIRSIA	RUXOL TO KOIREA TOLA (RAXAUL)	20.0	III
	FARMAR	ALONG JOGBANI	3.6	V
	GANGA	BUXAR TO BHAGALPUR	3.2 - 4.2	V
	POONPUN	GAURICHAK TO FATUHA	3.3	V
	RAM REKHA	HARINAGAR TO RAMNAGAR	5.0	V
	SIKRAHNA	ALONG NARKATIAGANJ	4.5	V
CHHATTISGARH	HASDEO	KORBA TO URGA	3.6 - 7	IV
	KHAROON	BUNDRI TO RAIPUR	3.3 - 7.2	IV
	MAHANADI	ARRANG TO SIHAWA	3.3 - 8	IV
	SEONATH	SHIMGA TO BEMTA	3.4 - 8.4	IV
	KELO	RAIGARH TO KANAKTORA	3.8	V
GOA	SAL	KHAREBAND TO MOBOR	4.2 - 16.8	III
	MANDOVI	MARCELA TO VOLVOI	3.3 - 6.2	IV
	TALPONA	ALONG CANACONA	6.8	IV
	ASSONORA	ASSONORA TO SIRSAIM	3.3	V
	BICHOLIM	BICHOLIM TO CURCHIREM	4.8	V
	CHAPORA	PERNEM TO MORJIM	3.5 - 5.2	V
	KHANDEPAR	PONDA TO OPA	3.4	V
	SINQUERIM	ALONG CANDOLIM	3.6	V
	TIRACOL	ALONG TIRACOL	3.9	V
	VALVANT	SANKLI – BICHOLIM TO PORIEM	4.3	V
	ZUARI	CURCHOREM TO MADKAI	3.2 - 5.1	V
GUJARAT	DHADAR	KHOTDA TO CHANDPURA	16.0	III
	TRIVENI	TRIVENI SANGAM TO BADALPARA	11.0	III
	AMRAVATI (TRIBUTARY OF NARMADA)	ALONG DADHAL, ANKALESHWAR	10.0	IV
	DAMANGANGA	KACHIGAON TO VAPI	8.0	IV
	KOLAK	KIKARLA TO SALVAV	8.0	IV
	MAHI	SEVALIA TO BAHADARPUR	4.5 - 7	IV
	SHEDHI	DHAMOD TO KHEDA	9.0	IV
	TAPI	KHADOD (BARDOLI) TO SURAT	8.0	IV
	ANAS	DAHOD TO FATEHPURA	5.0	V
	BALEHWAR KHADI	PANDESARA TO KAPLETHA	4.0	V
	KIM	SAHOL BRIDGE TO HANSOL	3.1	V
	MESHWA	ALONG SHAMLAJI	4.0	V
	MINDHOLA	ALONG SACHIN	6.0	V
	NARMADA	GARUDESHWAR TO BHARUCH	5.0	V
HIMACHAL PRADESH	SIRSA	NALAGARH TO SOLAN	8 - 16	III
	ASHWANI	ALONG YASHWANT NAGAR	3.2	V
	BEAS	KULLU TO DEHRAGOPIPUR	6.0	V

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	GIRI	ALONG SAINJ	4.4 - 6	V
	PABBAR	ALONG ROHRU	3.6 - 4	V
JAMMU & KASHMIR	BANGANGA	PONY SHED TO BATHING GHAT	6 –14	III
	CHUNT KOL	MAULANA AZAD BRIDGE TO KANIKADAL	14.5	III
	GAWKADAL	GAWKADAL BRIDGE TO NOHATA	9.0	IV
	TAWI	SURAJNAGAR TO BELICHARANA	5 - 8.3	IV
	BASANTER	SAMBA TO CHAKMANGARAKWAL	5 - 6	V
	CHENAB	JAL PATAN TO PARGAWAL	5.0	V
	JHELAM	CHATTABAL WEIR TO ANANTNAG	3.2 - 5.5	V
	SINDH	ALONG DUDERHAMA	3.7	V
JHARKHAND	GARGA	ALONG TALMUCHU	6.2	IV
	SANKH	KONGSERABASAR TO BOLBA	8.4	IV
	SUBARNAREKHA	HATIA DAM TO JAMSHEDPUR	3.4 - 10	IV
	DAMODAR	PHUSRO ROAD BDG TO TURIO	3.9	V
	JUMAR	KANKE DAM TO KADAL	3.3	V
	KONAR	ALONG TILAYA AND KONAR	3.4 - 3.6	V
	NALKARI	ALONG PATRATU	3.8	V
KARNATAKA	ARKAVATHI	HALLI RESERVOIR TO KANAKAPURA TOWN	14.0	III
	LAKSHMANTIRTHA	KATTEMALAVADI TO HUNSUR	7.1 - 12.4	III
	MALPRBHA	KHANAPUR TO DHARWAD	7.3 - 17.3	III
	TUNGABHADRA	HARIHAR TO KORLAHALLI	4 - 19	III
	BHADRA	HOLEHUNNUR TO BHADRAVATHI	5.5 - 7.8	IV
	CAUVERY	RANGANATHITTU TO SATHYAMANGALAM BRIDGE	3.1 - 6.7	IV
	KABINI	NANJANAGUD TO HEJJIGE	3.6 - 6.5	IV
	KAGINA	SHAHABAD TO HONGUNTA	4.6 - 7.4	IV
	KALI	HASAN MAAD (WEST COAST PAPER MILL) TO BOMMANAHALLI RESERVOIR	6.5	IV
	KRISHNA	YADURWADI TO TINTINI BRIDGE	3.1 - 6.2	IV
	SHIMSHA	YEDIYAR TO HALAGUR	4 - 10	IV
	ASANGI NALLA	ALONG ASANGI	4.4	V
	BHIMA	GHANAPUR TO YADGIR	3.3 - 6	V
	KUMARDHARA	ALONG UPPINANGADI	4.0	V
	NETRAVATHI	UPPINANGADI TO MANGALURU	4.0	V
	TUNGA	SHIVAMOGA TO KUDLI	4.3	V
	YAGACHI	ALONG YAGACHI, HASSAN	4.0	V
KERALA	BHARATHAPUZHA	ALONG PATAMBI	6.6	IV
	KADAMBAYAR	MANCKAKADAVU TO BRAHMAPURAM	5.9 - 6.4	IV
	KEECHERI	PULIYANNOR TO KECHERY	6.4	IV
	MANIMALA	KALLOOPARA TO THONDRA	6.3 - 6.4	IV
	PAMBA	MANNAR TO THAKAZHY	3.3 - 7.8	IV
	BHAVANI	ALONG ELACHIVAZHY	5.4	V
	CHITRAPUZHA	IRUMPANAM TO KARINGACHIRA	4.6	V

	KADALUNDY	ALONG HAJIRAPPALLY/ HAJIYARPALLI	3.6	V
	KALLAI	THEKEPURAM TO ARAKKINAR	4.5	V
	KARUVANNUR	ALONG KARUVANNUR	3.5	V
	KAVVAI	ALONG KAVVAI	3.9	V
	KUPPAM	THALIPARAMBA TO VELICHANGOOL	3.1 - 3.8	V
	KUTTIYADY	ALONG KUTTIYADY	5.0	V
	MOGRAL	ALONG MOGRAL	3.1	V
	PERIYAR	ALWAYE-ELOOR TO KALAMASSERY	3.2 - 5.1	V
	PERUVAMBA	ALONG PERUVAMBA	3.9	V
	PUZHACKAL	OLARIKKARA TO PUZHACKAL	3.8	V
	RAMAPURAM	ALONG RAMAPURAM	3.3	V
	THIRUR	NADUVILANGADI TO THALAKKADATHUR	3.6	V
	UPPALA	POYYA TO MULINJA	3.2	V
MADHYA PRADESH	SONE	ALONG AMLAI	12.4	III
	GOHAD	GOHAD DAM TO GORMI	6.3	IV
	KOLAR	SURAJNAGAR TO SHIRDIPURAM	7.5	IV
	TAPI	NEPANAGAR TO BURHANPUR	4.6 - 8	IV
	BICHIA	SILPARI TO GADHAWA	3.5	V
	CHAMLA	ALONG BADNAGAR, UJJAIN	4.0	V
	CHOUPAN	ALONG VIJAIPUR	3.4	V
	KALISOT	MANDIDEEP TO SAMARDHA VILLAGE	4.1	V
	KANHAN	KANHAN IN CHINDWARA DISTRICT BOUNDRY	3.2	V
	KATNI	ALONG KATNI	3.5	V
	KUNDA	KHARGONE TO KHEDI KHURD	4.0	V
	MALEI	JAORA TO BARAUDA	3.5	V
	MANDAKINI (MP)	ALONG CHITRAKUT	5.8	V
	NEWAJ	ALONG SHUJALPUR	4.0	V
	PARVATI	BATAWADA TO PILUKHEDI	3.2	V
	SIMRAR	ALONG KATNI	3.9	V
	TONS	CHAKGHAT TO CHAPPAR	3.5	V
	WAINGANGA	CHINDWARA TO BALAGHAT	3.2	V
MAHARASHTRA	GHOD	ANNAPUR TO SHISHUR	10.2	III
	KANHAN	BHANDARA TO NAGPUR	9.8-16.4	III
	KOLAR (MAH)	ALONG KORADI	18.0	III
	KRISHNA	SHINDI TO KURUNDWAD	3.4-14.0	III
	MOR	JALGAON TO AMODA	16.0	III
	PATALGANGA	KHADEPADA TO KOPOLI	5.0-18	III
	PEDHI	NARAYANPUR TO BHATKULI	20.0	III
	PENGANGA	MEHKAR TO UMARKHED	8.6-20	III
	PURNA	DHUPESHWAR TO ASEGAON	10.2-18.4	III
	TAPI	RAVER TO SHAHADA	8.0-12.0	III
	URMODI	DHANGARWADI TO NAGTHANE	12.4	III
	VENNA	MAHABALESHWAR TO MAHULI	7.2-12.5	III
	WAGHUR	SUNASGAON TO SAKEGAON	18.0	III
	WENA	KAWADGHAT TO HINDONGHAT	10.2-13.8	III

	BINDUSAR	SWARAJ NAGAR TO SNEHNAGAR	8.0	IV
	BORI	ALONG AMALNER	9.2	IV
	CHANDRABHAGA	PANDHARPUR TO SHEGAON DHUMALA	7.5-9.5	IV
	DARNA	IGATPURI TO SANSARI	5.0-9.0	IV
	GIRNA	MALEGAON TO JALGAON	6.6-9.0	IV
	HIWARA	PACHORA TO NIMBORA	8.6	IV
	KOYNA	KARAD TO PAPDARDE	8.6	IV
	PEHLAR	PELHAR DAM TO GOLANI NAKA	7.0	IV
	SINA	SOLAPUR TO BANKALAGI	8.5	IV
	TITUR	ALONG CHALISGAON, JALGAON	7.8	IV
	AMBA	BENSE TO ROHA	4.8	V
	BHATSA	SHAHAPUR TO BHADANE	4.8-6.0	V
	GOMAI	LONKHEDA TO SHAHDA	6.0	V
	KAN	KAVATHE TO SAKARI	5.0	V
	MANJEERA	LATUR TO NANDED BRIDGE	5.0	V
	PANCHGANGA	SHIROL TO KOLHAPUR	3.2-5.8	V
	PANZARA	VARKHEDE TO DHULE	6.0	V
	RANGAVALI	TINTEMBA TO NAVAPUR	5.0	V
	SAVITRI	DADLI TO MUTHAVALI	3.2-5.0	V
	SURYA	DHAMNI DAM TO PALGHAR	4.4-5.0	V
	TANSA	ALONG THANE	6.0	V
	ULHAS	KALYAN TO BADLAPUR	4.0-5.0	V
	VAITARNA	GANDHRE TO SARASHI	4.0	V
	VASHISTI	KHERDI TO DALVATNE	3.2-3.4	V
MANIPUR	IMPHAL	KANGLA MOAT TO SAMUROU	3.4-6.4	V
	IRIL	KANGLA SIPHAI TO UKHRUL	3.2	V
	KHUGA	KHUGA LAKE TO CHURACHANDPUR	3.1-3.6	V
	KHUJAIROK	MOREH TO MAOJANG	4.3	V
	LOKCHAO	BISHNUPUR TO LOKTAK LAKE	4.5	V
	MANIPUR	SEKMAIJAN TO THOUBAL	3.6-4.3	V
	THOUBAL	SHONG KONG TO PHADOM	3.5	V
	WANGJING	WANGJING TO HEIROK	4.1-4.3	V
MEGHALAYA	KYRHUKHLA	SUTNGA TO KHLIERIAT	10.0	IV
	NONBAH	NANGSTOIN TO WAHRIAT	6.0-7.5	IV
	UMTREW	BYRNIHAT TO MORANG DALA	6.2-8.0	IV
	LUKHA	MYNDIHATI TO SHYMPLONG	6.0	V
	MYNTDU	JOWAI TO PAMHADEM	5.2	V
MIZORAM	TIAU	ALONG CHAMPHAI	11.3	III
	TLAWNG	ALONG ZOBAWK, SAIRANG TO BAIRABI	3.1-6.7	IV
	TUIPUI	ALONG CHAMPHAI	8.2	IV
	TUIVAWL	ALONG KEIFANG	6.8	IV
	CHITE	ALONG ARMED VENG	3.7	V
	MAT	ALONG SERCHHIP	5.5	V
	SAIKAH	ALONG LAWNGTLAI	4.4	V
	TUIKUAL	ALONG SERCHHIP	6.0	V

	TUIRIAL	ALONG TUIRIAL, AIZWAL	3.4-4.6	V
NAGALAND	DZUNA	ALONG KOHIMA	6.0-13.0	III
	CHATHE	MEDZIPHEMA TO, DIMAPUR	7.0	IV
	DZU	KOHIMA TO DZUKO VALLEY	7.0	IV
	DZUCHA	ALONG KOHIMA	4.0	V
	SANO	ALONG KOHIMA	4.0	V
ODISHA	GURADIH NALLAH	ALONG ROURKELA	11.3	III
	KATHAJODI	CUTTACK TO URALI	5.8-11.2	III
	NANDIRAJHOR	D/S TALCHER	2.7 - 13	III
	DAYA	BHUBANESWAR TO BARAGARH	4.0-7.3	IV
	KUAKHAI	URALI TO BHUBANESWAR	6.7-7.7	IV
	BANGURU NALLAH	ALONG TALCHER RENGALI	3.2	V
	BHEDEN	ALONG BHEDEN	3.6	V
	BRAHAMANI	ROURKELA TO BIRITOL	5.8-6.0	V
	BUDHABALNAGA	MAHULIA TO BARIPADA	3.5	V
	KUSUMI	ALONG ANGUL TALCHER	3.2	V
	MAHANADI	SAMBALPUR TO PARADEEP	3.6	V
	MANGALA	ALONG PURI	5.7	V
	NAGAVALLI	JAYKAYPUR TO RAYAGADA	3.5	V
	NUNA	ALONG BIJIPUR, PURI	3.1	V
	RATNACHIRA	ALONG BHUBHNESHWAR, PURI	3.3	V
	RUSHIKULYA	PRATAPPUR TO GANJAM	3.4	V
	SABULIA	ALONG JAGANNATHPATNA, RAMBHA	5.0	V
	SERUA	KHANDAETA TO SANKHATRASA	4.8	V
PUDUCHERRY	ARASALAR	ALONG KARAIKAL	7.0	IV
	CHUNNAMBAR	ALONG ARIYANKUPPAM	6.0	V
PUNJAB	KALI BEIN	SULTANPUR LODHI TO CONF TO BEAS	9.0	IV
	BEAS	ALONG MUKERIAN	3.8	V
RAJASTHAN	BANAS	ALONG BISALPUR DAM, SWAROOPGANJ, NEWTA DAM	13.2	III
	CHAMBAL	SAWAIMADHOPUR TO KOTA	3.2-4.8	V
SIKKIM	MANEY KHOLA	ADAMPOOL TO BURTUKK	3.2-4.5	V
	RANGIT	DAM SITE (NHPC) TO TREVENI	3.2-3.8	V
	RANICHU	NAMLI TO SINGTAM	3.8-4.0	V
	TEESTA	MELLI TO CHUNGTHANG	4.0-4.3	V
TAMIL NADU	BHAVANI	SIRUMUGAI TO KALINGARAYAN	3.3-6.6	IV
	TAMBIRAPANI	PAPPANKULAM TOARUMUGANERI	3.1-4.0	V
TELANGANA	KARAKAVAGU	ALONG PALWANCHA	18.0	III
	MANER	WARANGAL TO SOMNAPALLI	6-20.0	III
	GODAVARI	BASAR TO KHAMMAM	4.0-9.0	IV
	KINNERSANI	ALONG PALWANCHA	10.0	IV
	KRISHNA	THANGADIGI TO WADAPALLY	5.0-6.0	V
TRIPURA	BURIGAON	ALONG BISHALGARH	3.9	V
	GUMTI	TELKAJILA TO AMARPUR	3.9	V
	HAORA	AGARTALA TO BISHRAMGANJ	3.2-4.0	V
	JURI	ALONG	4.9	V

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		DHARMANAGAR		
	KHOWAI	ALONG TELIAMURA	3.3	V
	MANU	ALONG KAILASHAHAR	3.5-3.6	V
UTTAR PRADESH	GOMTI	SITAPUR TO VARANASI	3.1-18.0	III
	GANGA	KANNAUJ TO VARANASI	3.5-8.8	IV
	RAMGANGA	MURADABAD TO KANNAUJ	6.6	IV
	BETWA	HAMIRPUR TO WAGPURA	3.5-4.2	V
	GHAGHARA	BARHALGANJ TO DEORIA	4.0-4.5	V
	RAPTI	DOMINGARH TO RAJGHAT	4.7-5.9	V
	SAI	UNNAO TO JAUNPUR	4.0-4.5	V
	SARYU	AYODHYA TO ELAFATGANJ	4.3	V
UTTARAKHAND	KALYANI	D/S PANT NAGAR	16.0	III
	GANGA	HARIDWAR TO SULTANPUR	6.6	IV
	KOSI	SULTANPUR TO PATTIKALAN	6.4	IV
	NANDOUR	ALONG SITARGANJ	5.6-8.0	IV
	PILKHAR	IN THE VICINITY OF RUDRAPUR	10.0	IV
WEST BENGAL	CHURNI	SANTIPUR TOWN TO MAJHADIA	10.3-11.3	III
	DWARKA	TARAPITH TO SADHAK BAMDEB GHAT	5.6-17.0	III
	GANGA	TRIBENI TO DIAMOND HARBOUR	5.0-12.2	III
	DAMODAR	DURGACHAKM TO DISHERGARH	4.4-8.2	IV
	JALANGI	LAAL DIGHI TO KRISHNA NAGAR	8.3	IV
	KANSI	MIDNAPORE TO RAMNAGAR	9.9	IV
	MATHABHANGA	MADHUPUR TO GOBINDAPUR	8.5	IV
	BARAKAR	KULTI TO ASANSOL	5.7	V
	DWARAKESHWAR	ALONG BANKURA	1-5.6	V
	KALJANI	BITALA TO ALIPURDWAR	6.0	V
	KAROLA	JALPAIGURI TO THAKURER KAMAT	3.9	V
	MAYURKASHI	SURI TO DURGAPUR	5.2	V
	RUPNARAYAN	KOLAGHAT TO BENAPUR	3.1-5.8	V
	SILABATI	GHATAL TO NISCHINDIPUR	3.8	V
	TEESTA	SILIGURI TO PAHARPUR	3.3	V

48. In view of above, it is absolutely necessary that Action Plans are prepared to restore the polluted river stretches to the prescribed standards. The Action Plans may cover the following:

A) Source control

Source control includes industrial pollution control and treatment and disposal of domestic sewage as detailed below:-

(a) Industrial pollution control

(i) Inventorisation of industries

(ii) Categories of industry and effluent quality

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(iii) Treatment of effluents, compliance with standards and mode of disposal of effluents

(iv) Regulatory regime.

(b) Channelization, treatment, utilization and disposal of treated domestic sewage.

(i) Identification of towns in the catchment of river and estimation of quantity of sewage generated and existing sewage treatment capacities to arrive at the gap between the sewage generation and treatment capacities;

(ii) Storm water drains now carrying sewage and sullage joining river and interception and diversion of sewage to STPs,

(iii) Treatment and disposal of septage and controlling open defecation,
(iv) Identification of towns for installing sewerage system and sewage treatment plants.

(B) River catchment/Basin Management-Controlled ground water extraction and periodic quality assessment

(i) Periodic assessment of groundwater resources and regulation of ground water extraction by industries particularly in over exploited and critical zones/blocks.

(ii) Ground water re-charging /rain water harvesting

(iii) Periodic ground water quality assessment and remedial actions in case of contaminated groundwater tube wells/bore wells or hand pumps.

(iv) Assessment of the need for regulating use of ground water for irrigation purposes.

(C) Flood Plain Zone.

(i) Regulating activities in flood plain zone.
(ii) Management of Municipal, Plastic, Hazardous, Bio-medical and Electrical and Electronic wastes.
(iii) Greenery development- Plantation plan.

(D) Ecological/Environmental Flow (E-Flow)

(a) Issues relating to E-Flow
(b) Irrigation practices

(E) Such other issues which may be found relevant for restoring water quality to the prescribed standards.

49. Model Action Plan for Hindon River, already prepared by the CPCB, may also be taken into account.

50. In view of above, we consider it necessary to issue the following directions:

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i) All States and Union Territories are directed to prepare action plans within two months for bringing all the polluted river stretches to be fit at least for bathing purposes (i.e BOD < 3 mg/L and FC < 500 MPN/100 ml) within six months from the date of finalisation of the action plans.

ii) The action plans may be prepared by four-member Committee comprising, Director, Environment., Director, Urban Development., Director, Industries., Member Secretary, State Pollution Control Board of concerned State. This Committee will also be the Monitoring Committee for execution of the action plan. The Committee may be called "River Rejuvenation Committee" (RRC). The RRC will function under the overall supervision and coordination of Principal Secretary, Environment of the concerned State/Union Territory.

iii) The action plan will include components like identification of polluting sources including functioning/ status of STPs/ETPs/CETP and solid waste management and processing facilities, quantification and characterisation of solid waste, trade and sewage generated in the catchment area of polluted river stretch. The action plan will address issues relating to; ground water extraction, adopting good irrigation practices, protection and management of Flood Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environmental flow of river and plantation on both sides of the river. Setting up of biodiversity parks on flood plains by removing encroachment shall also be considered as an important component for river rejuvenation. The action plan should focus on proper interception and diversion of sewage carrying drains to the Sewage Treatment Plant (STP) and emphasis should be on utilization of treated sewage so as to minimize extraction of ground or surface water. The action plan should have speedy, definite or specific timelines for execution of steps. Provision may be made to pool the resources, utilizing funds from State budgets, local bodies, State Pollution Control Board/ Committee and out of Central Schemes.

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iv) The Action Plans may be subjected to a random scrutiny by a task team of the CPCB.

v) The Chief Secretaries of the State and Administrators/ Advisors to Administrators of the Union Territories will be personally accountable for failure to formulate action plan, as directed.

vi) All States and Union Territories are required to send a copy of Action Plan to CPCB especially w.r.t Priority I & Priority II stretches for approval.

vii) The States and the Union Territories concern are directed to set up Special Environment Surveillance Task Force, comprising nominees of District Magistrate, Superintendent of Police, Regional Officer of State Pollution Control Board and one person to be nominated by District Judge in his capacity as Chairman of Legal Services Authority on the pattern of direction of this Tribunal dated 07.08.2018, in *Original Application No. 138/2016 (T_{NHRC}), "Stench Grips Mansa's Sacred Ghaggar River (Suo-Motu Case).*

viii) The Task Force will also ensure that no illegal mining takes place in river beds of such polluted stretches.

ix) The RRC will have a website inviting public participation from educational institutions, religious institutions and commercial establishments. Achievement and failure may also be published on such website. The Committee may consider suitably rewarding those contributing significantly to the success of the project.

x) The RRCs will have the authority to recover the cost of rejuvenation in Polluter Pays Principle from those who may be responsible for the pollution, to the extent found necessary. In this regard, principle laid down by this Tribunal in order dated 13.07.2017 in *O.A No. 200 of 2014, M.C Mehta Vs. U.O.I* will apply. Voluntary donations, CSR contribution, voluntary services and private participation may be considered in consultation with the RRC.

51. We understand that the State Pollution Control Boards or other authorities are having funds deposited under the order of the Tribunal besides funds available

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under Consent Mechanism. The said funds may be utilized for the purpose of expenditure for the Committees, including preparation and execution of action plans in accordance with the provisions contained in the Water Act, 1974.

52. A copy of this be sent by e-mail to all the concerned i.e. the Ministry of Water Resources, Ministry of Environment, Forest & Climate Change, Ministry of Housing and Urban Affairs, the Niti Ayog, National Mission for Clean Ganga, Central Pollution Control Board, Chief Secretaries of all the States and Union Territories for compliance.

53. The RRCs will send progress reports by e-mail at filing.ngt@gmail.com on or before 15.12.2018.

54. Needless to say, that order of National Green Tribunal is binding as a decree of Court and non-compliance is actionable by way of punitive action including prosecution, in terms of the National Green Tribunal Act, 2010.

55. Put up for consideration of the Report on 19th December, 2018.

....., CP
(Adarsh Kumar Goel)

.....,JM
(S.P. Wangdi)

.....,EM
(Dr. Nagin Nanda)

New Delhi
September 20, 2018

ANNEXURE-II

Item Nos. 04 & 05 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 673/2018
(M.A. No. 1777/2018)

WITH

Original Application No. 727/2018

News item published in "The Hindu" authored by Shri Jacob Koshy

Titled

"More river stretches are now critically polluted: CPCB

WITH

Dr. Tudi Indrasena Reddy & Anr. Applicant(s)

Versus

Union of India & Ors. Respondent(s)

Date of hearing: 19.12.2018

CORAM: **HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON**
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

For Applicant(s): Mr. Sravan Kumar, Advocate in Original Application No. 727/2018

For Respondent(s): Mrs. Sharmila Upadhyay and Mr. Krishna Kanodia, Advocates for CPCB
Mr. Pradeep Misra, Advocate for UPPCB
Mrs. G. Indira, Mr. K.V. Jagdishvari and Ms. Mrinal K. Mondal, Advocates for Andeman & Nicobar Administration
Mr. Dinesh Jindal, LO GNCTD
Mr. Rajshree Choudhary, Mr. Guntur Pramod Kumar, Advocates for State of A.P.
Mr. Sanjay Kumar, Advocate for HPSPCB
Mr. Deepak K. Singh, Advocate for State of Telangana
Mr. Dhananjay Baijal and Mr. Nikhil Nayyar, Advocates for APPCB and TSPCB

ORDER

1. The issue taken up for consideration in this matter is abatement of pollution in 351 river stretches in the country, identified as such by the Central Pollution Control Board (CPCB). The said river stretches

are not meeting the prescribed standards of the water quality in terms of Bio-chemical Oxygen Demand (BOD). Existence of polluted river stretches is evidence to show that the State Pollution Control Boards (SPCBs) have failed to perform their statutory obligation to take appropriate action to achieve the objects of the Water (Prevention and Control of Pollution) Act, 1974.

2. Having regard to the importance of the issue and in the light of judgments of the Hon'ble Supreme Court in *M.C. Mehta Vs. Union of India & Ors.*[1], *M.C. Mehta Vs. Union of India And Ors.*[2] *(Calcutta Tanneries' Matter), Vellore Citizen' Welfare Forum Vs. Union of India*[3], *S. Jagannath Vs. Union of India & Ors.*[4], *And Quiet Flows The Maily Yamuna*[5], *Tirupur Dyeing Factory Owners Association Vs. Noyyal River Ayacutdars Protection Association & Ors.*[6] and *TechiTagi Tara Vs. Rajendra Singh Bhandari & Ors.*[7] and of this Tribunal in *Manoj Mishra Vs. Union of India*[8], *M.C. Mehta Vs. Union of India*[9], *Mahendra Pandey Vs. Union of India &Ors.*[10], *Sobha Singh & Ors. Vs. State of Punjab & Ors.*[11], *Nityanand Mishra Vs. State of M.P. & Ors*[12], Stench Grips Mansa's Sacred Ghaggar River (Suo-Moto Case)[13], *Doaba Paryavaran Samiti Vs. State of U.P. & Ors.*[14], *Arvind Pundalik Mhatre Vs. Ministry of Environment, Forest and Climate Change & Ors.*[15], *Meera Shukla Vs. Municipal Corporation, Gorakhpur & Ors.*[16], *Amresh Singh Vs. Union of India & Ors.*[17], *Sudarsan Das Vs. State of West Bengal & Ors.*[18], *Satish Kumar vs. U.O.I & Ors.*[19], this Tribunal noted

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[1] (1987) 4 SCC 463 ¶14 & (1988) 1 SCC 471
[2] (1997) 2 SSC 411
[3] (1996) 5 SSC 647
[4] (1997) 2 SCC 87
[5] (2009) 17 SSC 720
[6] (2009) 9 SSC 737
[7] (2018) 11 SCC 734
[8] O.A. No. 6/2012, 2015 ALL(I) NGT REPORTER (1) (DELHI) 139
[9] O.A No. 200 of 2014, 2017 NGTR (3) PB 1
[10] O.A. No. 58/2017
[11] O.A.No. 101/2014
[12] O.A. No. 456/2018
[13] O.A. No. 138/2016 (TSSIDC)
[14] O.A. No. 231/2014
[15] O.A. No. 125/2018
[16] O.A. No. 116/2014
[17] Execution Application No. 32/2016 in O.A. No. 295/2016
[18] O.A.No. 173 of 2018
[19] O.A No. 56 (THC) of 2013

the need for steps to check discharge of untreated sewage and effluents, plastic waste, e-waste, bio-medical waste, municipal solid waste, diversion of river waters, encroachments of catchment areas and floodplains, over drawal of groundwater, river bank erosion on account of illegal sand mining. There is need for installation of Effluent Treatment Plants (ETPs), Common Effluent Treatment Plants (CETPs), Sewage Treatment Plants (STPs), Solid Waste Treatment and processing facilities etc.

3. It was also noted that BOD was required to be less than 3.0 mg/l, Dissolved Oxygen more than 5.0 mg/l and Faecal Coliform bacteria less than 500 MPN/100 ml.

4. The Tribunal also noted that as per data published by the CPCB in January, 2018, 30,042 million litres per day (MLD) of domestic sewage is generated from urban areas along the polluted river stretches. The installed sewage treatment capacity is about 16,846 MLD, leaving a gap of about 13,196 MLD (43.9%). There is a large gap in sewage treatment capacity and generation of sewage in urban areas.

5. The Tribunal also noted that on the one hand, there is need to enhance the river flow through intervention on the water sheds/catchment areas for conservation and recharge of rain water for subsequent releases during lean flow period in a year and on the other hand, there in need to dilute the pollutants in the rivers and streams so as reduce concentration to meet the desired level of water quality and extent of flow as per prescribed norms. This called for preparation of action plan including the water shed management by way of (a) Recognition phase (b) Restoration phase (c) Protection phase (d) Improvement phase. Attention was also required for agriculture and forest management and production, forage

production and pasture management, socio-economic conditions to achieve the objectives of watershed management.

6. The object of the action plan should be to restore the water quality for which model action plan prepared for river Hindon could be taken into account. Salient features of the action plan are to be:
   i. Execution of field surveys to assess pollution load generated by industries and sewage generated in a city or town discharging sewage and trade effluent into river Hindon and its tributaries.
   ii. Collating water quality monitoring data of river Hindon and its tributaries and assigning the class as per primary water quality criteria.
   iii. Water quality assessment of river in context of sewage/industrial drain outfalls with dilution and distance factors.
   iv. Laying time-limes for regulating industrial pollution control by ensuring consent compliance and closing the defaulting industries till they comply with the norms stipulated to them.
   v. Setting up of STPs in towns located in the river catchment and emphasis on utilization of treated sewage.
   vi. Adopting water conservation practices, ground water regulation, flood plain zone management and maintaining environmental flow.

7. The Tribunal also referred to different actions to be taken for different categories of the priorities for the action plan to deal with the source control, treatment of sewage, ground water, regulation, activities in flood plain zone, e-flow and other issues.

8. The direction issued by the Tribunal was to constitute River Rejuvenation Committee (RRC) comprising of Directors of Environment, Urban Development, Industries and Member

Secretaries of the SPCBs so as to identify pollution sources, functioning/status of STPs/ETPs/CETP and solid waste management and processing facilities, quantification and characterisation of solid waste, trade and sewage generated in the catchment areas of polluted river stretch. The action plan is to address issues relating to ground water extraction, adopting good irrigation practices, protection and management of Flood Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environmental flow of river and plantation on both sides of the river, setting up of bio-diversity parks, interception and diversion of sewage carrying drains to the STP. The Chief Secretaries of States were to be personally accountable for failure to formulate the action plans.

9. This Tribunal directed action plans to be prepared within two months with the contemplation that water quality will be fit for bathing purposes within six months from the date of the action plan. We are informed that out of 29 States and 7 Union Territories (UTs), total of 16 States/UTs have prepared the draft action plans and 15 have failed to do so.

10. As already noted, contamination of water and deterioration of water quality are matters to be taken seriously as they affect public health and right of citizen to have access to potable drinking water. Unfortunately, in spite of categorical directions of this Tribunal in the order dated 20.09.2018 based on earlier judgments of the Hon'ble Supreme Court and this Tribunal, 15 States and UTs have failed to carry out the order of this Tribunal. The said States and UTs have not even taken the first requisite step of preparing an action plan, showing total insensitivity to such a serious matter and

public issue. With great regret, we may be left with no opinion but to take coercive action, if there is further failure.

11. We also find that for 16 States/UTs which have prepared action plans, the action plans are not complete. Base line data has not been given, preparation of action plans has been assigned to third parties, details of STPs etc. are also not given, timelines given are too long, status of e-flow has not been given, action plans are not proposed to be placed on websites to involve educational and other institutions and the public at large. The said States/ UTs may now give revised reports on or before 31.01.2019 to CPCB after complying with the deficiencies. The CPCB shall examine the action plans and only if they meet the scientific and technical yardstick shall approve the same and convey it to the respective States/UTs. The States/ UTs after its approval shall place/host these action plans on the respective website giving clear timelines for its execution, agencies responsible for its execution along with the matching budgetary provisions.

12. By way of last opportunity, we extend the time for preparation of action plans till 31.01.2019 with the stipulation that for every delay thereafter, compensation for damage to the environment will be payable by each of the States/ UTs at the rate of Rs. One Crore per month for each of the Priority- I and Priority- II stretches, Rs. 50 lacs per month for stretches in Priority- III and Rs. 25 lacs per month each for Priority- IV and Priority- V stretches. The payment will be the responsibility of the Chief Secretaries of the States/Administrators of the UTs and the amount may be recovered from the erring officers. The CPCB may prominently place the names of the defaulting States and UTs and a notice to this effect on its website.

13. The SPCBs and Pollution Control Committees of UTs may display the quality of the water of polluted river stretches on their respective websites within one month from today, alongwith action taken, if any, which may be revised every three months. The CPCB may also display the water quality of the river stretches and action/inaction by such States on its websites. It is made clear that BOD will not be the sole criteria to determine whether a particular river stretch is a polluted river stretch. Other parameters including Faecal Coliform (FC) bacteria will also be the criteria for classifying a stretch as polluted or otherwise. CPCB may devise within two weeks a mechanism for classification wherein two criteria pollutants that is BOD and FC shall henceforth be basis of classification in Priority Classes.

14. The CPCB may also examine whether river Rangpo in Sikkim falls in the category of polluted river stretches and if it is so, CPCB may give appropriate directions with regard to the said river also.

15. Any incomplete action plan will be treated as non-compliance. Performance guarantees are to be furnished for implementation of action plans within the above stipulated time to the satisfaction of Central Pollution Control Board in the sum of:

    (i) Rs. 15 crore for each of Priority I & II stretches

    (ii) Rs. 10 crore for each of Priority III stretches

    (iii) Rs. 5 crore for each of Priority IV & V stretches.

16. The CPCB will be at liberty to take further coercive measures against the States/UTs concerned and furnish a consolidated report to this Tribunal by 28.02.2019 by e-mail at ngt.filing@gmail.com.

List for further consideration on 08.04.2019.

Adarsh Kumar Goel, CP

S.P. Wangdi, JM

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

December 19, 2018
Original Application Nos. 673/2018 & 727/2018
R

ANNEXURE- III

Item No. 01 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No.673/2018
(M.A. No. 1777/2018)

News item published in "The Hindu"authored by Shri Jacob Koshy titled
"More river stretches are nowcritically polluted : CPCB

Date of hearing: 08.04.2019

CORAM: **HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON**
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

For Applicant(s): None

For Respondent (s): Ms. Sharmila Upadhyay, Advocate for CPCB
Dr. S.D. Singh, APCCF, Uttarakhand

ORDER

1. The question for consideration is the remedial action to tackle the major problem of rivers pollution which is manifested in the form of 351 identified polluted river stretches based on the data compiled by the Central Pollution Control Board (CPCB) on the basis of analysis of sample by the State Pollution Control Boards (State PCB) as per National Water Quality Monitoring Programme (NWQMP) undertaken by the CPCB.

2. The Tribunal considered the matter by way of chamber meeting on 10.09.2018 with the participation of all the Members of the Tribunal and the representatives of CPCB, the Ministry of Water Resources

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(MoWR), the Ministry of Environment, Forest & Climate Change (MoEF&CC), the NITI Aayog, the National Mission for Clean Ganga (NMCG), Ministry of Housing and Urban Affairs (MoHUA), States of Maharashtra, Gujarat, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Bihar, Punjab, Uttar Pradesh, NCT of Delhi and the Union Territory of Daman & Diu. (Some of the States appeared by video conferencing.

3. Present proceedings were initiated based on a news item dated 17.09.2018 in 'The Hindu" under the heading "More river stretches are now critically polluted: CPCB"[1].

4. According to the news item, 351 polluted river stretches have been noted by the Central Pollution Control Board (CPCB). 117 such stretches are in the States of Assam, Gujarat, and Maharashtra. The CPCB has apprised the concerned States of the extent of pollution in the rivers. Most polluted stretches are from Powai to Dharavi – with Biochemical Oxygen Demand (BOD) 250 mg/L; the Godavari - from Someshwar to Rahed – with BOD of 5.0-80 mg/L; the Sabarmati – Kheroj to Vautha – with BOD from 4.0-147 mg/L; and the Hindon – Saharanpur to Ghaziabad – with a BOD of 48-120 mg/L. The CPCB has a programme to monitor the quality of rivers by measuring BOD. BOD greater than or equal to 30mg/L is termed as 'Priority I', while that between 3.1-6 mg/L is 'Priority V'. The CPCB considers BOD less than 3mg/L an indicator of a healthy

[1]https://www.thehindu.com/news/national/more-river-stretches-critically-polluted cpcb/article24962440.ece

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river. In its 2015 Report[2], the CPCB had identified 302 polluted stretches on 275 rivers, spanning 28 States and six Union Territories. The number of such stretches has now been found to be 351 in 2018.

5. The Water (Prevention and Control of Pollution) Act, 1974 prohibits use of any stream or well for disposal of polluted matter. Any person doing so is punishable.

6. Article 48A of the Constitution casts a duty on the State to protect and improve the environment. Article 51A imposes a fundamental duty on every citizen to protect and improve the environment. The Stockholm Declaration (1972) recommended prevention of pollution by adopting the 'Precautionary Principle', the 'Polluter Pays Principle' and the principle of 'Sustainable Development'.

7. In spite of above, in flagrant violation of law of the land, polluted water in the form of sewage, industrial effluents or otherwise has continued to be discharged in the water bodies including the rivers or the canals meeting the rivers. Violation of law is not only by private citizens but also statutory bodies including the local bodies and also failure of the regulatory authorities in taking adequate steps.

8. Above situation led to consideration of the matter by the Hon'ble Supreme Court in the context of pollution of river pallar in Tamil

[2]http://cpcb.nic.in/cpcbold/RESTORATION-OF-POLLUTED-RIVER-STRETCHES.pdf

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Nadu[3] and river Noyyal. In M.C. Mehta Vs. Union of India & Ors.[4], directions to enforce the statutory provisions by the municipal bodies and the industries by stopping discharge of untreated sewage and effluents in River Ganga were issued by the Hon'ble Supreme Court. It was noted that the water pollution caused serious diseases, including Cholera and Typhoid. Water pollution could not be ignored and adequate measures for prevention and control are necessary. It was also observed that the educational institutions must teach at least for one hour in a week lessons relating to protection and improvement of environment. Awareness should be created by organizing suitable awareness programs. In the same matter, the issue of Calcutta tanneries was considered in M.C Mehta Vs. Union of India And Ors.[5], (Calcutta Tanneries' Matter). The tanneries were directed to be shifted by adopting the 'Precautionary Principle' so as to prevent discharge of effluents in the River Ganga.

9. This Tribunal also considered the issue of pollution of river Yamuna, in *Manoj Mishra Vs. Union of India*[6], river Ganga in *M.C. Mehta Vs. Union of India*[7], river Ramganga which is a tributary of river Ganga in *Mahendra Pandey Vs. Union of India & Ors.*[8], rivers Sutlej and Beas in the case of *Sobha Singh & Ors. Vs. State of Punjab & Ors.*[9], river Son in *Nityanand Mishra Vs. State of M.P. & Ors.*[10], river

[3] *Vellore Citizen' Welfare Forum v. Union of India*, (1996) 5 SSC 647
[4] (1988) 1 SCC 471
[5] (1997) 2 SSC 411
[6] *O.A. No. 6/2012, 2015 ALL(I) NGT REPORTER (1) (DELHI) 139*
[7] O.A No. 200 of 2014, 2017 NGTR (3) PB 1
[8] O.A. No. 58/2017
[9] O.A.No. 101/2014
[10] O.A. No. 456/2018

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Ghaggar in Stench Grips Mansa's Sacred Ghaggar River (Suo-Moto Case)[11]", river Hindon in *Doaba Paryavaran Samiti Vs. State of U.P. & Ors.*[12], river Kasardi in *Arvind Pundalik Mhatre Vs. Ministry of Environment, Forest and Climate Change & Ors.*[13], River Ami, Tapti, Rohani and Ramgarh lake in *Meera Shukla Vs. Municipal Corporation, Gorakhpur & Ors.*[14], rivers Chenab and Tawi in the case of *Amresh Singh Vs. Union of India & Ors.*[15] and *Subarnarekha in Sudarsan Das Vs. State of West Bengal & Ors.*[16] and issued directions from time to time.

10. On 08.08.2018, in Doaba Paryavaran Samiti Vs. State of U.P. & Ors.[17], pollution in river Hindon was the subject matter of consideration. The matter was taken up on the allegation that 71 persons in Baghpat district died and more than 1000 persons were affected by diseases on account of pollution. The Tribunal noted that there was contamination of groundwater on account of pollution caused by sugar, paper, distilleries and tannery industries. An inspection team appointed by the Tribunal, found that 124 industries were causing pollution. It was noted that no punitive action has been initiated. The pollution caused included discharge of Mercury. The Tribunal observed that sources of contaminated water are required to be closed. The victims of diseases are required to be rehabilitated. A statement that there are 302 river stretches in the

[11] O.A. No. 138/2016 (T_{NHRC})
[12] O.A. No. 231/2014
[13] O.A. No. 125/2018,
[14] O.A. No. 116/2014,
[15] Execution Application No. 32/2016 in O.A. No. 295/2016,
[16] O.A.No. 173 of 2018
[17] O.A. No. 231/2014

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country was noted and the CPCB was directed to identify at least 10 most critical stretches and prepare an action plan, in similar format as that of river Hindon[18]. The directions issued by the Tribunal include making functionaries of the statutory authorities accountable for their failure, making potable water available, sources of contamination being closed, action plans being prepared at District, State and National levels for restoration of water quality and reversing the damage. The Committee headed by a former Judge of High Court was also constituted to oversee the execution of the directions.

11. As already noted, well known causes of pollution of rivers are dumping of untreated sewage and industrial waste, garbage, plastic waste, e-waste, bio-medical waste, municipal solid waste, diversion of river waters, encroachments of catchment areas and floodplains, over drawl of groundwater, river bank erosion on account of illegal sand mining. In spite of directions to install Effluent Treatment Plants (ETPs), Common Effluent Treatment Plants (CETPs), Sewage Treatment Plants (STPs), and adopting other anti-pollution measures, satisfactory situation has not been achieved. Tough governance is the need of the hour. If pollution does not stop, the industry has to be stopped. If sewage dumping does not stop, local bodies have to be made accountable and their heads are to be prosecuted. Steps have to be taken for awareness and public involvement.

[18]Hindon action plan prepared by CPCB is explained in para 46

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12. River Water is considered to be fit for bathing when it meets the criteria of having Bio-chemical Oxygen Demand (BOD) less than 3.0 mg/L, Dissolved Oxygen more than 5.0 mg/L and Faecal Coliform bacteria to be less than 500 MPN/100 ml.

13. As already noted, according to latest assessment by the CPCB, there are 351 polluted river stretches in India i.e. where the BOD content is more than 3mg/L. The plan of CPCB is to target enhancement of river flow. The plan for restoration of polluted river stretches is proposed to be executed through two-fold concepts. One concept is to target enhancement of river flow through interventions on the water sheds/catchment areas for conservation and recharge of rain water for subsequent releases during lean flow period in a year. This concept will work on dilution of pollutants in the rivers and streams to reduce concentration to meet desired level of water quality. Other concept is of regulation and enforcement of standards in conjunction with the available flow in rivers /streams and allocation of discharges with stipulated norms.

14. In view of above, this Tribunal found it necessary to take up the matter and direct preparation and execution of river action plans to control pollution and restore water quality of the river as per norms within reasonable time. There have been successful river cleaning programmes in other countries such as relating to rivers Thames(England), Rhine(Germany) and Danube(France). There is no reason why our polluted river stretches cannot be restored.

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15. Accordingly, vide order dated 20.09.2018, the Tribunal issued following directions:-

" i) *All States and Union Territories are directed to prepare action plans within two months for bringing all the polluted river stretches to be fit at least for bathing purposes (i.e BOD < 3 mg/L and FC < 500 MPN/100 ml) within six months from the date of finalisation of the action plans.*

ii) *The action plans may be prepared by four-member Committee comprising, Director, Environment, Director, Urban Development., Director, Industries., Member Secretary, State Pollution Control Board of concerned State. This Committee will also be the Monitoring Committee for execution of the action plan. The Committee may be called "River Rejuvenation Committee" (RRC). The RRC will function under the overall supervision and coordination of Principal Secretary, Environment of the concerned State/Union Territory.*

iii) *The action plan will include components like identification of polluting sources including functioning/ status of STPs/ETPs/CETP and solid waste management and processing facilities, quantification and characterisation of solid waste, trade and sewage generated in the catchment area of polluted river stretch. The action plan will address issues relating to; ground water extraction, adopting good irrigation practices, protection and management of Flood Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environmental flow of river and plantation on both sides of the river. Setting up of biodiversity parks on flood plains by removing encroachment shall also be considered as an important component for river rejuvenation. The action plan should focus on proper interception and diversion of sewage carrying drains to the Sewage Treatment Plant (STP) and emphasis should be on utilization of treated sewage so as to minimize extraction of*

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ground or surface water. The action plan should have speedy, definite or specific timelines for execution of steps. Provision may be made to pool the resources, utilizing funds from State budgets, local bodies, State Pollution Control Board/ Committee and out of Central Schemes.

iv) *The Action Plans may be subjected to a random scrutiny by a task team of the CPCB.*

v) *The Chief Secretaries of the State and Administrators/ Advisors to Administrators of the Union Territories will be personally accountable for failure to formulate action plan, as directed.*

vi) *All States and Union Territories are required to send a copy of Action Plan to CPCB especially w.r.t Priority I & Priority II stretches for approval.*

vii) *The States and the Union Territories concern are directed to set up Special Environment Surveillance Task Force, comprising nominees of District Magistrate, Superintendent of Police, Regional Officer of State Pollution Control Board and one person to be nominated by District Judge in his capacity as Chairman of Legal Services Authority on the pattern of direction of this Tribunal dated 07.08.2018, in Original Application No. 138/2016 (T_{NHRC}), "Stench Grips Mansa's Sacred Ghaggar River (Suo-Motu Case).*

ix) *The Task Force will also ensure that no illegal mining takes place in river beds of such polluted stretches.*

x) *The RRC will have a website inviting public participation from educational institutions, religious institutions and commercial establishments. Achievement and failure may*

also be published on such website. The Committee may consider suitably rewarding those contributing significantly to the success of the project."

16. The Tribunal suggested that action plan prepared for River Hindon could be taken as a model for restoration of water quality.[19] Salient features of the said Action Plan are:

i. Execution of field surveys to assess pollution load generated by industries and sewage generated in a city or town discharging sewage and trade effluent into river Hindon and its tributaries.

ii. Collating water quality monitoring data of Hindon and its tributaries and assigning the class as per primary water quality criteria.

iii. Water quality assessment of river in context of sewage/industrial drain outfalls with dilution and distance factors.

iv. Laying time-limes for regulating industrial pollution control by ensuring consent compliance and closing the defaulting industries till they comply with the norms stipulated to them.

v. Setting up of STPs in towns located in the river catchment and emphasis on utilization of treated sewage.

vi. Adopting water conservation practices, ground water regulation, flood plain zone management and maintaining environmental flow.

[19] http://cpcb.nic.in/NGT/CPCB-Reply-Affidavit-Report-on-Hindon-Action-Plan.pdf

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17. The data for the polluted river stretches indicated that the river stretches were identified in 5 categories as follows:-

I. <u>Criteria for Priority I</u>

(a) Monitoring locations exceeding BOD concentration 30 mg/L has been considered as it is the standard of sewage treatment plant and in river it appears without dilution.(River locations having water quality exceeding discharge standards for BOD to fresh water sources)

(b) All monitoring locations exceeding BOD concentration 6 mg/L on all occasions.

(c) Monitoring locations exceeding 3 mg/L BOD are not meeting desired water quality criteria but does not affect to Dissolved Oxygen level in water bodies. If BOD exceeds 6mg/L in water body, the Dissolved Oxygen is reduced below desired levels.

(d) The raw water having BOD levels upto 5 mg/L are does not form complex chemicals on chlorination for municipal water supplies. Hence the water bodies having BOD more than 6 mg/L are considered as polluted and identified for remedial action.

II. <u>Criteria for Priority II</u>

(a) Monitoring locations having BOD between 20-30 mg/L.

(b) All monitoring locations exceeding BOD concentration 6 mg/L on all occasions.

III. <u>Criteria for Priority III</u>

(a) Monitoring locations having BOD between 10-20 mg/L.

(b) All monitoring locations exceeding BOD concentration 6 mg/L on all occasions.

IV. <u>Criteria for Priority IV</u>

(a) Monitoring locations having BOD between 6-10 mg/L.

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V. Criteria for Priority V

(a) Monitoring locations having BOD between 3-6 mg/l.
(b) The locations exceeding desired water quality of 3mg/l BOD.

18. Table showing location and categories are reproduced in the said order. The action plans were required to cover the following:-

A) Source control

Source control includes industrial pollution control and treatment and disposal of domestic sewage as detailed below:-

(a) Industrial pollution control

(i) Inventorisation of industries

(ii) Categories of industry and effluent quality

(iii) Treatment of effluents, compliance with standards and mode of disposal of effluents

(iv) Regulatory regime.

(b) Channelization, treatment, utilization and disposal of treated domestic sewage.

(i) Identification of towns in the catchment of river and estimation of quantity of sewage generated and existing sewage treatment capacities to arrive at the gap between the sewage generation and treatment capacities;

(ii) Storm water drains now carrying sewage and sullage joining river and interception and diversion of sewage to STPs,

(iii) Treatment and disposal of septage and controlling open defecation,

(iv) Identification of towns for installing sewerage system and sewage treatment plants.

(B) River catchment/Basin Management-Controlled ground water extraction and periodic quality assessment

(i) Periodic assessment of groundwater resources and regulation of ground water extraction by industries particularly in over exploited and critical zones/blocks.

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(ii) Ground water re-charging /rain water harvesting

(iii) Periodic ground water quality assessment and remedial actions in case of contaminated groundwater tube wells/bore wells or hand pumps.

(iv) Assessment of the need for regulating use of ground water for irrigation purposes.

(C) Flood Plain Zone.

(i) Regulating activities in flood plain zone.
(ii) Management of Municipal, Plastic, Hazardous, Bio-medical and Electrical and Electronic wastes.
(iii) Greenery development- Plantation plan.

(D) Ecological/Environmental Flow (E-Flow)

(a) Issues relating to E-Flow
(b) Irrigation practices

(E) Such other issues which may be found relevant for restoring water quality to the prescribed standards.

19. The matter was thereafter taken up for consideration on 19.12.2018. It was noted that contamination of water and deterioration of water quality are matters to be taken seriously as they affect public health and right of citizen to have access to potable drinking water. Unfortunately, in spite of categorical directions of this Tribunal in the order dated 20.09.2018 based on earlier judgments of the Hon'ble Supreme Court and this Tribunal, 15 States and UTs failed to carry out the order of this Tribunal. The said States and UTs had not even taken the first requisite step of preparing action plans, showing total insensitivity to such a serious matter and public issue.

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20. We also found that for 16 States/UTs which had prepared action plans, the action plans are not complete. Base line data was not been given, Preparation of action plans was assigned to third parties. Details of STPs etc. were not given. Timelines given were too long. Status of e-flow was not been given, action plans were not proposed to be placed on websites to involve educational and other institutions and the public at large. The said States/ UTs were directed to give revised reports on or before 31.01.2019 to CPCB after complying with the deficiencies. The CPCB was to examine the action plans and if they met the scientific and technical yardstick, was to approve the same and convey it to the respective States/UTs. The States/ UTs, after approval were to place/host these action plans on the respective website giving clear timelines for execution, agencies responsible for execution along with the matching budgetary provisions.

21. By way of last opportunity, we extended the time for preparation of action plans till 31.01.2019 with the stipulation that for delay thereafter, compensation for damage to the environment was to be payable by each of the States/ UTs at the rate of Rs. One Crore per month for each of the Priority- I and Priority- II stretches, Rs. 50 lacs per month for stretches in Priority- III and Rs. 25 lacs per month each for Priority- IV and Priority- V stretches. The payment was to be the responsibility of the Chief Secretaries of the States/Administrators of the UTs and the amount could be recovered from the erring officers. The CPCB was to prominently

place the names of the defaulting States and UTs and a notice to this effect on its website.

22. The SPCBs and Pollution Control Committees of UTs were to display the quality of the water of polluted river stretches on their respective websites within one month, along with action taken, if any, which was to be revised every three months. The CPCB was also to display the water quality of the river stretches and action/inaction by such States on its websites. It was made clear that BOD will not be the sole criteria to determine whether a particular river stretch is a polluted river stretch. Other parameters including Faecal Coliform (FC) bacteria will also be the criteria for classifying a stretch as polluted or otherwise. CPCB was to devise within two weeks a mechanism for classification wherein two criteria pollutants that is BOD and FC shall henceforth be basis of classification in Priority Classes.

23. The Tribunal directed that the CPCB may also examine whether river Rangpo in Sikkim falls in the category of polluted river stretches and if it is so, CPCB may give appropriate directions with regard to the said river also.

24. Further direction in the order dated 19.12.2018 is that any incomplete action plan will be treated as non-compliance. Performance guarantees are to be furnished for implementation of action plans within the above stipulated time to the satisfaction of Central Pollution Control Board in the sum of:

(i) Rs. 15 crore for each of Priority I & II stretches

(ii) Rs. 10 crore for each of Priority III stretches

(iii) Rs. 5 crore for each of Priority IV & V stretches.

25. We have taken up the matter for consideration to consider further progress. Apart from response of other parties, consolidated and updated reports have been filed by the CPCB on 05.04.2019.

26. Before proceeding further, we may also note that vide order dated 16.01.2019 in Original Application No. 606 of 2018, dealing with the issue of compliance of Municipal Solid Waste Management Rules and other important issues, the Tribunal directed presence of Chief Secretaries of all States/ Union Territories on specified dates before this Tribunal in person after monitoring the progress in their respective States on several issues, including the issue of polluted river stretches. By now, Chief Secretaries of Himachal Pradesh, Haryana, Punjab, Delhi, Bihar, Odisha, Uttarakhand, and West Bengal and Advisor to Administrator, Chandigarh have appeared in person before this Tribunal and indicated progress in the said States/UTs which was not found to be satisfactory and further directions have been issued on 05.03.2019, 06.03.2019, 07.03.2019, 11.03.2019, 15.03.2019, 26.03.2019, 07.03.2019, 26.03.2019 and 02.04.2019.

27. Coming to the updated consolidated report dated 05.04.2019 filed by the CPCB, we find that 28 States and 3 Union Territories have constituted River Rejuvenation Committees (RRCs). The CPCB

constituted a 'Task Team' for scrutiny of the action plans under the Chairmanship of Member Secretary, CPCB. So far, CPCB has received 41 out of 45 action plans with reference to P-I, 14 out of 16 action plans with reference to P-II and total 182 action plans received with reference to P-III to P-V polluted river stretches. 6 out of 61 action plans in respect of P-I and P-II have not been received from the States of Assam (P-I: 3 viz., Bharalu, Borsola, Silsako) and P-II:1 (Sorusola)), Manipur (P-II: 1 viz., Nambu) and Uttar Pradesh (P-I: viz., river Hindon). It is also submitted that the action plan in respect of River Hindon is required to be implemented by the Government of Uttar Pradesh in compliance to the Hon'ble NGT Orders passed in Original Application No. 231/2014 & Original Application No.66/2015. State-wise Identified Polluted River stretches and the Status of Action Plans received (as on 03.04.2019) is given in Table 2.

"Table 2. State-wise Identified Polluted River stretches and the Status of Action Plans as received by CPCB (as on 04.04.2019)

Name of the State / UT	Total No. of Identified Polluted River Stretches (PRS)	Priority I Identified Polluted River Stretches		Priority II Identified Polluted River Stretches		Priority – III to V Identified Polluted River Stretches		Total Action Plans Received
		No. of P-I PRS	Action Plans received w.r.to P-I	No. of P-II PRS	Action Plans received w.r.to P-II	No. of P-III to P-V	Action Plans received w.r.to P-III to P-V	
Andhra Pradesh	5	0	0	0	0	5	5	5
Assam	***44***	***3***	***0***	***1***	***0***	***40***	***1***	***1***
Bihar	6	0	0	0	0	6	6	6
Chhattisgarh	5	0	0	0	0	5	5	5
DD & DNH	1	1	1	0	0	0	0	1

Delhi	1	1	1	0	0	0	0	1
Goa	11	0	0	0	0	11	9	9
Gujarat	20	5	5	1	1	14	14	20
Haryana	2	2	2	0	0	0	0	2
Himachal Pradesh	7	1	1	1	1	5	5	7
Jammu & Kashmir	9	0	0	1	1	8	8	9
Jharkhand	7	0	0	0	0	7	7	7
Karnataka	17	0	0	0	0	17	17	17
Kerala	21	1	1	0	0	20	0	1
Madhya Pradesh	22	3	3	1	1	18	0	4
Maharashtra	53	9	9	6	6	38	38	53
Manipur	***9***	***0***	***0***	***1***	***0***	***8***	***0***	***0***
Meghalaya	7	2	2	0	0	5	5	7
Mizoram	9	0	0	0	0	9	0	0
Nagaland	6	1	1	0	0	5	5	6
Odisha	19	1	1	0	0	18	8	9
Puducherry	2	0	0	0	0	2	2	2
Punjab	4	2	2	0	0	2	2	4
Rajasthan	2	0	0	0	0	2	2	2
Sikkim	4	0	0	0	0	4	4	4
Tamil Nadu	6	4	4	0	0	2	2	6
Telangana	8	1	1	2	2	5	5	8
Tripura	6	0	0	0	0	6	6	6
Uttar Pradesh	***12***	***4***	***3***	***0***	***0***	***8***	***6***	***9***
Uttarakhand	9	3	3	1	1	5	5	9
West Bengal	17	1	1	1	1	15	15	17
Grand Total	**351**	**45**	**41**	**16**	**14**	**290**	**182**	**237**

28. State-wise status of action plans received and the action plans recommended for approval by the CPCB Task Team is enclosed as Table 3.

"Table 3. State-wise status of action plans received and the action plans recommended for approval by the CPCB Task Team w.r.t Priority I & Priority II Polluted Rivers (as on 03.04.2019)

STATE	Total Identified Polluted River	Identified PRS Priority	Identified Priority	No. of Action Plans	No. of Action Plans Not	Action Plans Not	Action plans approved subject

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	Stretches (PRS) Priority-I & Priority II	-I	- II	Received	Received	Recommended for approval	to conditions
ASSAM	4	3	1	0	4	-	0
DAMAN, DIU AND DADRA NAGAR HAVELI	1	1	0	1	0	-	1
DELHI	1	1	0	1	0	1	0
GUJARAT	6	5	1	6	0	-	6
HARYANA	2	2	0	2	0	-	2
HIMACHAL PRADESH	2	1	1	2	0	-	2
JAMMU & KASHMIR	1	0	1	1	0	-	1
KERALA	1	1	0	1	0	-	1
MADHYA PRADESH	4	3	1	4	0	-	4
MAHARASHTRA	15	9	6	15	0	-	15
MANIPUR	1	0	1	0	1	-	0
MEGHALAYA	2	2	0	2	0	2	0
NAGALAND	1	1	0	1	0	1	0
ODISHA	1	1	0	1	0	-	1
PUNJAB	2	2	0	2	0	-	2
TAMIL NADU	4	4	0	4	0	4	0
TELANGANA	3	1	2	3	0	-	3
UTTAR PRADESH	4	4	0	3	1	3	0
UTTARAKHAND	4	3	1	4	0	4	0
WEST BENGAL	2	1	1	2	0	-	2
TOTAL	**61**	**45**	**16**	**55**	**6**	**15**	**40**

29. 55 out of 61 total action plans received so far, 40 action plans pertaining to the States /UT of Daman [P-I (01)], Gujarat [P-I (5), P-

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II (01)], Haryana [P-I (01), P-II (01)], Himachal Pradesh [P-I (01), P-II (1)], J & K [P-II (01)], Kerala [P-I (01)], Madhya Pradesh [P-I (03), P-II (1)], Maharashtra [P-I (09), P-II (06)], Qdisha [P-I (1], Punjab [P-I (02)], Telangana [P-I (01), P-II (02)] and West Bengal [P-I (01) and P-II (01)] have been approved along with the conditions. 15 action plans received require further improvement with reference to either of the following:

(i) Identification of polluting sources including drains contributing to river pollution, functioning status of STPs/ETPs/CETP and solid waste management and processing facilities;

(ii) Map showing Polluted River, its tributaries, drains, major towns, industrial estates, location of STPs/CETPs

(iii) Detailed gap analysis w.r.t town-wise water consumption (including ground water consumption), sewage generation, existing infrastructure in the catchment area of the and the gap analysis;

(iv) Detailed gap analysis w.r.t industrial water consumption, wastewater generation, existing infrastructure for treatment of industrial effluent (both captive ETPs/CETPs and their performance assessment), gap analysis w.r.to the industrial effluent management in the catchment area;

(v) Quantification and characterisation of waste (such as solid waste, industrial hazardous waste, bio-medical waste, E-Waste), STP sludge management, existing infrastructure and detailed gap analysis;

(vi) Latest Water quality of polluted river, its tributaries, drains with flow details and ground water quality in the catchment of polluted river;

(vii) Aspects such as ground water extraction, adopting good irrigation practices, protection and management of Flood

Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environmental flow of river (by having watershed management provisions), plantation on both sides of the river, setting up biodiversity parks on flood plains by removing encroachment., proper interception and diversion of sewage carrying drains to Sewage Treatment Plant (STP), upgradation of existing sewage treatment plants if not in a position to comply with effluent discharge norms, emphasis on utilization of treated sewage so as to minimize extraction of ground or surface water be included,

(viii) Speedy, definite or specific timelines for execution of action plans and the estimated budget including the monitoring agency

(ix) Achievable goals with specific timelines for restoration of water quality of polluted rivers

(x) Organisation-wise action plans with timelines and the estimated budget for implementation of action plans.

30. It has also been stated that water quality of polluted river stretches has not been displayed by Manipur, Sikkim, Tamil Nadu and Delhi UT on their respective websites.

31. CPCB has suggested that as against the timeline laid down by this Tribunal, longer timeline may be required where infrastructure has to be set up and where no infrastructure was possible, the polluted river stretches be diluted by using fresh water, preventing disposal of waste or adoption of bio-remediation/provision of green bridges/proper O&M of existing STPs, ensuring proper disposal of STP sludges, ODF, etc. In case of industries, 100 % strict compliance to the discharge norms by the industries should be

ensured and in case of non-compliance, penalty or environmental compensation as per guidelines of CPCB on such industries should be levied in addition to prosecution under various provisions of Rules, as necessary.

32. CPCB has further suggested that scale of performance guarantee should be as follows:

"

No. of Polluted River Stretches in a State/UT	Suggested Performance Guarantee (in Rupees)
> 10	15 Crore
5 to 10	10 Crore
< 5	5 Crore

"

33. We have heard Mr. A. Sudhakar, Scientist-E, In-charge Member Secretary, CPCB and Dr. A.B. Akolkar, Member of Task Team, CPCB. They have assisted this Tribunal by highlighting various aspects of the problem. None appears for any other State/UT or authority.

34. As already noted, pollution of 351 river stretches has caused serious threat to safety of water and environment. On account of use of polluted water in irrigation, there is threat to food safety. On account of consumption of polluted water in absence of any other source of drinking water being available and partly on account of ignorance of the persons consuming such water, health of human being is threatened, apart from the aquatic flora and fauna, animals wild and domestic who may consume such water. It is therefore,

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necessary to have regular hygienic survey of the rivers particularly with reference to pathogenic organisms having impact on human health directly or indirectly. It is also important to note that biological health of the rivers is an important aspect. Much of the important biodiversity is lost on account of severe pollution in the rivers. There has to be a regular study of the Indian rivers with regard to biological heath and its diversity. We understand that bio-mapping of rivers and setting biological goals/criteria is part of River Rejuvenation Programmes in some countries. There is threat to the environmental rule of law of the country.

35. These are substantial questions relating to the environment. For enforcing legal right to clean environment, which is also a fundamental right, this Tribunal has to pass appropriate orders for relief to the victims of pollution and for restoration of the environment even in absence of an identified victim. All the States and UTs have been duly put to notice of the present case.

36. In this endeavor, this Tribunal directed constitution of RRCs by the concerned States/UTs by including Departments of Environment, Urban Development, Industries and the Pollution Control Boards/Pollution Control Committees and further directions to the Chief Secretaries of the States/UTs to monitor the progress. At the national level, CPCB has been required to assist the Tribunal by way of compiling the data and furnishing its views. A copy of order dated 29.09.2018 was directed to be forwarded to the Niti Ayog, Ministry of

Water Resources, Ministry of Environment, Forest & Climate Change, Ministry of Housing and Urban Affairs, National Mission for Clean Ganga, apart from other authorities as the said authorities were represented in a chamber meeting before this Tribunal to consider the problem of pollution of rivers.

37. Having regard to the exercise already undertaken in pursuance of orders of this Tribunal, we find that while substantial number of States have framed their action plans within the extended time i.e. 31.01.2019, some have defaulted in spite of clear stipulation that failure will require this Tribunal to direct payment of compensation for the damage to the environment on account of inaction of the said States.[20] No explanation has been given by defaulting States. The order has attained finality.

38. Accordingly, States of Assam, Manipur and Uttar Pradesh are liable to pay compensation in terms of order dated 19.12.2018 for delay after 31.1.2019 till the action plans are furnished for failing to submit action plan in respect of four river stretches. The said amount may be deposited with the CPCB within one month. CPCB may use the amount for restoration of environment as per law. It will be open to the States to recover the amount from the erring officers. For delay, interest @ 12% will be payable. Responsibility for payment will be of Chief Secretaries. CPCB is at liberty to seek enforcement of this order as decree of Civil Court by civil imprisonment of Chief Secretaries concerned or attachment of salary

[20]Para 12, Order dated 31.01.2019

or assets as per Section 51, Code of Civil Procedure read with Section 25 of the National Green Tribunal Act, 2010. It is also permissible to initiate prosecution under Section 26 of NGT Act, as noncompliance of order of NGT is a criminal offence.

39. The report of the CPCB further shows that 6 States have furnished incomplete action plan as given in Table 3 quoted above. The said six states i.e. Delhi, Meghalaya, Nagaland, Tamil Nadu, Uttar Pradesh and Uttarakhand are liable to pay compensation as per order dated 19.12.2018 for delay after 31.1.2019 at the scale of 50% of the compensation payable by the States who have failed to submit any action plan.

None of the above defaulting States except the State of Uttarakhand is represented before this Tribunal. There is no satisfactory explanation by any of the States, including the State of Uttarakhand who is represented by an officer. This part of order will be governed by earlier para for interest and enforcement. The requirement to pay compensation will continue till action plans are furnished or completed. The action plans may be uploaded on the websites of the CPCB as well as respective States/UTs and the MoEF&CC after former approval by the CPCB.

40. As regards 108 river stretches for which action plans have not still been furnished for Priority-III, Priority-IV and Priority-V river stretches, we direct that same scale of compensation will apply for

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failure to furnish action plans in further extended timeline upto 30.06.2019. The Action Plans not so far furnished, as required by earlier order of this Tribunal, may also now be furnished upto 30.06.2019.

41. We accept the proposal of CPCB to revise the scale of performance guarantee with regard to timeline. We also accept the suggestions of CPCB to extend the timeline for execution of action plans to the extent that upper limit for execution of the action plans will be two years from 01.04.2019 and the monitoring of the action plans may be done not only at the level of the Chief Secretaries of the States/UTs but also by the CPCB.

42. We direct that CPCB with SPCBs and PCCs to launch nationwide programme on biodiversity monitoring and indexing of the rivers to assess the efficacy of river cleaning programme. Further, for safety of human health and maintaining sanctity of the rivers, regular hygienic surveys of the rivers should be carried out with reference to fecal coliform and fecal streptococci, as indicated in the primary water quality criteria for bathing waters. Nodal agency will be CPCB.

43. Having given due consideration to the serious issue and inadequacy of success achieved so far, we find it necessary to constitute a Central Monitoring Committee to undertake a national initiative by way of preparation and enforcement of a national plan to make river stretches pollution free comprising a senior representative of NITI

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Aayog, Secretaries Ministry of Water Resources, Ministry of Urban Development, Ministry of Environment, Forest and Climate Change, Director General, National Mission for Clean Ganga and Chairman CPCB. Chairman CPCB will be the nodal authority for coordination. Senior most among them will preside over the deliberations.

44. The Central Monitoring Committee will also co-ordinate with the RRCs of the States and oversee the execution of the action plans, taking into account the timelines, budgetary mechanism and other factors. Chief Secretaries of States will be the nodal agency at State level. The Chief Secretaries of the States may undertake review of progress of RRCs by involving concerned Secretaries of Department of Urban Development, Environment, Industries, Irrigation and Public Health, Health etc.

45. We also direct the MoEF & CC to consider a policy for giving environmental awards to outstanding persons (natural and juristic) and Institutions/States and introducing dis-incentives for non compliant states. Such scheme may be framed preferably before 30.06.2019.

46. First meeting of the Central Monitoring Committee may be held by 30.06.2019. The Central Monitoring Committee may consider identifying experts, best practices and models for use of treated water, including plan to supply untreated sewage for a price or

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otherwise so that the concerned needy party can treat and utilize such water as is reportedly being done at Surat in Gujarat, Nagpur in Maharashtra and Bhilwada in Rajasthan or any other place. Use of treated water for agriculture or other purpose may save potable surface and ground water.

47. The Central Monitoring Committee may give its report by 31.07.2019.

A copy of this order be furnished to CPCB for being mailed to all concerned.

List for further consideration on 05.08.2019.

Adarsh Kumar Goel, CP

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

April 08, 2019
Original Application No.673/2018
(M.A. No. 1777/2018)
A & DV

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ANNEXURE-IV

Item No. 12 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

I.A. No. 551/2019
IN
Original Application No. 673/2018

M.A. No. 1777/2018
(Filed by the MOEF&CC for extension of time)

News item published in "The Hindu" authored by Shri Jacob Koshy titled "More river stretches are now critically polluted: CPCB

Date of hearing: 04.09.2019

CORAM: **HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON**
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

For Applicant(s): Mr. Balendu Shekhar, Mr. Raj Kumar, Advocates for MoEF&CC

ORDER

1. The main application-O.A. 673/2018 deals with the remedial action in '351 polluted River stretches' identified as such by the CPCB. All the States, UTs have been required to prepare action plan and execute the same so as to bring the water quality in the said river stretches atleast

fit for bathing. Considering the steps taken in the matter on 08.04.2019, this Tribunal directed constitution of Central Monitoring Committee (CMC) comprising of representatives from NITI Ayog, Ministry of Water Resources (MoWR), Urban Development Department, MoEF&CC, NMCG and CPCB representing the Central Government and the Chief Secretaries representing the States/UTs so that a holistic view can be taken on all significant aspects of remedying 351 river stretches.

2. Thereafter on 24.04.2019., the Tribunal directed that the CMC should also include the issues dealt with in the present matter in the light of the report of the CPCB identifying the gaps in compliance of Solid Waste Management Rules, 2016, Plastic Waste Management Rules, 2016, Bio Medical Waste Management Rules, 2016, air pollution in 102 cities, pollution in 100 polluted industrial clusters, illegal and unscientific sand mining, these subjects being integral to the purpose for which CMC was being constituted as mentioned in sub para (ii) above.[1] Further, a suggestion was given that the authorities allocating funds such as Finance Commission or other Central Government Departments may consider incentives to encourage compliance and impose appropriate conditions to ensure such compliance. The Tribunal further directed that the CMC may also take cognizance of issue of reuse of treated water as the said matter deals with improving ground water regime and therefore was connected to remedying the 351 polluted river stretches.[2] The Tribunal further directed that the Chief Secretaries may monitor the issue at the State level and the

[1] O.A. No. 606/2018, Compliance of Municipal Solid Waste Management Rules, 2016 (in respect of State of Karnataka).
[2] Vide order dated 10.05.2019 in O.A. No. 148/2016, Mahesh Chandra Saxena Vs. South Delhi Municipal Corporation & Ors.,

CMC may consider the matter at national level as the said matter deals with improving ground water regime and therefore was connected to remedying the 351 polluted river stretches. The Tribunal suggested that the Ministry of Drinking Water (now Jal Shakti) may also be added to the nominees representing Central Government. The deliberations may be preferably presided over by the Cabinet Secretary. If viable, PMO may depute an observer at important deliberations[3]. The Tribunal suggested that the Ministry of Drinking Water (now Jal Shakti) may also be added to the nominees representing Central Government. The deliberations may be preferably presided over by the Cabinet Secretary. If viable, PMO may depute an observer at important deliberations. [4]

3. The matter was considered further on 18.07.2019[5], and it was directed:

> *"47. We find no justification for a request to close OA 673/2018 in absence of satisfactory progress in dealing with the control of pollution in 351 polluted river stretches. Closure of such cases will be against the mandate for this Tribunal under the law of the land. We expect the CMC to give its considered report at the earliest and before 31.08.2019. If no such report is received the Tribunal may have to proceed further on the date fixed without the benefit of such a report."*

4. O.A. No. 673/2018 is now listed for hearing on 29.11.2019.

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[3] Vide order dated 10.05.2019 in O.A. No. 325/2015, Lt. Col. Sarvadaman Singh Oberoi Vs. Union of India & Ors.
[4] Vide order dated 17.05.2019 in OA No. 606/2018.
[5] O.A. No 606/2018 relating to Jammu and Kashmir

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In view of above, if the report is furnished by October 31, 2019, the same may be put up for consideration on the date fixed.

The Application is disposed of.

Adarsh Kumar Goel, CP

S.P. Wangdi, JM

Dr. Nagin Nanda, EM

September 04, 2019

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Annexure-V

State-wise Identified Polluted Rivers and the Status of Action Plans received by CPCB in compliance to Hon'ble NGT Orders dated 20.09.2018, 19.12.2018 and 08.04.2019 in OA No. 673 of 2018 (as on 07.11.2019)

Name of the State / UT	Total No. of Identified Polluted River stretches (PRS)	Priority I Identified Polluted River stretches		Priority II Identified Polluted River stretches		Priority – III to V Identified Polluted River stretches		Total Action Plans Received
		No. of P-I PRS	Action Plans received w.r.to P-I	No. of P-II PRS	Action Plans received w.r.to P-II	No. of P-III to V	Action Plans received w.r.to P-III to V	
Andhra Pradesh	5	0	0	0	0	5	5	5
Assam	44	3	3	1	1	40	40	44
Bihar	6	0	0	0	0	6	6	6
Chhattisgarh	5	0	0	0	0	5	5	5
DD & DNH	1	1	1	0	0	0	0	1
Delhi	1	1	1	0	0	0	0	1
Goa	11	0	0	0	0	11	11	11
Gujarat	20	5	5	1	1	14	14	20
Haryana	2	2	2	0	0	0	0	2
Himachal Pradesh	7	1	1	1	1	5	5	7
J & K	9	0	0	1	1	8	8	9
Jharkhand	7	0	0	0	0	7	7	7
Karnataka	17	0	0	0	0	17	17	17
Kerala	21	1	1	0	0	20	20	21
Madhya* Pradesh	22	3	3	1	1	18	18	22
Maharashtra	53	9	9	6	6	38	38	53
Manipur	9	0	0	1	1	8	8	9
Meghalaya	7	2	2	0	0	5	5	7
Mizoram	9	0	0	0	0	9	9	9
Nagaland	6	1	1	0	0	5	5	6
Odisha	19	1	1	0	0	18	18	19
Puducherry	2	0	0	0	0	2	2	2
Punjab	4	2	2	0	0	2	2	4
Rajasthan	2	0	0	0	0	2	2	2
Sikkim	4	0	0	0	0	4	4	4
Tamil Nadu	6	4	4	0	0	2	2	6
Telangana**	8	1	1	2	2	5	5	8
Tripura	6	0	0	0	0	6	6	6
UP	12	4	4	0	0	8	8	12
Uttarakhand	9	3	3	1	1	5	5	9
West Bengal	17	1	1	1	1	15	15	17
Grand Total	**351**	**45**	**45**	**16**	**16**	**290**	**290**	**351**

Note:-

* **MP State have submitted one combined action plan for river Kolar & River Kaliasot**

** **Telangana State submitted one action plan for river Manjeera & River Nakkavagu**

ANNEXURE-VI

State-wise status of action plans received and the action plans approved by CPCB Task Team w.r.to Priority I & Priority II Polluted Rivers (as on 07.11.2019)

NAME OF THE STATE/UT	Total Identified Polluted River Stretches (PRS) Priority-I & Priority II	Identified PRS Priority-I	Identified PRS Priority - II	No. of Action Plans Received	Action Plans Not Approved	Total Action Plans Approved
ASSAM	4	3	1	4	-	4
DAMAN, DIU AND DADRA NAGAR HAVELI	1	1	0	1	-	1
DELHI	**1**	**1**	**0**	**1**	**1**	**0**
GUJARAT	6	5	1	6	-	6
HARYANA	2	2	0	2	-	2
HIMACHAL PRADESH	2	1	1	2	-	2
JAMMU & KASHMIR	1	0	1	1	-	1
KERALA	1	1	0	1	-	1
MADHYA PRADESH	4	3	1	4	-	4
MAHARASHTRA	15	9	6	15	-	15
MANIPUR	1	0	1	1	-	1
MEGHALAYA	2	2	0	2	-	2
NAGALAND	1	1	0	1	-	1
ODISHA	1	1	0	1	-	1
PUNJAB	2	2	0	2	-	2
TAMIL NADU	4	4	0	4	-	4
TELANGANA	3	1	2	3	-	3
UTTAR PRADESH	4	4	0	4	-	4
UTTARAKHAND	4	3	1	4	-	4
WEST BENGAL	2	1	1	2	-	2
TOTAL	**61**	**45**	**16**	**61**	**01**	**60**

Annexure-VII

State-wise & River-wise recommendations of Task Team - Action Plans for Restoration of Identified Polluted River Stretches- as per Hon'ble NGT Orders dated 20.09.2018, 19.12.2018 & 08.04.2019 (Status as on 07.11.2019)

STATE	RIVER NAME	Status
ASSAM	BHARALU	Recommended subjected to conditions
	BORSOLA	Recommended subjected to conditions
	SILSAKO	Recommended subjected to conditions
	SORUSOLA	Recommended subjected to conditions
DAMAN, DIU AND DADRA NAGAR HAVELI	DAMANGANGA	Recommended subjected to conditions
DELHI	***YAMUNA***	***Not Recommended***
GUJARAT	AMLAKHADI	Recommended subjected to conditions
	BHADAR	Recommended subjected to conditions
	BHOGAVO	Recommended subjected to conditions
	KHARI	Recommended subjected to conditions
	SABARMATI	Recommended subjected to conditions
	VISHWAMITRI	Recommended subjected to conditions
HARYANA	GHAGGAR	Recommended subjected to conditions
	YAMUNA	Recommended subjected to conditions
HIMACHAL PRADESH	SUKHANA	Recommended subjected to conditions
	MARKANDA	Recommended subjected to conditions
JAMMU & KASHMIR	DEVIKA	Recommended subjected to conditions
KERALA	KARAMANA	Recommended subjected to conditions
MADHYA PRADESH	CHAMBAL	Recommended subjected to conditions
	KHAN	Recommended subjected to conditions
	KSHIPRA	Recommended subjected to conditions
	BETWA	Recommended subjected to conditions
MAHARASHTRA	GODAVARI	Recommended subjected to conditions
	KALU	Recommended subjected to conditions
	KUNDALIKA	Recommended subjected to conditions
	MITHI	Recommended subjected to conditions
	MORNA	Recommended subjected to conditions
	MULA	Recommended subjected to conditions
	MUTHA	Recommended subjected to conditions
	NIRA	Recommended subjected to conditions
	VEL	Recommended subjected to conditions
	BHIMA	Recommended subjected to conditions
	INDRAYANI	Recommended subjected to conditions
	MULA-MUTHA	Recommended subjected to conditions
	PAWANA	Recommended subjected to conditions
	WAINGANGA	Recommended subjected to conditions
	WARDHA	Recommended subjected to conditions
MANIPUR	NAMBUL	Recommended subjected to conditions
MEGHALAYA	UMKHRAH	Recommended subjected to conditions
	UMSHYRPI	Recommended subjected to conditions
NAGALAND	DHANSIRI	Recommended subjected to conditions
ODISHA	GANGUA	Recommended subjected to conditions
PUNJAB	GHAGGAR	Recommended subjected to conditions
	SUTLEJ	Recommended subjected to conditions
TAMIL NADU	CAUVERY	Recommended subjected to conditions
	SARABANGA	Recommended subjected to conditions
	THIRUMANIMUTHAR	Recommended subjected to conditions
	VASISTA	Recommended subjected to conditions

TELANGANA	MUSI	Recommended subjected to conditions
	MANJEERA	Recommended subjected to conditions
	NAKKAVAGU	Recommended subjected to conditions
UTTAR PRADESH	HINDON	Recommended subjected to conditions
	KALINADI	Recommended subjected to conditions
	VARUNA	Recommended subjected to conditions
	YAMUNA	Recommended subjected to conditions
UTTARAKHAND	BHELA	Recommended subjected to conditions
	DHELA	Recommended subjected to conditions
	SUSWA	Recommended subjected to conditions
	KICHHA	Recommended subjected to conditions
WEST BENGAL	VINDHADHARI	Recommended subjected to conditions
	MAHANANDA	Recommended subjected to conditions

ANNEXURE -VIII

CRITERIA FOR CATEGORISATION OF RIVER MONITORING LOCATION

1. Introduction

Water Quality monitoring is an essential component to maintain and restore the wholesomeness of resources by way of prevention and control of pollution as prescribed under the Water (Prevention and Control of Pollution) Act, 1974. However, the Water (Prevention and Control of Pollution), Act, 976 does not define the level of wholesomeness to be maintained or restored in different water bodies of the country. In view of the said reason, the Central Pollution Control Board (CPCB) has tried to define the wholesomeness of water in terms of safe human uses, and thus, taken human uses of water as base for identification of water quality objectives for different water bodies in the Country. It is considered ambitious to maintain or restore all natural water body at pristine level which is possible only by taking proper control measures. The level and degree of treatment required can be decided depending on the categorization of the polluted river locations/stretch, as per the criteria detailed below: -

2. Categorization of River Monitoring Location

The water quality data is required to be analyzed and primarily mean or average values of Biochemical Oxygen Demand (BOD) and Faecal Coliform (FC) need to be estimated. Then, based on the total score estimated for the parameters BOD (weightage- 70 %) and FC (Weightage- 30 %), based on the criteria, the monitoring location is categorized as 'polluted' location. The polluted monitoring locations in a continuous sequence are defined as 'polluted river stretch'. However, actual self-purification distance need to be estimated based on the requisite input parameters which depend on the case-to-case and the local conditions.

The monitoring locations may be categorized in five classes from Category I to Category –V. i.e., critically polluted to Good or Fit for Bathing i.e., Category –I indicates 'critically polluted'; Category-II indicates 'severely polluted'; Category-III indicates 'moderately polluted', Category –IV indicates 'less polluted', Category – V indicates 'Good' or Fit for Bathing'

Above suggested criteria is intended only for categorization of the river monitoring locations. However, if any State/UT desires to identify any other water body such as lakes, tanks may also apply these criteria depending on the need and the requisite achievable goals for rejuvenation of such water bodies.

Table 1 to Table 3 gives the mean or average BOD/Faecal Coliform values or range and the corresponding scores as well as categorization of the monitoring location

Table 1. Observed Mean or Average BOD Value in mg/l and corresponding BOD Score

S. No	*Mean or Average* BOD (Weightage-70 %)	
	Mean or Average BOD (in mg/l)	BOD Score (X)
1	> 48	100
2	24-48	80
3	12-24	60
4	6-12	40
5	< 6	20

Table 2. Observed Mean or Average Faecal Coliform (in MPN/100 ml) and corresponding FC Score

S. No	Mean or Average Faecal Coliform (Weightage -30 %)	
	Mean or Average Faecal Coliform (in MPN/100 ml)	FC Score (Y)
(1)	> 5,00,000	100
(2)	50000 to 5,00,000	80
(3)	5000 to 50,000	60
(4)	500 to 5000	40
(5)	<500	20

Table 3. Total Score and corresponding Category of River Monitoring Location

S. No	Total Score* (Z')	Category Class of the Monitoring location	Category of Monitoring location
(1)	81-100	Category -I	Critically Polluted
(2)	61-80	Category--II	Severely Polluted
(3)	41-60	Category -III	Moderately Polluted
(4)	21-40	Category -IV	Less Polluted
(5)	< 20	Category -V	Good or Fit For Bathing

Note:

(i) Above criteria must be considered only for the river locations having monitored at least for 2 years and 8 observations in each year covering at least pre-monsoon and post-monsoon period;

(ii) *Above criteria is a preliminary screening criteria for categorizing monitoring locations. However, comprehensive assessment needs to be done by States/UTs to arrive at the extent of contamination;*

(iii) *Please refer to the procedure for estimation of Total Score given in S.No 3.;*

2.1 **Criteria for Category- I – Critically Polluted: -** If the Total score is 81-100, then the monitoring location is categorized as **'Critically Polluted'.**

2.2 **Criteria for Category- II – Severely Polluted: -** If the Total score is 61-80, then the monitoring location is categorized as **'Severely Polluted'**

2.3 **Criteria for Category- III-Moderately Polluted: -** If the Total score is 41-60, then the monitoring location is categorized as **'Moderately Polluted'**

2.4 **Criteria for Category-IV –Less Polluted: -** If the Total score is 21-40, then the monitoring location is categorized as **'Less Polluted'**.

2.5 **Criteria for Category -V-Good or Fit for Bathing:-**If the Total score is ≤ 20, then the monitoring location is categorized as **'Good or Fit for Bathing'.**

*For easy understanding, flow chart given in **Figure 1** and steps for calculating the total score may also be referred in the subsequent paras: -*

3. Steps for calculating total score and categorizing of monitoring location: -

(i) *Depending on the average BOD measured value, assign the BOD score (X) as given in **Table 1.***

(ii) *Similarly depending on the average FC measured value, assign the FC Score (Y) as given in **Table 2.***

(iii) *Total score **(Z)** is estimated as: BOD Score **(X) X** (Weightage of BOD i.e., 70 %) + FC Score **(Y) X** (Weightage for FC i.e., 30 %). and*

(iv) *Now compare calculated Total Score (Z) with the **Z'** Value given in the Table 3 and the monitoring location is categorized suitably.*

For easy understanding, an Example 1 and Table 4 may be referred as given in the subsequent paras.

E.g. (1): *At a particular monitoring location, the average values of BOD and the FC values are observed as 6 mg/l and 9000 MPN/100 ml respectively. Then, the total score is calculated as*

- *X is the BOD Score corresponding to the mean BOD value of 6 mg/l as per* ***Table 1*** *= 20*
- *Y is the FC Score corresponding to the average FC value of 9000 MPN/100 ml as per* ***Table 2*** *= 60*
- *Calculated Total Score* ***(Z)*** *=* ***X*** *X* ***Weightage of BOD*** *+* ***Y*** *X* ***Weightage of FC*** *i.e.,20 X 0.7 + 60 X 0.3 = 14 + 18= 32.*
- *Compare 39 value with the* ***Z'*** *values given in* ***Table 3*** *to decide on the Category of the Monitoring Location. In this case, monitoring location is Category-IV i.e., 'Less Polluted',*

Table 4. Categorisation of Monitoring Location with Examples

Sl. No (I)	Mean or Average of BOD (mg/L) (II)	Mean or Average of Faecal Coliform (MPN/100mL) (III)	BOD Score (as per Table 1) (IV)	FC Score (as per Table 2) (V)	Calculation of Total score (Z) [0.70(Column IV) + 0.30(Column V)] (VI)	Monitoring Location Category Class (VII)
1	6.0	9000	20	60	32	IV
2	2.0	45	20	20	20	V
3	2.0	550000	20	100	44	III
4	45.0	80	80	20	62	II
5	24.0	200000	60	80	66	II
6	63.3	127500	100	80	94	I

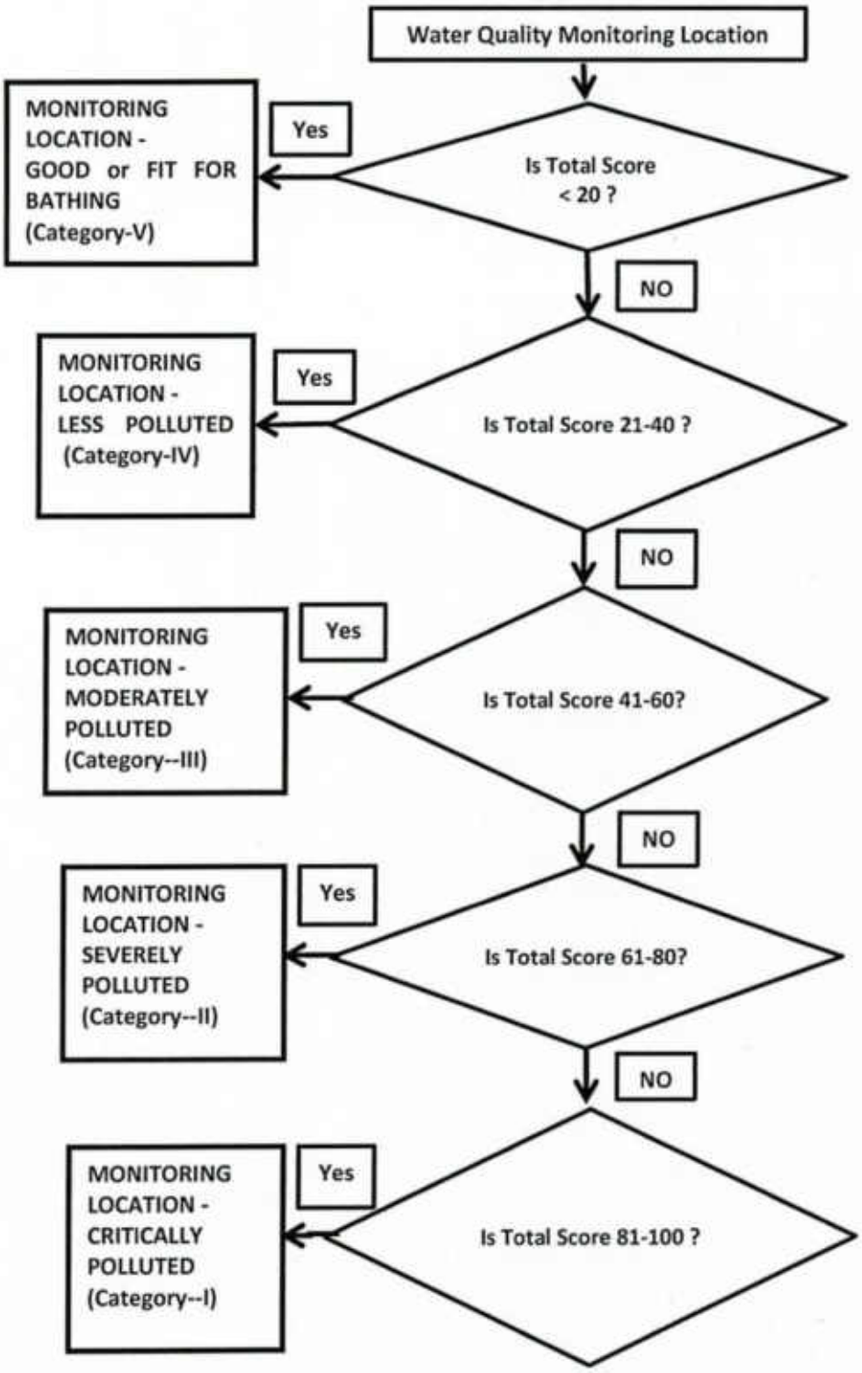

Figure 1. Flow Chart Showing Criteria for Categorization of River Monitoring Location

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Annexure- IX

Details of Performance Guarantee (PG)/
Bank Guarantee (BG) Submitted by the States/UTs

S. No	Name of State/ UT	No. of PRS	PG to be submitted as per Hon'ble NGT (Crores)	Details of PG or BG Submitted					
				Submitted by	Performance Guarantee (PG)/ Bank Guarantee (BG)	Submitted through (Bank/Govt Dept)	Date	PG/BG No	Amount (in Crore)
1	Madhya Pradesh	22	15	Executive Director, Environmental Planning and Coordination Organization	BG	PNB	16.8.2019	6310ILG000119	15
2	Manipur	9	10	Principal Secretary (Finance)	Sovereign Guarantee	State Govt. Manipur	12.7.2019	4/372/2019-FX(19)	10
3	Delhi	1	5	Delhi Pollution Control Committee (Govt. of NCT of Delhi)	PG	Article Guarantee Bond	29.4.2019	IN-DL80538150264526R	5
4	Odisha	19	15	Adl. Chief Secretary, Forest & Environment Dept Govt. of Odisha	PG	State Bank of India	5.7.2019	30/05	15
5	West Bengal	17	15	Program Director, WBSPMG & RRC member Convener	PG	United Bank of India	23.7.2019	109619ILPER0082	15
6	Puducherry	2	5	Chief Engineer, Public Works Department	PG	Article 37(ii) Guarantee Bond	3.8.2019	IN-PY33485861379024R	5
7	Goa	11	15	Department of Environment	BG	SBI	8.7.2019	0050919BG0000010	15
8	Jharkhand	7	10	Forest, Environment & Climate Change Department	PG	Guarantee Bond	3.8.2019	IN-JH19900009999127R	10
9	Haryana	2	5	Public Heath Dept.	BG	SBI	26.8.2019	0506219BG0000434	10
								0506219BG0000435	5
10	Daman & Diu	1	5	DDD Administration	BG	RBL	17.9.2019	PBGI00701900702	5
11	Gujarat	20	15						15
			0.08	Ahmedabad Hand Screen Printing Association (AHSPA)	BG	Bank of Baroda	4.6.2019	0734IGPER001419	0.08
			0.03	Green Environment Services Co-op. Soc. Ltd.	BG	Bank of India	1.6.2019	2026IPEBG190061	0.03
			0.01	Naroda Enviro Project Ltd.	BG	Yes Bank	10.6.2019	007BG01191610007	0.01
			0.22	Narol Textile Infrastructure & Enviro Management	BG	SBI	17.6.2019	0403819BG0000118	0.22
			0.40	Jetpur Dyeing and Printing Association	BG	SBI	1.6.2019	01/2019-20	0.40
			0.01	Shree Dhareshwar	BG	SBI	15.6.2019	09/2018-19	0.01

				GIDC Vistar Association					
			0.69	Vapi Green Enviro Ltd.	BG	Indian Bank	1.6.2019	00786IG190000013	0.69
			0.03	GHCL	BG	SBI	27.5.2019	0415219BG0000106	0.03
			0.08	Mafatlal Industries Ltd.	BG	Bank of Baroda	27.5.2019	1665IGPER000219	0.08
			0.05	Nadiad GIDC Association	BG	Indian Overseas Bank	31.5.2019	317471119000010	0.05
			0.3	New Palsana Enviro	BG	Bank of Baroda	13.6.2019	4189IGFIN000819	0.3
			0.45	Gujarat Eco Textile	BG	Bank of Baroda	2.7.2019	2595IGPER000419	0.45
			0.23	Vapi Notified Area Authority	BG	Bank of Baroda	21.6.2019	0238IGPER004919	0.23
			0.75	Sachin Notified Area Authority	BG	Bank of Baroda	15.7.2019	2557IGPER000419	0.75
			8.9	Gujarat Urban Development Mission	BG	Axis Bank	29.7.2019	00320100000438	8.9
			2.02	Panchayat Rural housing and Rural Development Department (Development Commissioner-Smart Village Society Gandhinagar of Gujarat State)	BG	Axis Bank	31.7.2019	00320100000440	2.02
			0.75	Somnath Trust	BG	Bank of Baroda	25.9.2019	3398IGPER000819	0.75

ANNEXURE-X

F.No.A-14011/1/2019-WQM-I 7718-7733 **14.10.2019**

To

1. The Member Secretary,
   Andhra Pradesh State Pollution Control Board,
   D.No.33-26-14 D/2, Near Sunrise Hospital,
   Pushpa Hotel Centre,
   Chalamvari Street Kasturibaipet, Vijayawada- 520 010

2. The Member Secretary,
   Bihar State Pollution Control Board
   Parivesh Bhawan, Plot No. NS-B/2
   Paliputra Industrial Area,
   Patliputra, Patna (Bihar)-800 010

3. The Member Secretary,
   Goa State Pollution Control Board,
   Nr. Pilerne Industrial Estate,
   Opp. Saligao Seminary, Saligao - Bardez Goa – 403511

4. The Member Secretary,
   Jharkhand State Pollution Control Board,
   H. E. C, Dhurwa,
   Ranchi- 834004

5. The Member Secretary,
   Karnataka State Pollution Control Board
   Parisara Bhavan, 49, 4th & 5th Floor,
   Church Street, Bengaluru-560001

6. The Member Secretary,
   Mizoram Pollution Control Board
   New Secretariat Complex, Khatla,
   Khatla Thlânmual Pêng, Aizawl, Mizoram – 796001

7. The Member Secretary,
   Rajasthan State Pollution Control Board,
   4 Jhalana Institutional Area Jhalana Doongri,
   Jaipur (Rajasthan) – 302004

8. The Member Secretary,
   Tripura Pollution Control Board,
   Parivesh Bhawan, Pandit Nehru Complex,
   P.O., Kunjaban, Gorkhabasti Agartala – 799 006

9. The Member Secretary,
   Department of Science, Technology and Environment,
   Housing Board Complex,
   3rd Floor, Anna Nagar, Puducherry-600 005

10. The Member Secretary,
    Chhattisgarh Environment Conservation Board,
    North Block Sector-19,
    Naya Raipur (C.G.) 492002

11. The Member Secretary,
    Sikkim State Pollution Control Board
    Forest, Environment Wildlife Management Department
    Government of Sikkim Forest Secretariat Annex I,
    Ground Floor, Deorali, Gangtok -737102

Sub: Minutes of the review meeting held in CPCB on 12.09.2019 in compliance to Hon'ble NGT (PB) New Delhi orders dated 20.09.2018 ,19.12.2018 & 08.04.2019 in O. A No. 673/2018

Sir,

Please find enclosed minutes of review meeting held on 12th September, 2019 in CPCB, Delhi, for kind information and necessary action in light of the decisions taken in the afore-said meeting and arrange to submit RRC approved revised action plan, at an early date to CPCB.

Also, it is requested that revised action plan be uploaded in States/UTs website to have access to the public.

Yours faithfully,

(A. Sudhakar)
Division Head, WQM-I

Encl: As above

Copy to:

1. PS to 'MS' : For kind information of 'MS' please
2. RD (Bengaluru, Bhopal, Kolkata, Shillong & Chennai) : For information & follow up with concerned SPCBs/PCCs, please

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
निर्गत.....
दिनांक.....
15/10/19

(A. Sudhakar)

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Central Pollution Control Board

(Ministry of Environment, Forest & Climate Change, Govt. of India)
Parivesh Bhawan, East Arjun Nagar,
Delhi – 110032
****

Minutes of review meeting held on 12.09.2019 in Conference Hall, 2nd Floor, CPCB, Delhi for ensuring compliance to Hon'ble NGT (PB), New Delhi orders dated 20.09.2018, 19.12.2018 and 08.04.2019 in OA No 673/2018 in the Matter of News Item Published in 'THE HINDU' Titled "More river stretches are now critically polluted: CPCB"

A review meeting was held on **September, 12, 2019** in CPCB under the Chairmanship of Dr. Prashant. Gargava, Member Secretary, CPCB for scrutinizing revised and RRC approved action plans for rejuvenation of identified polluted river stretches (from P-III to P-V category) received from States viz. Andhra Pradesh, Bihar, Chhattisgarh, Goa, Jharkhand, Karnataka, Mizoram, Rajasthan, Sikkim, Tripura and Puducherry Pollution Control Committee for ensuring compliance to Hon'ble NGT orders dated 20.09.2018, 19.12.2018 and 08.04.2019 in OA No 673/2018. Representatives of States viz Chattisgarh & Sikkim have not attended the meeting. List of participants is annexed **(Annexure-I)**.

Dr. Prashant Gargava, Member Secretary, CPCB, welcomed the officials of States & UT Government and requested Sh. A. Sudhakar, DH-WQM-I to brief about latest Hon'ble NGT orders in respect of P-III to P-V (and not P-I or P-II) polluted river stretches. Sh. A. Sudhakar DH, WQM-I informed that considering all aspects as per NGT order for rejuvenation of PRS in respective States/UTs to meet bathing quality crieteria i.e. BOD ≤ 3mg/l , River Rejuvenation Committees (RRCs) constituted in compliance to Hon'ble NGT order dated 20.09.2019 have to upload the approved action plan on website by respective SPCBs/PCCs seeking views of public if any.

Thereafter, Member Secretary, CPCB, requested representatives of States/ State Government/ UT administration officials to present detailed action plans of polluted river stretches of P-III to P-V category. All 8 States & 1UT viz i.e. Andhra Pradesh, Bihar, Goa, Jharkhand, Karnataka, Mizoram, Rajasthan, Tripura and Puducherry presented their action plans which were reviewed. Upon detailed deliberations, State-wise decisions/ suggestions made are detailed in the table below:

S.No	State/UT	Identified polluted river stretches		Observations of CPCB on the action plans presented by the States/UTs
		River	Stretch	
1	Bihar	Sirsia P-III	Ruxol to Koirea Tola (Raxaul)	Representatives of Bihar presented the proposed action in respect of river Sirsia and informed that all

		Farmar P-V	Along Jogbani	the action plans were prepared in similar lines. Main observations made by CPCB during the meeting are • Projected population not taken into account for assessment of sewage generation and action plans for Septage management to be included. • Drains also be analyzed for heavy metals and results included. • Option of Bio-remediation of drains/wetlands in rural areas also be included. • Water consumption by industrial sector not included. Also, Industries operating in the river catchment which have not obtained NOC from CGWA for abstraction of ground water and not complying to prescribed discharge standards to be included and action be initiated against such industries. • Detailed gap analysis w.r.t Waste Managemen (Solid waste, MSW, HW, E-waste, biomedical waste, plastic waste) be included. • Encroachment in flood plain zone to be removed. • Action plan for utilization of treated sewage to be included in action plan. • Performance Guarantee to be submitted by State Govt. as per Hon'ble NGT Order dated 08.04.2019. • Action point-wise definite timelines & budget estimate to be included
		Ganga P-V	Buxar to Bhagalpur	
		Punpun P-V	Gaurichak to Fatuha	
		Ramrekha P-V	Harinagar to Ramnagar	
		Sikrahna P-V	Along Narkatiaganj	
2.	Goa	Sal	Khareband To Mobor	MS, Goa SPCB made a presentation on proposed action in respect of river Sal and main observations of CPCB made during presentation are • Latest water quality of tributaries and drains for general parameters including Heavy metals and ground water in the catchment area to be included. • River-wise detailed gap analysis with respect to sewage, Industrial Effluent and waste (MSW, HW, E-waste, biomedical waste, plastic waste)management to be included.
		Marcela To Volvoi	Marcela To Volvoi	
		Talpona	Along Canacona	
		Assonora	Assonora To Sirsaim	
		Bicholim	Bicholim To Curchirem	
		Chapora	Pernem To Morjim	

		Khandepar	Ponda To Opa	• I& D of sewage from all major drains contributing to pollution to be included • All water polluting industries along the river catchment to be included. • Action plan to be revised covering other aspects w.r.t Adoption of good irrigation practices/ utilization of treated sewage to minimize abstraction of ground water ground water recharge development of bio-diversity parks including removal of encroachment along the banks of polluted river to be included. • Action point-wise timelines & budget to be included as per Hon'ble NGT order dated 08.04.2019 • Performance Guarantee to be submitted by the State Govt. as per Hon'ble NGT Order dated 08.04.2019
		Sinquerim	Along Candolim	
		Tiracol	Along Tiracol	
		Valvant	Sankli – Bicholim To Poriem	
		Zuari	Curchorem To Madkai	
3.	Jharkhand	Garga	Along Talmuchu	Representatives of Jharkhand State made presentation on proposed action plan in respect of river Garga and main observations of CPCB made during presentations are • Water quality of drains contributing pollution and ground water in the catchment area for general and core parameter including Heavy metals to be included. • River wise gap analysis w.r.t sewage and industrial effluent management and waste management (MSW, HW, E-waste, biomedical waste, plastic waste) and requisite infrastructure for management be included. • Action plan to be revised covering other aspects w.r.to Adoption of good irrigation practices/ utilization of treated sewage to minimize abstraction of ground water, FPZ protection and its management, rain water harvesting and ground water recharge, maintaining E-flows and water shed management and setting up of Bio-diversity parks including removal of encroachment along the banks
		Sankh	Kongserabasar to Bolba	
		Subarnarekha	Hatia Dam to Jamshedpur	
		Damodar	Phusro Road Bdg to Turio	
		Jumar	Kanke Dam to Kadal	
		Konar	Along Tilaya and Konar	
		Nalkari	along Patratu	

				of polluted river to be included. • Performance Guarantee to be submitted by the State Govt. as per Hon'ble NGT Order dated 08.04.2019 • Achievable target & budget estimate to be specified & included.
4	Karnataka	Arkavathi	Halli Reservoir to Kanakapura Town	Representatives of Karnataka State made presentation on proposed action in respect of river Krishna and main observations of CPCB made during presentation are • Map showing all the towns, distributaries, drains & industrial estates, contributing to pollution to be included • Latest water quality of drains including flow characteristics, as well as Ground water quality in terms of general and core parameters including heavy metals in the catchment area be included. • Detailed gap analysis w.r.t sewage, industrial effluent and waste management such as (MSW, HW, E-waste, biomedical waste, C& D waste and plastic waste) along with existing infrastructure needs to be included. • Other aspects such as adoption of good irrigation practices, utilization of treated sewage to minimize abstraction of groundwater or use of surface water, Flood plain zone protection and its management, setting up of bio-diversity parks including removal of encroachment, plantation on both sides of the river removal of encroachment to be covered as directed by Hon'ble NGT vide order dated 19.12.2018. • Action point-wise definite & specific time lines to achieve the desired water quality goals to be included. • Performance Guarantee to be submitted by State Govt. as per Hon'ble NGT Order dated 08.04.2019
		Lakshmantirtha	Kattemalavadi to Hunsur	
		Malprbha	Khanapur to Dharwad	
		Tungabhadra	Harihar to Korlahalli	
		Bhadra	Holehunnur to Bhadravath	
		Cauvery	Ranganathittu to Sathyamangalam Bridge	
		Kabini	Nanjanagud to Hejjige	
		Kagina	Shahabad to Hongunta	
		Kali	Hasan Maad (West Coast Paper Mill) to Bommanahalli Reservoir	
		Krishna	Yadurwadi to Tintini Bridge	
		Shimsha	Yediyar to Halagur	
		Asangi Nalla	Along Asangi	

		Bhima	Ghanapur to Yadgir	
		Kumardhara	Along Uppinangadi	
		Netravathi	Uppinangadi to Mangaluru	
		Tunga	Shivamoga to Kudli	
		Yagachi	Along Yagachi, Hassan	
5	Rajasthan	Banas	Along Bisalpur Dam, Swaroopganj, Newta Dam	Representatives of Rajasthan State made presentation on proposed action plan for rejuvenation of river Chambal & main observations of CPCB made during presentation are • Achievable water quality goals to be included • Flow of all drains contributing to pollution to be included. • Latest ground water quality w.r.t basic & core parameter as well as heavy metals to be included. • Aspects in compliance to the Hon'ble NGT Orders dated 20.09.2018 and 19.12.2018 such as Flood Plain Zone protection and its management, Setting up of bio-diversity parks, Interception and diversion of sewage/industrial effluent carrying drains to CETPs/STPs to be added • Action point-wise definite & specific time lines and budget estimates to achieve the desired water quality goals to be included • Performance Guarantee to be submitted by the State Govt. as per Hon'ble NGT Order dated 08.04.2019
		Chambal	Sawaimadhopur to Kota	

6	Andhra Pradesh	Kundu	Nandyal to Madduru	Representatives of Andhra Pradesh State made presentation on proposed action plan for rejuvenation of river Godavari and main observations of CPCB made during presentation are • Detailed list of major towns distributaries & major drains contributing to pollution in the catchment of identified river stretches along with a digital map showing details to be included • Flow details of all the drain contributing to pollution to be included • Latest characteristics of water quality of, tributaries, drains and ground water in the catchment area for general and core parameter including heavy metals to be included. • Detailed gap analysis w.r.t town-wise sewage management (on the basis of projected population) and waste management such as (MSW, HW, E-waste, biomedical waste, plastic waste) be included. • Achievable water quality goals with timelines required to be included. • Action plans be revised covering all other aspects such as adoption of good irrigation practices/ utilization of treated sewage to minimize abstraction of ground water, FPZ protection and its management, rain water harvesting and ground water recharge, maintaining E-flows and water shed management and setting up of Bio-diversity parks including removal of encroachment along the banks of polluted river. • Action point-wise implementing agency, timelines and budget estimates to be included
		Tungabhadra	Manthralayam to Bavapuram	
		Godavari	Rayanpeta to Rajahmundri	
		Krishna	Amravathi to Hamsala Deevi	

		Nagavali	along Thotapalli	
7	Puducherry	Arasalar	Along Karaikal	Representatives of Puducherry UT made presentation on proposed action in respect of river Chunambar and main observations of CPCB made during presentation are • Latest water quality of polluted river, drains including flow characteristics, as well as Ground water quality in the catchment area to be included • Town- and industry - wise gap analysis with regard to sewage, industrial effluent and waste management such as (Solid waste, Plastic waste, Biomedical waste, E-waste, Construction & Demolition and Hazardous waste management) to be included • Aspects such as Adoption of good irrigation practices, utilization of treated sewage to minimize abstraction of groundwater or use of surface water, Flood plain zone protection and its management, Rain water harvesting/ground water recharge aspects, removal of encroachment as well as interception & diversion of drains carrying sewage to nearby STPs/ upcoming STPs to be included • Action point-wise definite time lines to be provided to achieve the desired goals
		Chunnambar	Along Ariyankuppam	
8	Mizoram	Tiau	Along Champhai	Representatives of Mizoram State made presentation on proposed action in respect of river Tiau and main observations of CPCB made during presentation are • Projected Population is not considered while making assessment of sewage generation • Water polluting industries such as automobile service centres also be covered under Water (Prevention and Control of Pollution) Act, 1974/ Authorization under Hazardous And Other Wastes (Management and Trans boundary Movement) and included in the report.
		Tlawng	Along Zobawk, Sairang To Bairabi	
		Tuipui	Along Champhai	
		Tuivawl	Along Keifang	
		Chite	Along Armed Veng	
		Mat	Along Serchhip	
		Saikah	Along Lawngtlai	
		Tuikual	Along Serchhip	
		Tuirial	Along Tuirial, Aizwal	

				• Latest ground water quality w.r.t. general and core parameter as well as heavy metals to be included • Quantification and detailed gap analysis with respect to waste such as (solid waste, Hazardous waste, Bio-medical waste, E waste, plastic waste and Construction & Demolition waste) and existing infrastructure to be included • Achievable goals for restoration of water bodies to be indicated • Action point-wise speedy, definite or specific timelines, organization responsible for implementation of action plans and total estimated budget with justification also be included • Other aspects in compliance to Hon'ble NGT order such as ground water extraction, adopting good irrigation practices, protection and management of flood plain zone, rain water harvesting, ground water charging, maintaining environmental flow of river, plantation on both sides of river, setting up biodiversity parks on flood plains by removing encroachment to be included • Performance Guarantee by the State Govt. to be submitted as per Hon'ble NGT Order dated 08.04.2019
9	Tripura	Burigaon	Along Bishalgarh	Representatives of Tripura State made presentation on proposed action plan for rejuvenation of river Tiau and main observations of CPCB made during presentations are • Achievable water quality goals within the stipulated timelines to be included • Latest water quality of drains with flow, as well as Ground water assessment in the catchment area to be included • Gap analysis w.r.t generation and existing
		Gumti	Telkajila To Amarpur	
		Haora	Agartala To Bishramganj	
		Along DHARMANAGAR	Along DHARMANAGAR	
		Khowai	Along Teliamura	

		Manu	Along Kailashahar	infrastructure for sewage, industrial effluent and waste management to be clearly indicated. • Action point-wise organization responsible for implementation, definite timeline and the budget estimate to be included • Performance Guarantee by the State Govt. to be submitted as per Hon'ble NGT Order dated 08.04.2019

In the review meeting, it was also suggested to all the States/UTs that for any activity directed by Hon'ble NGT which could not be included as a part of proposed action plans for rejuvenation of identified polluted river stretches in the respective States/UTs, in such a case, all the concerned States/UTs are required to file an affidavit seeking exemption for specific activity before Hon'ble NGT with justification seeking exemption of such activity from the Action plan.

Also, the States/UTs are suggested to revise the action plans in light of the discussion and observations (CPCB observation were communicated earlier also) of CPCB and after approval of RRC, actions be completed for ensuring compliance to within the timelines i.e by March 31, 2021 and .action taken reports be submitted by States/UTs periodically to CMC for apprising Hon'ble NGT accordingly.

The Meeting ended with vote of thanks to the Chair.

--oo—

Annexure -I

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest & Climate Change)
"Parivesh Bhawan", East Arjun Nagar,
Delhi-110032

Review meeting held on 12.09.2019 in Conference Hall, 2nd Floor, CPCB, Delhi for ensuring compliance to Hon'ble NGT (PB), New Delhi orders dated 20.09.2018, 19.12.2018 and 08.04.2019 in OA No 673/2018 in the Matter of News Item Published in 'THE HINDU' Titled "More river stretches are now critically polluted: CPCB"

S.No	NAME	ORGANISATION	DESIGNATION	Contact no	EMAIL
	Review Committee Members				
1	**Dr. Prashant Gargava**	**CPCB**	**Member Secretary**	22303655	**mscb.cpcb@nic.in**
2	Sh. A. Sudhakar	CPCB	AD & DH-WQM-I	8800326699	asudhakar.cpcb@nic.in
3	Sh. J.C.Babu	WQM-1, CPCB	Sc.E & Add. Director	9868278903	jcb.cpcb@nic.in
	Bihar PCB/ Govt. Officials				
4	Sh. S.N. Jayaswal	BSPCB	Board Analyst	9431425750	bspcb@yahoo.com jayaswalsn@gmail.com
	Goa PCB/ Govt. Officials				
5	Dr. Shamila Monteiro	GSPCB	MS	9326125025	Ms-gpscbgoa@nic.in
6	Dr. Mohan R. Girap	GSPCB	Sc–C	9422451650	mgirap@gmail.com
7	Ms. Nandan Prabhudess	GSPCB	JEE		n_dhume@rediffmail.com
	Jharkhand PCB/ Govt. Officials				
8	Sh. Chandan Kumar	JSPCB	CE	8292400560	Er.chandankumar90@gmail.com
9	Sh. Kumar Gourav Jain	JSPCB	CE.	7762845805	Kgouravjain13@gmail.com
	Karnataka PCB/ Govt. Officials				
10	Dr. H.Lokeshwari	KSPCB	CSO	9448485226	ecckspcb@gmail.com
	Andhra Pradesh PCB/ Govt. Officials				
11	Dr. B.V Prasad	APPCB	JSO	8008407053	bvprasad2appcb.gov.in
	Rajasthan PCB/ Govt. Officials				

2	Sh. Bhuvenesh Mathur	RPCB	EE	9414071118	scmg.rpcb@gmail.com
Mizoram PCB/Govt. Officials					
13	Dr. Lalramghaki Pachua	MPCB	Sc-B	9436146946	mpcb@mail.gov.in
14	Mr .Joseph Lalhnunliana	MPCB	JSA	9436351035	mpcb@mail.gov.in

ANNEXURE -XI

F.No.A-14011/OA-673/2019-WQM-I 7005-7043

26.09.2019
HON'BLE NGT MATTER
IMPORTANT

To
PS to Chief Secretary
States/UT Administration

Sub: Information to be provided as per the attached format with respect to Status on Implementation of Action Plans for Restoration of Identified Polluted River Stretches for ensuring compliance to Hon'ble NGT (PB) New Delhi orders dated 20.09.2018, 19.12.2018 & 08.04.2019.

Sir,

As per Hon'ble NGT order dated 08.04.2019 in OA NO 673 of 2018, CMC is required to file the status related to implementation of action plans for rejuvenation of identified Polluted River Stretches apart from aspects as covered under OA No. 606/2019. In this connection, CPCB is required to compile information pertaining to status on implementation of approved action plans for rejuvenation of polluted river stretches and for ensuring compliance to Hon'ble NGT order in OA No 673/2018.

In view of the above, it is requested to arrange and send information in light of the format enclosed within two weeks and thereafter once in a quarter to CPCB to enable to apprise CMC, accordingly.

Yours faithfully,

(A. Sudhakar)
Division Head, WQM-I
O/C

Encl: As above
Copy to:

1. Joint Secretary, CP Division, MoEF&CC, New Delhi : For information, please
2. PS to 'CCB' : For kind information of 'CCB' please
3. PS to 'MS' : For kind information of 'MS' please
4. All RDs, CPCB : For information & follow up with concerned SPCBs/PCCs, please
5. Member Secretary (SPCBs/PCCs) : For information, with a request to arrange to send desired information, please
6. LO (UT), CPCB, Delhi : For information, please

(A. Sudhakar)
O/C

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
निर्गत.....
दिनांक 27/09/19

1. PS to Chief Secretary,
Government of Assam
Block- C, 3rd Floor,
Assam Sachivalaya
Dispur - 781006, Guwahati

2. PS to Chief Secretary,
Government of Manipur
South Block, Old Secretariat
Imphal-795001

3. PS to Chief Secretary,
Government of Uttar Pradesh
1st Floor, Room No. 110
Lal bahadur Shastri Bhawan
Uttar Pradesh Secretariat,
Lucknow - 226 001

4. PS to Chief Secretary,
Delhi Secretariat,
IP Estate, New Delhi - 110002

5. PS to Chief Secretary,
Government of Meghalaya
Main Secretariat Building
Rilang Building, Room No. 321
Meghalaya Secretariat,
Shillong – 793001

6. PS to Chief Secretary,
Government of Nagaland
Civil Secretariat,
Kohima-797004

7. PS to Chief Secretary,
Government of Tamil Nadu
Secretariat, Chennai – 600009

8. PS to Chief Secretary,
Government of Uttarakhand
4 Subhash Road, Uttarakhand Secretariat
Dehradun – 248001

9. PS to Chief Secretary,
Secretariat, Moti, Silvasa,
Daman - 396220

10. PS to Chief Secretary,
Government of Haryana
4th Floor, Haryana Civil Secretariat
Sector-1, Chandigarh – 160019

11. PS to Chief Secretary,
Government of Andhra Pradesh
1st Block, 1st Floor
A.P Secretariat Office,
Velagapudi – 522503

12. PS to Chief Secretary,
Government of Bihar
Main Secretariat, Patna – 800015

13. PS to Chief Secretary,
Government of Chhattisgarh
Mahanadi Bhawan, Mantralaya
Naya Raipur - 492002

14. PS to Chief Secretary,
Government of Goa Secretariat,
Porvroim, Bardez, Goa – 403521

15. PS to Chief Secretary,
Government of Gujarat
1st Block, 5th Floor Sachivalaya,
Gandhinagar – 382010

16. PS to Chief Secretary,
Government of Himachal Pradesh
H P Secretariat, Shimla –171002

17. PS to Chief Secretary,
Government of Jammu & Kashmir
R. No. 2/7, 2nd, Floor Main Building
Civil Secretariat, Jammu – 180001

18. PS to Chief Secretary,
Government of Jammu & Kashmir
R. No. 307, 3rd Floor
Civil Secretariat, Srinagar – 190001

19. PS to Chief Secretary,
Government of Jharkhand
1st Floor, Project Building,
Dhurwa, Ranchi- 834004

20. PS to Chief Secretary,
Governement of Karanataka
Room No. 320, 3rd Floor
Vidhana Soudha, Bengaluru - 560 001

21. PS to Chief Secretary,
Government of Kerala
Secretariat, Thiruvananthapuram - 695001

22. PS to Chief Secretary,
Government of Madhya Pradesh
MP Mantralaya, Vallabh Bhavan
Bhopal – 462004

23. PS to Chief Secretary,
Government of Maharashtra
CS Office Main Building, Mantralaya
6th Floor, Madame Cama Road,
Mumbai – 400032

24. PS to Chief Secretary,
Government of Mizoram
New Secretariat Complex,
Aizwal – 796001

25. PS to Chief Secretary,
Government of Odisha
General Administration Department
Odisha Secretariat, Bhubaneswar - 751001

26. PS to Chief Secretary,
Chief Secretariat, Goubert Avenue,
Puducherry – 605001

27. PS to Chief Secretary,
Government of Punjab
Chief Secretary Office,
6th Floor, Punjab Civil Secretariat -1,
Sector 1, Chandigarh, 160001

28. PS to Chief Secretary,
Government of Rajasthan
Secretariat, Jaipur – 302005

29. PS to Chief Secretary,
Government of Sikkim
New Secretariat,
Gangtok – 737101

30. PS to Chief Secretary,
Government of Telangana
Block C, 3rd Floor,
Telangana Secretariat, Khairatabad,
Hyderabad, Telangana - 500022

31. PS to Chief Secretary,
Government of Tripura
Agartala West Tripura
New Secretariat Complex
Secretariat-799010

32. PS to Chief Secretary,
Government of West Bengal
Nabanna, 13th Floor, 325,
Sarat Chatterjee Road, Mandirtala
Shibpur, Howrah – 711102

33. PS to Chief Secretary,
Raj Bhawan, Chandigarh

34. PS to Chief Secretary,
Andaman and Nicobar Administration
Secretariat, Port Blair – 744101

35. PS to Chief Secretary,
Government of Arunachal Pradesh
Civil Secretariat, Itanagar – 791111

36. PS to Chief Secretary,
Lakshadweep, Kavaratti – 682555

1. Regional Director,
Central Pollution Control Board
Regional Directorate (South)
1st Floor, Nisarga Bhawan,
A-Block, Thimmaiah
Road, 7th D cross,
Shivnagar, Opp Pushpanjali
Theatre, Bengaluru 560079

2. Regional Director,
Central Pollution Control Board
Regional Directorate – Shillong
"TUM-SIR". Lower Motinagar,
Near Fire Brigade H.Q.,
Shillong, Meghalaya-793014

3. Regional Director,
Central Pollution Control Board
Regional Directorate- Kolkata
Southend Conclave, Block 502,
5th & 6th Floors, 1582 Rajdanga Main Road
Kolkata - 700 107

4. Regional Director,
Central Pollution Control Board
Regional Directorate – Bhopal
3rd Floor, Sahkar Bhawan, North TT Nagar,
Bhopal - 462003

5. Regional Director,
Central Pollution Control Board
Regional Directorate - Vadodara
Parivesh Bhawan,Opp. VMC Ward Office No. 10,
Subhanpura, Vadodara-390 023

6. Regional Director,
Regional Directorate - Lucknow
PICUP Bhawan, Vibhuti Khand,
Gomti Nagar, Lucknow– 226010

1. The Member Secretary,
Assam Pollution Control Board,
Bamunimaidam,
Guwahati – 781021

2. The Member Secretary,
Manipur Pollution Control Board,
Lamphelpat; Imphal West D.C. Office Complex
Imphal– 795004

3. The Member Secretary,
Uttar Pradesh Pollution Control Board,
Building.No. TC-12V, Vibhuti Khand,
Gomti Nagar, Lucknow-226 010

4. The Member Secretary,
Delhi Pollution Control Committee,
Government of N.C.T. Delhi
4th Floor, ISBT Building,
Kashmere Gate, Delhi-110006

5. The Member Secretary,
Meghalaya Pollution Control Board
Arden- Lumpyngngad
Shillong: 793014

6. The Member Secretary,
Nagaland Pollution Control Board,
Signal Point, Dimapur
Nagaland – 797112

7. The Member Secretary,
Tamil Nadu Pollution Control Board,
76, Mount Salai, Guindy,
Chennai-600 032

8. The Member Secretary,
Uttarakhand Environmental Protection & Pollution Control Board,
29/20, Nemi Road,
Dehradun, Uttarakhand – 248001

9. The Member Secretary,
Daman, Diu & Dadra Nagar Haveli Pollution Control Committee,
Office of the Deputy Conservator of Forests,
Fort Area, Court Compound,
Moti Daman, Daman – 396220

10. The Member Secretary,
Andhra Pradesh Pollution Control Board
D.No. 33-26-14 D/2, Near Sunrise Hospital,
Pushpa Hotel Centre, Chalamalavari Street,
Kasturibaipet, Vijayawada – 520 010

11. The Member Secretary,
Bihar State Pollution Control Board,
Parivesh Bhawan, Plot No. NS-B/2
Paliputra Industrial Area,
Patliputra, Patna (Bihar) - 800 010

12. The Member Secretary,
Chhattisgarh Environment Conservation Board,
Paryavas Bhavan, North Block Sector-19,
Atal Nagar Dist- Raipur (C.G.) 492002

13. The Member Secretary,
Goa State Pollution Control Board,
1st Floor, Dempo Tower,
EDC Patto Plaza, Panaji, Goa-403 001

14. The Member Secretary,
Gujarat Pollution Control Board
Paryavan Bhavan, Sector 10- A,
Gandhinagar – 382 043

15. The Member Secretary,
Himachal Pradesh Pollution Control Board,
Him Parivesh, Phase-III,
New Shimla, Himachal Pradesh 171009

16. The Member Secretary,
Jammu & Kashmir State Pollution Control Board,
Parivesh Bhawan, Forest Complex,
Gladni, Narwal, transport Nagar, Jammu,
Jammu and Kashmir 180004

17. The Member Secretary,
Jammu & Kashmir State Pollution Control Board,
Shiekh-ul-Campus, behind Govt. Silk Factory,
Raj Bagh, Srinagar (J&K)

18. The Member Secretary,
Jharkhand Pollution Control Board,
T.A Building, HEC, P.O. Dhurwa,
Ranchi – 834004

19. The Member Secretary,
Karnataka State Pollution Control Board,
Parisara Bhavan, 4th & 5th Floor,

Haryana State Pollution Control Board,
C-11, Sector-6, Panchkula-134109,
Haryana

21. The Member Secretary,
Kerala State Pollution Control Board,
Plamoodu Jn., Pattom Palace P.O.
Thiruvananthapuram - 695 004

22. The Member Secretary,
Madhya Pradesh Pollution Control Board,
E-5, Arera Colony, ParyavaranParisar,
Bhopal - 462 016, Madhya Pradesh

23. The Member Secretary,
Maharashtra Pollution Control Board,
Kalpataru Point, 2nd – 4th Floor
Opp. Cine Planet Cinema,
Nr. Sion Circle, Sion (E)
Mumbai – 400 022

24. The Member Secretary,
Mizoram Pollution Control Board,
New Secretariat Complex,
KhatlaThlanmualPeng,
Khatla, Aizawl, Mizoram: 796001

25. The Member Secretary,
Odisha Pollution Control Board,
A-118, Nilakanta Nagar, Unit –VIII,
Bhubaneshwar – 751012

26. The Member Secretary,
Puducherry Pollution Control Committee,
Housing Board Complex, Anna Nagar,
Puducherry -600 005

27. The Member Secretary,
Punjab Pollution Control Board,
Vatavaran Bhawan, Nabha Road,
Patiala, Punjab

28. The Member Secretary,
Rajasthan Pollution Control Board,
4, Jhalana Institutional Area,
Jhalana Doongri,
Jaipur (Rajasthan) - 302 004

49, Church St., Bengaluru-560 001

29. The Member Secretary,
Sikkim State Pollution Control Board,
Department of Forest,
Environment & Wildlife Management
Government of Sikkim,
Deorali, Gangtok, -737102

30. The Member Secretary,
Telangana State Pollution Control Board,
Paryavaran Bhawan, A-3, I.E. Sanath Nagar,
Hyderabad-500 018

31. The Member Secretary,
Tripura Pollution Control Board,
Vigyan Bhawan, Pandit Nehru Complex,
Gorkhabasti, PO: Kunjaban Agartala – 799006

32. The Member Secretary,
West Bengal Pollution Control Board,
Paribesh Bhavan, 10A, Block-L.A.,
Sector III, Salt Lake City,
Kolkata - 700 106

33. The Member Secretary,
Lakshadweep Pollution Control Committee,
Department of Science, Technology &
Environment,
Kavarati- 682555

34. The Member Secretary,
Arunachal Pradesh State Pollution Control
Board,
Paryavaran Bhawan, Papu Hill, Yupia Road,
Naharlagun- 791110

35. The Member Secretary,
Andaman & Nicobar Islands Pollution Control
Committee,
Department of Science & Technology,
Dollygunj Van Sadan, Haddo P.O., Port
Blair – 744102

36. The Member Secretary,
Chandigarh Pollution Control Committee,
Paryavaran Bhawan, Ground Floor, Sector 19 B
Madhya Marg, Chandigarh

CENTRAL POLLUTION CONTROL BOARD
(Water Quality Management Division-I)
"Parivesh Bhawan", East Arjun Nagar,
Delhi-110032
*****

Status on Implementation of Action Plans for Restoration of Identified Polluted River Stretches for ensuring compliance to Hon'ble NGT Orders dated 20.09.2018, 19.12.2018 and 08.04.2019

Name of the State/UT:- **No. of Identified Polluted River Stretches :-**

Contact details of the Nodal Officer:-

S.No	KEY COMPONENTS OF PROPOSED ACTION PLANS FOR RESTORATION OF IDENTIFIED POLLUTED RIVER STRETCHES IN STATEs/UTs	Proposed Achievable Target	Proposed Time Targets for compliance	Present Status and or pendency in terms of %	Remarks
1	PERT Chart in respect of implementation of action plans for each polluted river stretch	(Pl. enclose as attachment)	-		
2	Latest water quality - River, tributaries, drains and groundwater characteristics in the catchment	(Pl. enclose as attachment)	-		
3	**Status on implementation of action plans**				
	A. Sewage Management				
	Commissioning of STPs with State of Art technologies including flow measuring devices at all salient points				
	Bioremediation of Drains				
	Upgradation of existing STPs with State of Art technologies				
	Laying of new sewerage pipelines & House connections				
	Interception & Diversion of Sewage from Drains				
	STP Sludge Management				
	Septage Management				

	Restoration of natural storm water drains for ensuring natural flow				
	Utilization of treated sewage				
	Ensuring proper Operation and Maintenance of STPs				
	Maintenance of drains and sewage network including periodic cleaning				
	Awareness and training for the concerned authorities				
	B. Industrial Effluent Management				
	Identification of non-complying as well as illegal units				
	Closure Direction for non- complying and illegal units				
	Upgradation of existing captive ETPs or construction of new ETPs by individual industries				
	Upgradation of existing CETPs with State of Art technologies				
	Commissioning of new CETPs with State of Art technologies				
	Interception & diversion of industrial effluent from drains carrying industrial effluents				
	Installation of OCEMS by industries and connectivity of all OCEMS with SPCB/PCC and CPCB server				
	Utilization of treated effluent and reduction of water consumption by the industries				
	Adoption of Zero Liquid Discharge by the industries as per Directions of CPCB				
	Notification of PETP standards				
	Awareness and training for the concerned authorities of O& M of ETPs/CETPs				
	C. Municipal Solid Waste Management				
	Commissioning of Integrated Waste Management Facilities or Sanitary Land Fills or Bio manure or Pellets making or Waste to Energy Plants				
	Bio- mining and capping of existing dump sites				
	Leachate management including Ground Water remediation in the vicinity of existing dumpsites				
	D. Biomedical Waste Management				
	Commissioning of new Common Biomedical Waste Treatment and Disposal Facilities (CBMWTDF)				

	Ensuring disposal of generated Biomedical waste through captive measures by the Healthcare Facilities where there is CBMWTDF				
	Implementation of Barcode system by Healthcare facilities and CBMWTDF				
	Upgradation of existing CBMWTDF				
	E. Hazardous Waste Management				
	Commissioning of Integrated Hazardous Waste Management Facility/ Secured Land fill facilities/ Incinerators				
	Remediation of any contaminated site in the catchment of Polluted River Stretch				
	Resource recovery and recycling of Incinerable waste through Cement Kilns or Waste to Energy Plants				
	F. E-Waste				
	Development of E-waste management facilities or Dismantlers or recyclers				
	Development of adequate number of E-waste Collection Centers under EPR				
	G. Construction & Demolition				
	Commissioning of Construction & Demolition Waste Management Facility				
	H. Plastic Waste Management				
	Actions against unregistered manufacturing or recycling units				
4	**Adoption of Good irrigation practices**				
5	**Flood Plain Zone protection and its management**				
6	**Rain water harvesting/ground water recharge aspects**				
7	**Maintaining E-flows and watershed management**				
8	**Setting up of bio-diversity parks**				
9	**Removal of encroachments to maintain natural flow in drains**				
10	**Greenery or plantation on both sides of the river**				
11	**Capping of contaminated Ground water sources- Hand pumps, Tube wells and alternate water supply arrangements for drinking purposes in GW affected areas**				
12	**Any other relevant issues**				

Station:-
Date:-

Signature of the authorised person with Date and Seal

ANNEXURE-XII

Item No. 09 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 829/2019

Lt. Col. Sarvadaman Singh Oberoi Applicant(s)

Versus

Union of India & Ors. Respondent(s)

Date of hearing: 17.09.2019

CORAM: **HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON**
HON'BLE MR. JUSTICE S.P WANGDI, JUDICIAL MEMBER
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

For Applicant: Ms. Nivedita Sharma along with Ms. Sonia Rana, Advocates

ORDER

1. This application seeks direction to formulate an action plan to restore sea water quality along the Indian Coastal areas. Reliance has been placed on report of CPCB "Classification of Indian Coasts and Conflicts" (1982-86) relating to marine pollution by sewage and other discharge in violation of environment laws. The issue raised is too general. Individual issues of scientific handling of solid waste and other waste as well as sewage are already subject matter of proceedings before this Tribunal in several matters.[1] The Tribunal has directed that no untreated sewage/industrial effluent be discharged into any water bodies (which includes coastal waters). Any violation is to result in compensation starting from 01.04.2020.[2] The Tribunal is also considering the issue of remedying 351 identified

[1] Compliance of Municipal Solid Waste Rules, 2016, O.A. No. 606/2018, Paryavaran Suraksha Samiti & Anr. v. UOI, O.A. No. 593/2017

[2] Paryavaran Suraksha Samiti & Anr. v. UOI, O.A. No. 593/2017, at para 21(iii)

polluted river stretches[3]. The directions issued therein includes steps for controlling industrial and municipal sewage which may result in marine pollution. The subject of preventing untreated sewage and industrial effluents being discharged in the sea can also be gone into the said case. The CPCB has issued directions dated 15.12.2016, under Section 18(1)(b) of the Water (Prevention and Control of Pollution) Act, 1974 on the subject, to all the State PCB/PCCs to ensure that no sewage or industrial pollution is discharged in coastal waters. CPCB may file latest status report on the subject in *O.A No. 673/2018*. The District Magistrates may also cover the subject of coastal and marine pollution in the District Environment Plans to be prepared with reference to order of this Tribunal dated 15.07.2019[4] and furnish reports to the Chief Secretary concerned. The Chief Secretaries of the concerned States/UTs may also include the subject in their monitoring and in the reports furnished to this Tribunal in *O.A No. 606/2018*.

In view of above, we do not find any ground to entertain this application to avoid duplication.

The application is disposed of. A copy of this order be sent to CPCB and SPCBs/PCCs and Chief Secretaries of the concerned States.

Adarsh Kumar Goel, CP

S.P Wangdi, JM

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

September 17, 2019
Original Application No. 829/2019
A

[3] Original Application No. 673/2018
[4] Original Application No. 710/2017 at para 8

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ANNEXURE-XIII

F. No. A-14011/1/2019–WQM-I/ 8712-8747 Date: 11.11.2019

To

1. PS to Chief Secretary, State Govt./ UT Administration (as per list enclosed)
2. The Member Secretary, SPCB/PCC (as per list enclosed)

Non Coastal States- Arunachal Pradesh, Assam, Bihar, Chandigarh, Chhattisgarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Rajasthan, Sikkim, Telangana, Tripura, Uttar Pradesh, Uttarakhand

Sub: Hon'ble NGT (PB) New Delhi order dated 17.09.2019 in O.A. No. 829/2019 in the matter of Lt. Col Sarvadaman Singh Oberoi Vs Union of India & Ors-reg

Sir,

Kindly refer to CPCB letter dated 1.10.2019 requesting to take necessary action for ensuring compliance to Hon'ble NGT (PB) New Delhi order dated 17.09.2019 passed in O.A. No. 829/2019 on the captioned subject. In this connection, it is to inform that afore-said NGT order is applicable only to the coastal States/UTs and hence CPCB letter dated 1.10.2019 may please be ignored. However, necessary directions be issued to concerned Dept within the jurisdiction of the State/UT for taking necessary measures for management of generated sewage & industrial effluent as well as utilization of treated sewage/ industrial effluent as a measure to minimize natural water resources consumption and action taken may please be informed at an early date.

Yours faithfully

(A. Sudhakar)
DH, WQM-I Division

Copy to:

PS to MS : for kind information of 'MS', please

(A. Sudhakar)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
दिनांक 15/11/19

1. PS to Chief Secretary,
   Government of Arunachal Pradesh
   Civil Secretariat, Itanagar – 791111

2. The Member Secretary,
   Arunachal Pradesh State Pollution Control Board,
   Paryavaran Bhawan, Papu Hill, Yupia Road,
   Naharlagun- 791110

3. PS to Chief Secretary,
   Government of Assam
   Block- C, 3rd Floor,
   Assam Sachivalaya
   Dispur - 781006, Guwahati

4. The Member Secretary,
   Assam Pollution Control Board,
   Bamunimaidam,
   Guwahati – 781021

5. PS to Chief Secretary,
   Government of Bihar
   Main Secretariat, Patna – 800015

6. The Member Secretary,
   Bihar State Pollution Control Board,
   Parivesh Bhawan, Plot No. NS-B/2
   Paliputra Industrial Area,
   Patliputra, Patna (Bihar) - 800 010

7. PS to Chief Secretary,
   Raj Bhawan, Chandigarh

8. The Member Secretary,
   Chandigarh Pollution Control Committee,
   Paryavaran Bhawan, Ground Floor, Sector 19 B
   Madhya Marg, Chandigarh

9. PS to Chief Secretary,
   Government of Chhattisgarh
   Mahanadi Bhawan, Mantralaya
   Naya Raipur - 492002

10. The Member Secretary,
    Chhattisgarh Environment Conservation Board,
    Paryavas Bhavan, North Block Sector-19,
    Atal Nagar Dist- Raipur (C.G.) 492002

11. PS to Chief Secretary,
    Delhi Secretariat,
    IP Estate, New Delhi - 110002

12. The Member Secretary,
    Delhi Pollution Control Committee,
    Government of N.C.T. Delhi
    4th Floor, ISBT Building,
    Kashmere Gate, Delhi-110006

13. PS to Chief Secretary,
    Government of Haryana
    4th Floor, Haryana Civil Secretariat
    Sector-1, Chandigarh – 160019

14. The Member Secretary,
    Haryana State Pollution Control Board,
    C-11, Sector-6, Panchkula-134109,
    Haryana

15. PS to Chief Secretary,
    Government of Himachal Pradesh
    H P Secretariat, Shimla –171002

16. The Member Secretary,
    Himachal Pradesh Pollution Control Board,
    Him Parivesh, Phase-III, New Shimla,
    Himachal Pradesh - 171009

17. PS to Chief Secretary,
    Government of Jammu & Kashmir
    R. No. 2/7, 2nd, Floor Main Building
    Civil Secretariat, Jammu – 180001

18. The Member Secretary,
    Jammu & Kashmir State Pollution Control Board,
    Parivesh Bhawan, Forest Complex,
    Gladni, Narwal, transport Nagar, Jammu,
    Jammu and Kashmir 180004

19. PS to Chief Secretary,
    Government of Jammu & Kashmir
    R. No. 307, 3rd Floor
    Civil Secretariat, Srinagar – 190001

20. The Member Secretary,
    Jammu & Kashmir State Pollution Control Board,
    Shiekh-ul-Campus, behind Govt. Silk Factory,
    Raj Bagh, Srinagar (J&K)

21. PS to Chief Secretary,
    Government of Jharkhand
    1st Floor, Project Building,
    Dhurwa, Ranchi- 834004

22. The Member Secretary,
    Jharkhand Pollution Control Board,
    T.A Building, HEC, P.O. Dhurwa,
    Ranchi – 834004

23. PS to Chief Secretary,
    Government of Madhya Pradesh
    MP Mantralaya, Vallabh Bhavan
    Bhopal – 462004

24. The Member Secretary,
    Madhya Pradesh Pollution Control Board,
    E-5, Arera Colony, Paryavaran Parisar,
    Bhopal - 462 016, Madhya Pradesh

25. PS to Chief Secretary,
Government of Manipur
South Block, Old Secretariat
Imphal-795001

26. The Member Secretary,
Manipur Pollution Control Board,
Lamphelpat, Imphal West D.C. Office Complex
Imphal– 795004

27. PS to Chief Secretary,
Government of Meghalaya
Main Secretariat Building
Rilang Building, Room No. 321
Meghalaya Secretariat,
Shillong – 793001

28. The Member Secretary,
Meghalaya Pollution Control Board
Arden- Lumpyngngad
Shillong: 793014

29. PS to Chief Secretary,
Government of Mizoram
New Secretariat Complex,
Aizwal – 796001

30. The Member Secretary,
Mizoram Pollution Control Board,
New Secretariat Complex,
KhatlaThlanmualPeng,
Khatla, Aizawl, Mizoram: 796001

31. PS to Chief Secretary,
Government of Nagaland
Civil Secretariat,
Kohima-797004

32. The Member Secretary,
Nagaland Pollution Control Board,
Signal Point, Dimapur
Nagaland – 797112

33. PS to Chief Secretary,
Government of Punjab
Chief Secretary Office,
6th Floor, Punjab Civil Secretariat -1,
Sector 1, Chandigarh, 160001

34. The Member Secretary,
Punjab Pollution Control Board,
Vatavaran Bhawan, Nabha Road,
Patiala, Punjab

35. PS to Chief Secretary,
Government of Rajasthan
Secretariat, Jaipur – 302005

36. The Member Secretary,
Rajasthan Pollution Control Board,
4, Jhalana Institutional Area,
Jhalana Doongri,
Jaipur (Rajasthan) - 302 004

37. PS to Chief Secretary,
Government of Sikkim
New Secretariat,
Gangtok – 737101

38. The Member Secretary,
Sikkim State Pollution Control Board,
Department of Forest,
Environment & Wildlife Management Government of Sikkim,
Deorali, Gangtok - 737102

39. PS to Chief Secretary,
Government of Telangana
Block C, 3rd Floor,
Telangana Secretariat, Khairatabad,
Hyderabad, Telangana - 500022

40. The Member Secretary,
Telangana State Pollution Control Board,
Paryavaran Bhawan, A-3, I.E. Sanath Nagar,
Hyderabad-500 018

41. PS to Chief Secretary,
Government of Tripura
Agartala West Tripura
New Secretariat Complex
Secretariat, Tripura -799010

42. The Member Secretary,
Tripura Pollution Control Board,
Vigyan Bhawan, Pandit Nehru Complex,
Gorkhabasti, PO: Kunjaban Agartala – 799006

43. PS to Chief Secretary,
Government of Uttar Pradesh
1st Floor, Room No. 110
Lal bahadur Shastri Bhawan
Uttar Pradesh Secretariat,
Lucknow - 226 001

44. The Member Secretary,
Uttar Pradesh Pollution Control Board,
Building No. TC-12V, Vibhuti Khand,
Gomti Nagar, Lucknow-226 010

45. PS to Chief Secretary,
Government of Uttarakhand
4 Subhash Road, Uttarakhand Secretariat
Dehradun – 248001

46. The Member Secretary,
Uttarakhand Environmental
Protection & Pollution Control Board,
29/20, Nemi Road, Dehradun,
Uttarakhand – 248001

ANNEXURE-XIV

REMINDER- I

F. No. A-14011/1/2019–WQM-I/ 8912-8969 Date: 11.11.2019

To

1. PS to Chief Secretary, State Govt./ UT Administration (as per list enclosed)
2. The Member Secretary, SPCBs/PCCs as per list enclosed)

Coastal States/UTs- Andaman & Nicobar Islands, Andhra Pradesh, DD&DNH, Goa, Gujarat, Karnataka, Kerala, Lakshadweep, Maharashtra, Odisha, Puducherry, Tamil Nadu, West Bengal

Sub: Hon'ble NGT (PB) New Delhi order dated 17.09.2019 in O.A. No. 829/2019 in the matter of Lt. Col Sarvadaman Singh Oberoi Vs Union of India & Ors-reg

Sir,

Kindly refer to CPCB letter dated 1.10.2019 requesting to take necessary action for ensuring compliance to Hon'ble NGT (PB) New Delhi order dated 17.09.2019 passed in O.A. No. 829/2019 on the captioned subject.

In this connection, action taken report on compliance to the afore-said Hon'ble NGT order communicated by CPCB vide letter dated 15.12.2016 is still awaited. It is therefore requested to arrange to send action taken report on compliance of Hon'ble NGT order dated 17.09.2019 in O.A. No. 829/2019 to CPCB, at an early date.

Yours faithfully

(A. Sudhakar)
DH, WQM-I Division

O/C

Copy to:

PS to MS : for kind information of 'MS', please

(A. Sudhakar)

O/C

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
दिनांक 14/11/19

1. PS to Chief Secretary,
   Andaman and Nicobar Administration
   Secretariat, Port Blair – 744101

2. The Member Secretary,
   Andaman & Nicobar Islands Pollution Control Committee,
   Department of Science & Technology,
   Dollygunj Van Sadan, Haddo P.O., Port Blair – 744102

3. PS to Chief Secretary,
   Government of Andhra Pradesh
   1st Block, 1st Floor
   A.P Secretariat Office,
   Velagapudi – 522503

4. The Member Secretary,
   Andhra Pradesh Pollution Control Board
   D.No. 33-26-14 D/2, Near Sunrise Hospital,
   Pushpa Hotel Centre, Chalamalavari Street,
   Kasturibaipet, Vijayawada – 520 010

5. PS to Chief Secretary,
   Secretariat, Moti, Silvasa,
   Daman - 396220

6. The Member Secretary,
   Daman, Diu & Dadra Nagar Haveli
   Pollution Control Committee,
   Office of the Deputy Conservator of Forests,
   Fort Area, Court Compound,
   Moti Daman, Daman – 396220

7. PS to Chief Secretary,
   Government of Goa Secretariat,
   Porvroim, Bardez, Goa – 403521

8. The Member Secretary,
   Goa State Pollution Control Board,
   1st Floor, Dempo Tower,
   EDC Patto Plaza, Panaji, Goa-403 001

9. PS to Chief Secretary,
   Government of Gujarat
   1st Block, 5th Floor Sachivalaya,
   Gandhinagar – 382010

10. The Member Secretary,
    Gujarat Pollution Control Board
    Paryavan Bhavan, Sector 10- A,
    Gandhinagar – 382 043

11. PS to Chief Secretary,
    Governement of Karanataka
    Room No. 320, 3rd Floor
    Vidhana Soudha, Bengaluru - 560 001

12. The Member Secretary,
    Karnataka State Pollution Control Board,
    Parisara Bhavan, 4th & 5th Floor,
    # 49, Church St., Bengaluru-560 001

13. PS to Chief Secretary,
    Government of Kerala
    Secretariat, Thiruvananthapuram - 695001

14. The Member Secretary,
    Kerala State Pollution Control Board,
    Plamoodu Jn., Pattom Palace P.O.
    Thiruvananthapuram - 695 004

15. PS to Chief Secretary,
    Lakshadweep, Kavaratti – 682555

16. The Member Secretary,
    Lakshadweep Pollution Control Committee,
    Department of Science, Technology & Environment,
    Kavarati- 682555

17. PS to Chief Secretary,
    Government of Maharashtra
    CS Office Main Building, Mantralaya
    6th Floor, Madame Cama Road,
    Mumbai – 400032

18. The Member Secretary,
    Maharashtra Pollution Control Board,
    Kalpataru Point, 2nd – 4th Floor
    Opp. Cine Planet Cinema, Nr. Sion Circle,
    Sion (E), Mumbai – 400 022

19. PS to Chief Secretary,
    Government of Odisha
    General Administration Department
    Odisha Secretariat, Bhubaneswar - 751001

20. The Member Secretary,
    Odisha Pollution Control Board,
    A-118, Nilakanta Nagar, Unit –VIII,
    Bhubaneshwar – 751012

21. PS to Chief Secretary,
    Chief Secretariat, Goubert Avenue,
    Puducherry – 605001

22. The Member Secretary,
    Puducherry Pollution Control Committee,
    Housing Board Complex, Anna Nagar,
    Puducherry -600 005

23. PS to Chief Secretary,
    Government of Tamil Nadu
    Secretariat, Chennai – 600009

24. The Member Secretary,
    Tamil Nadu Pollution Control Board,
    76, Mount Salai, Guindy,
    Chennai-600 032

25. PS to Chief Secretary,
    Government of West Bengal
    Nabanna, 13th Floor, 325,
    Sarat Chatterjee Road, Mandirtala
    Shibpur, Howrah – 711102

26. The Member Secretary,
    West Bengal Pollution Control Board,
    Paribesh Bhavan, 10A, Block-L.A.,
    Sector III, Salt Lake City,
    Kolkata - 700 106

ANNEXURE XV

Government of Goa
Department of Environment
1st Floor, Pandit Deendayal Upadhay Bhavan,
Behind Pundalik Devasthan, Near Sanjay School,
Porvorim, Bardez Goa

Phone Nos.: 0832-2416581 / 2416583 / 2416584

e-mail: dir-env.goa@gov.in

No.5/2/2017/ENVT/DIR/666 Date: 22/10/2019

To,

1. The Director, Directorate of Health Services, Panaji-Goa.
2. The Director, Directorate of Panchayat, Junta House, Panaji-Goa.
3. The Principal Chief Engineer, Public Works Department, Altinho, Panaji-Goa.
4. The Chief Town Planner, Town and Country Planning Department, Panaji-Goa.
5. The Member Secretary, Goa State Pollution Control Board, Saligao-Goa.
6. The Managing Director, Sewerage Infrastructure Development Corporation Goa Limited, Panaji-Goa.

Sir/Madam,

I am to forward herewith a copy of letter F.No.A-14011/1/2019-WQM-I/7265 dated 01/10/2019 received from the Division Head, WQM-I, Central Pollution Control Board, Delhi regarding Hon'ble NGT (PB) New Delhi order dated 17/09/2019 in the O.A. No.829 of 2019 in the matter of Lt. Col Sarvadaman Singh Oberoi Vs Union of India & Ors. The Hon'ble NGT has directed that no untreated sewage/industrial effluent be discharged into any water bodies (which includes coastal waters).

In this regards you are requested to take necessary action and arrange to file compliance report on compliance of the Hon'ble NGT (PB) order dated 17.09.2019 in O.A. No.829/2019. The compliance report may be forwarded to this office onward submission to the Hon'ble NGT in O.A. No.606/2018

Yours faithfully,

(Johnson Pedy Fernandes)
Director (Environment)

Encl: As above

Copy to: The Division Head, WQM-I, Central Pollution Control Board, Parivesh Bhavan, East Qrjun Nagar, Delhi-110032.

14125/18/3/L
9/10/19

By speed post/E-mail

Hon'ble NGT MATTER
IMPORTANT

F.No. A-14011/1/2019 -WQM-I 7265

01.10.2019

Secretary (ENVT
Inward No. 7701/L
Date: 9/10/19

Director/Jt. Secretary (ENV)
Inward No.: 1528
Date: 14/10/19

To
PS to Chief Secretary
Government of Goa Secretariat,
Porvroim, Bardez, Goa – 403521

Reqr Dist. Collectors Cobtain report

Sub: Hon'ble NGT (PB) New Delhi order dated 17.09.2019 in O.A. No. 829/2019 in the matter of Lt. Col Sarvadaman Singh Oberoi Vs Union of India & Ors.

Sir,

This has reference to Hon'ble NGT order dated 17.09.19 in the O.A. No. 829 of 2019 on the captioned subject (A copy of Hon'ble NGT order is attached for ready reference).

Vide aforesaid order Hon'ble NGT referred about its order passed in Paryavaran Suraksha Samiti & Anr. v. UOI, O.A. No. 593/2017, at Para 21(iii), which is reproduced as follows: - "The Tribunal has directed that no untreated sewage/industrial effluent be discharged into any water bodies (which includes coastal waters). Any violation is to result in compensation starting from 01.02.2020."

Further, the relevant portion of directions of Hon'ble NGT passed on 17.09.2019 in O.A. No. 829/2019 is reproduced as below:-

"The District Magistrates may also cover the subject of coastal and marine pollution in the District Environment Plans (DEP) to be prepared with reference to order of this Tribunal dated 15.07.2019 and furnish reports to the Chief Secretary concerned. The Chief Secretaries of the concerned States/UTs may also include the subject in their monitoring and in the reports furnished to this Tribunal in O.A. No. 606/2018."

In view of above, it is requested to take necessary action and arrange to file compliance report on compliance of the Hon'ble NGT (PB) order dated 17.09.2019 in O.A. No. 829/2019 for consideration of Hon'ble NGT.

Encl: as above

Yours faithfully

(A.Sudhakar)
Divisional Head, WQM-I

Item No. 09 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 829/2019

Lt. Col. Sarvadaman Singh Oberoi Applicant(s)

Versus

Union of India & Ors. Respondent(s)

Date of hearing: 17.09.2019

CORAM: **HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON**
HON'BLE MR. JUSTICE S.P WANGDI, JUDICIAL MEMBER
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

For Applicant: Ms. Nivedita Sharma along with Ms. Sonia Rana, Advocates

ORDER

1. This application seeks direction to formulate an action plan to restore sea water quality along the Indian Coastal area. Reliance has been placed on report of CPCB "Classification of Indian Coasts and Conflicts" (1982-86) relating to marine pollution by sewage and other discharge in violation of environment laws. The issue raised is too general. Individual issues of scientific handling of solid waste and other waste as well as sewage are already subject matter of proceedings before this Tribunal in several matters.[1] The Tribunal has directed that no untreated sewage/industrial effluent be discharged into any water bodies (which includes coastal waters). Any violation is to result in compensation starting from 01.04.2020.[2] The Tribunal is also considering the issue of remedying 351 identified

[1] Compliance of Municipal Solid Waste Rules, 2016, O.A. No. 606/2018, Paryavaran Suraksha Samiti & Anr. v. UOI, O.A. No. 593/2017

[2] Paryavaran Suraksha Samiti & Anr. v. UOI, O.A. No. 593/2017, at para 21(iii)

polluted river stretches[3]. The directions issued therein includes steps for controlling industrial and municipal sewage which may result in marine pollution. The subject of preventing untreated sewage and industrial effluents being discharged in the sea can also be gone into the said case. The CPCB has issued directions dated 15.12.2016, under Section 18(1)(b) of the Water (Prevention and Control of Pollution) Act, 1974 on the subject, to all the State PCB/PCCs to ensure that no sewage or industrial pollution is discharged in coastal waters. CPCB may file latest status report on the subject in *O.A No. 673/2018*. The District Magistrates may also cover the subject of coastal and marine pollution in the District Environment Plans to be prepared with reference to order of this Tribunal dated 15.07.2019[4] and furnish reports to the Chief Secretary concerned. The Chief Secretaries of the concerned States/UTs may also include the subject in their monitoring and in the reports furnished to this Tribunal in *O.A No. 606/2018*.

In view of above, we do not find any ground to entertain this application to avoid duplication.

The application is disposed of. A copy of this order be sent to CPCB and SPCBs/PCCs and Chief Secretaries of the concerned States.

Adarsh Kumar Goel, CP

S.P Wangdi, JM

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

September 17, 2019
Original Application No. 829/2019
A

[3] Original Application No. 673/2018
[4] Original Application No. 710/2017 at para 8

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ANNEXURE-XVI

No. PCC/DMN/NWMP/2010-11/ 899
Office of the Member Secretary,
Pollution Control Committee,
DD & DNH,
Daman.

Date :- 16/10/19

To,
Shri A. Sudhakar,
Division Head, WQM – I,
Central Pollution Control Board,
Parivesh Bhawan, East Arjun Nagar,
Delhi - 110032.

Sub.- Updating of information on Marine Coastal Pollution - reg.

Ref.:- CPCB letter No: F. No. A- 14011/1/2019 – WQM-I/7160 dated 30/09/2019.

Sir,

With reference to the above mentioned subject, updated information pertaining to the costal regain of the UT of Daman & Diu is enclosed for your kind reference and further consideration.

16/10/19

Member Secretary,
Pollution Control Committee,
Daman & Diu
Daman

Encl. – As above.

Copy to:-

1. The Regional Director,
   Regional Directorate, CPCB, Vadodara.

Updated Information pertaining to Coastal area UT of Daman & Diu

4. Industrial Pollution :

4.1. 17 categories having installed on-line system:

S. No.	State/UT	No. of 17 categories in the state	No. of 17 categories installed in the state	On-line system installed in coastal District
1	Daman & Diu	02	02	02

4.2. Industries discharging in sea/creek/estuarine – ETP compliance:

S. No.	State/UT	No. of industries in the state	On-line system installed	Compliance/Non-compliance – ETP standards
1	Daman & Diu	01	01	01

4.3. Critically polluted area:

S. No.	State/UT	Name of critically polluted area	CEPI score	Major industries
1	Daman & Diu	00	00	00

4.4. CETPs / FETPs :

S. No.	State/UT	No of CETPs/ FETPs	Treatment capacity (MLD)	Compliance status		Directions issued
				Compliance	Non-compliance	
1	Daman & Diu	00	00	00	00	00

4.5. Sewage disposal

S. No.	State/ UT	No. of towns	Sewage generation (in MLD)	Treatment capacity (MLD)	Directions issued/response (under section 18 (1) (b) dated 21.04.2015)	Section 5 not responded (09.10.2015)
1	Daman & Diu	02	Daman : 7.5 MLD Diu : 3.5 MLD	Daman : 4.2 MLD Diu : 7 MLD (under proposed)	--	--

4.6. Coastal water quality monitoring:

S. No.	State/UT	No. of water quality monitoring stations		Water quality status (with respect to BOD)
		CPCB	SPCB	
1	Daman & Diu	00	00	

5. Water quality monitoring :

Water quality monitoring carried out at 14 locations in Damanganga River.

ANNEXURE-XVII

Item No. 14 Court No. 2

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 426/2018
(M.A. No. 986/2018)

Mohammed Nayeem Pasha & Anr. Applicant(s)

Versus

The State of Telangana & Ors. Respondent(s)

Date of hearing: 05.04.2019

CORAM:
HON'BLE MR. JUSTICE RAGHUVENDRA S. RATHORE, JUDICIAL MEMBER
HON'BLE DR. SATYAWAN SINGH GARBYAL, EXPERT MEMBER

For Applicant(s)

For Respondent(s) Ms. Kriti Sinha, Advocate for R-10

ORDER

The issue for consideration relates to pollution of river Musi at Hyderabad (Telangana). The river is contaminated due to disposal of industrial and domestic sewage effluents into it.

The applicant has brought out issues of pollution of river Musi due to disposal of untreated sewage by drains joining river Musi at different locations. The industries located in the catchment of the river which predominantly are bulk drug and pharmaceutical units, are also discharging effluents through common effluent treatment plants (CETPs). Besides, the river flood plain zone has been

encroached and huge construction and demolition waste along with other solid waste, is dumped into the river.

Water quality assessment report of river Musi filed by Telangana State Pollution Control Board, during 2014-2018, has indicated that the river stretch in Hyderabad is not fit even for irrigation (Class 'E' as per water quality criteria of CPCB).

According to Telangana State Pollution Board there are four CETPs commissioned to treat industrial effluents being generated in the catchment of river Musi and the treated effluents are disposed into the river. However, nothing has been said on the performance and compliance of the industries with respect to Zero Liquid Discharge (ZLD) imposed on them, as well as, the compliance by CETPs.

As per affidavit filed by the Principal Secretary, Municipal Administration and Urban Development Department, State of Telangana on 10th September, 2018, to prevent the pollution of river Musi, Hyderabad Metropolitan Water Supply and Sewerage Board has taken up the abetment of pollution in the river and sought funding under National River Conservation Plan of MoEF & CC. The works taken up include construction of STPs and laying of sewer lines.

With regard to sewage treatment and disposal which is the main cause of pollution of river Musi it is to be noted

that total sewerage generated is about 1400 mld which is being discharged in the catchment area of Musi river from either of the banks through Nalas. Already 592 mld capacity sewerage treatment plant have been built along the river Musi. DPRs are also prepared at a cost of Rs. 1200 crores for creation of additional STPs at 10 locations, to treat total sewage so as to prevent pollution into river Musi. Since there is no regular sever network system, the board is said to have undertaken a survey with a technical expertise and prepared the DPRs for sewerage system of the peripheral areas.

According to MAUD, HMWSSB has appointed Shah Technical consultant to prepare a detailed Project Report(DPR) for the master sewage plan, duly reviewing the available DPRs for integration covering the entire GHMC area up to ORR plus 4 IT hubs. The consultants are preparing DPRs for 27 STPs at 23 lakes in the GHMC area for the combined capacity of 450 mld under Phase-I, along the Musi river and further upgradation of the existing STPs will be taken up in Phase-III. The Phase-I STPs are planned to be taken up in 4 month's time, depending upon the funds availability and Phase-II in one year time. The up-gradation of STPs from the secondary level to the tertiary level 3 in one year time including the policy on recycling of water for the usage for the purpose of non-drinking, construction activity, gardening, industrial etc. Due to

financial constraint, the possibility of private investments through the transaction advisor under PPP mode is being explored. The HMWSSB is planning to implement the comprehensive sewage master plan within one and half year time.

It has also been brought on record by State Pollution Control Board that proceedings are pending before Honorable High Court at Hyderabad, in the case of *Forum of Good Governance vs the State of Telangana and Ors.* (WP (PIL) 27 of 2016). It has been submitted that in the said petition similar prayers are sought, as in the present application. The Honorable High Court had on 24.7.2018 directed as follows:

> *"In view of the aforesaid, having regard to the constitutional values and constitutional vision, which this Court has noticed through order, dated 10.07.2018, we direct the respondent No.4- the Commissioner of Greater Hyderabad Municipal Corporation to forthwith initiate action in terms of the relevant statutory provisions against each and every person, who is in conflict with law regarding the out-let if sewage and other waste and effluents from their private premises, which results in contaminating the Musi River. Such prohibitory exercise shall be carried on war-footing and the official respondents shall ensure that all statutory authorities and executive functionaries support such measures."*

In view of the aforesaid facts and circumstances, we order that as has been made clear in the order dated

19.12.2018 passed in OA no. 673/2018 BOD will not be the sole criteria to determine whether a particular river stretch is a polluted one. Other parameters including Faecal Coliform (FC) bacteria will also be the criteria for classifying a stretch as polluted or otherwise. CPCB may devise within two weeks a mechanism for classification wherein two criteria pollutants that is BOD and FC shall henceforth be the basis of classification in priority classes.

Therefore, we direct CPCB and Telangana Pollution Control Board to carry out a quick hygienic survey of the River by engaging Professor Suman Kapur, Dean, International Programmes and Collaborations and Senior Professor, Department of Biological Sciences, BITS- Pilani, Hyderabad Campus, Jawahar Nagar, Shameer Pet, Hyderabad-500078, skapur@hyderabad.bits-pilani.ac.in and submit a report for river Musi and any other clean river in the state falling in the category of 'A' and or 'B.' For this survey we request Professor Suman Kapoor to execute the survey at a cost 9.5 lakhs which will be paid by CPCB out of its environment compensation fund. The scientist of CPCP and TSPCB will be associated during the survey and field testing of pathogenic bacteria.

Professor Suman Kapoor will submit the report to CPCB before 31st July, 2019. Expenses of the said survey in relation to the Scientist of CPCB and SPCB shall be borne by the respective Boards. CPCB shall file its report on

execution of such survey for other rivers identified as polluted river stretches in the country. Further they shall give their opinion on adoption of field-based testing and its validation etc.

The CPCB is also directed to report the status of operation of STPs in an around Musi river.

List this matter on 1st July, 2019.

Raghuvendra S. Rathore, JM

Dr. Satyawan Singh Garbyal, EM

April 05, 2019
MN

ANNEXURE-XVIII

Item No. 07 Court No. 2

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 426/2018
(M.A. No. 986/2018)

Mohammed Nayeem Pasha & Anr. Applicant(s)

Versus

The State of Telangana & Ors. Respondent(s)

Date of hearing: 01.07.2019

CORAM:
HON'BLE MR. JUSTICE RAGHUVENDRA S. RATHORE, JUDICIAL MEMBER
HON'BLE DR. SATYAWAN SINGH GARBYAL, EXPERT MEMBER

For Applicant(s)

For Respondent(s) Mr. Raj Kumar, Advocate for CPCB
Mr. Dhananjay Baijal, Advocate for R-4
Mr. Satyalipsu Ray, Advocate for MoEF & CC
Mr. Harsha Peechara and Ms. Kriti Sinha, Advocates for TSRTC

ORDER

List this matter along with O.A. No. 673 of 2018.

Raghuvendra S. Rathore, JM

Dr. Satyawan Singh Garbyal, EM

July 01, 2019
SN

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ANNEXURE-XIX

Birla Institute of Technology & Science, Pilani
Hyderabad Campus

To,

24.10.2019

Mr. A Sudhakar
DH, WQM-1 Division
Central Pollution Control Board
Ministry of Environment, Forest & Climate Change, GOI
Parivesh Bhawan, East Arjun Nagar, Delhi-110032

Subject: Response to CPCB letter F.No. 14011/WQM-I/2019 dated 17.10.2019.

Dear Sir,

Please find below a point-wise response to the points raised in the letter dated 17.10.2019 (F.No. 14011/WQM-I/2019)

(i) Sensitivity and specificity of RightBiotic method

The data related to sensitivity and specificity of the RightBiotic assay in comparison with the conventional Kirby Bauer method is already given in the report. Please refer to page number 100 (Annexure 38) of the final report submitted to the CPCB on submitted on 4th Sept. 2019.

(ii) Composition of BITGEN media

BITGEN media is a proprietary media and the composition of the same is protected under a trade secret. Hence the composition of the same cannot be shared.

(iii) Pre-treatment of sample preparation details

For performing the routine bacterial culture and antibiotic sensitivity using Kirby-Bauer method and also the RightBiotic assay no pre-treatment was done except for allowing the mud and large particles to settle down on standing undisturbed for 30 minutes.

However, for extraction of antibiotics from water sample, the pH of the water sample was adjusted to pH 4 using 6N HCl as per the manufacturer`s instruction. A detailed protocol of this method has already been shared with the CPCB on 5th September 2019.

(iv) Number of samples that can be processed at a time

Processing of one sample using RightBiotic sample takes ~20 minutes and the process of reading the sample in RightBiotic device takes ~10 minutes. Therefore ~30 samples can be processed and read in an 8 hour working day.

(v) Cost per sample

The cost per sample is 550 Rs. However, this price can be negotiated as i) CPCB is a government organization and ii) Discount on can also be considered for bulk purchases.

I request you to please release the last instalment of this work-order/grant. Summary of bills, Tally sheet provided by BITS Accounts Department, is enclosed for your ready reference.

With best wishes and Happy Deepawali

Suman Kapur

Dr. Suman Kapur, Senior Professor, BITS Pilani

Birla Institute of Technology & Science, Pilani
Hyderabad Campus, Jawahar Nagar, ShameerpetMandal
Hyderabad 500078, Andhra Pradesh, India

Tel: +91 40 6630 3999
Fax: +91 40 6630 3998
Web: www.hyderabad.bits-pilani.ac.in

ANNEXURE-XIX(A)

REPORT ON

QUICK HYGIENE SURVEY OF RIVER MUSI

Prepared by

Dr. Suman Kapur

Senior Professor, Dept. of Biological Sciences

In collaboration with

TSPCB, Hyderabad and CPCB, New Delhi

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI
HYDERABAD CAMPUS

August 2019

Contents

List of abbreviations used

AMR: Anti-Microbial Resistance

API: Active Pharmaceutical Ingredients

ARB: Antibiotic Resistant Bacteria

ARG: Antibiotic Resistance Genes

BHU: Banaras Hindu University

CETPs: Common Effluent Treatment Plants

CPCB: Central Pollution Control Board

GDP: Gross Domestic Product

GPS: Global Positioning System

INT: Intermediate Sensitivity

KB: Kirby Bauer Disc diffusion assay

Kg: Kilogram

LB: Luria Bertani

MDR: Multi-Drug Resistant

NWQMP: National Water Quality Monitoring Programme

PPC: Pollution Control Committee

QS: Quorum Sensing

RB: RightBiotic Assay

RES: Resistant

SDG: Sustainable Development Goal

SEN: Sensitive

SPCB: State Pollution Control Board

STP: Sewage Treatment Plant

USD: United States Dollar

UTI: Urinary Tract Infection

WASH: Water, Sanitation, and Hygiene

WHO: World Health Organization

WWTP: Waste water Treatment Plant

ZLD: Zero Liquid Discharge

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ANTIBIOTICS ARE MAINSTAY DRUG FOR TREATMENT OF INFECTIONS IN HUMANS AND LIVESTOCK BOTH, AND THEIR IMPORTANCE IN HUMAN HEALTH CANNOT BE EMPHASIZED ENOUGH. IT IS A CHOICE OF A MULTI-SECTOR INTERVENTION PLAN BY A WIDE RANGE OF PLAYERS LED PRIMARILY BY THE CENTRAL AND STATE POLLUTION CONTROL BOARDS ACROSS THE COUNTRY TO ENSURE THE HEALTH OF OUR RIVERS AND THROUGH THEM THE PEOPLE OF THIS COUNTY.

Summary

- Waste (i.e., faeces) from people and animals can carry antimicrobial-resistant microbes (including pathogens) and antimicrobials, that are important in human medicine contaminating the environment with antimicrobials and AMR microbes when waste is not properly handled.
- The connection between waste, antimicrobials and resistant microbes in the environment, and its impact on human health, is yet to be delineated fully. However, scientific evidence shows that presence and overuse of antimicrobials and resistance do spread in the environment and people exposed to resistant pathogens in environment are at increased risk of infection.
- Levels of antimicrobial-resistant microbes in sewage waste from the general population varies geographically, but when the levels are high and the sanitation infrastructure is insufficient, this may be a source of antimicrobial-resistant microbes in the environment.
- While basic sanitation and the ability to maintain hygienic conditions, is critically important for preventing many diseases it is also very important to take note of that water samples from river Musi along its track through the city of Hyderabad were found to be of **very poor quality water**, with extremely **high bacterial load** and **alarming resistance patterns** to many antibiotics indicating an imminent public health disaster, waiting to happen.
- The present River Hygiene Survey of River Musi conducted in compliance with the Hon'ble NGT order dated 5.04.2019 in OA 426/218 **revealed the presence of several 'Super bugs' showing XDR resistance to as many as 13 frontline antibiotics out of the 14 tested.**
- Of the 90 different bacterial isolates studied for AMR no bacteria were found to be sensitive to all antibiotics tested. In fact, the minimum number of antibiotics that any bacteria were resistant to was 4 and the maximum was 13 out of the 14 tested.
- Therefore, in light of i) growing burden of AMR microbes and ii) emergence of 'Super Bugs' it is advisable to conduct a hygiene survey at all the points selected by CPCB for NWQMP in rivers/water bodies in India and also test suspected discharge points for presence of pathogenic antimicrobial resistant bacteria. **Assessments of environmental waters for resistant pathogens can help to identify insufficient sanitation strategies and gaps in processes.**
- **RightBiotic can be adopted for River Hygiene Surveys with 70-100% accuracy for identification of pathogens and their antibiotic sensitivity for long-term effect on health**
- The response to environmental contamination of AMR could include prevention strategies, like testing sewage from elevated sources, like hospitals, before release and removal strategies (e.g., wastewater treatment processes).

1.0 Introduction

Water is the most important components for survival of life and constitutes 70% of the total body composition. Adequate availability of water of required quality is pre-requisite for survival and quality of human life. Due to its cardinal importance in health and overall survival, "Water, Sanitation, and Hygiene (WASH)" is one of the sustainable development goals (SDG 6th) defined by the United Nations. Apart from its use as an essential component for survival, water is required for agricultural and industrial activities, and power generation, thus holding a central role in the global food supply, economic prosperity and survival of all living organisms on the planet earth [1]. Importance of clean and adequate water is apparent from the fact that all major civilizations of the ancient times have developed and flourished near banks of major river, in India and across the world, a trend that subsequent human generations continue to follow [2]. Thus rivers are the life-line for any civilization. As a result of the exponentially growing human activities, most world rivers are now being impacted, including by long range transport of pollutants. These changes are regarded as a global water quality issue. River surveillance activities have gained tremendous importance, particularly under the pressure of national and international regulations, the most important being the drinking water standards of the World Health Organization, WHO (1994).

Threats to the health of an aquatic ecosystem can come from many sources. Sometimes this source is a natural disturbance. However, more often it is due to human activity. Usually human-created pollutants comprise the major disturbance to a lake, river, or stream. Agricultural fertilizers are also a concern because they can cause an ecological problem in the form of – eutrophication. Eutrophication is the process in which a body of water becomes too low in oxygen because of very high levels of nitrogen and phosphate. Pollution is not readily evident, and lakes, rivers and streams which seem fine on the surface may be collapsing without providing any visible signs of decay. ***This makes water testing very crucial for preserving the health of the aquatic ecosystem in general.*** Regular checks of several factors in a lake, river, or stream can allow us to identify threats and minimize their damage. Knowing exactly what is wrong with an aquatic ecosystem can help us in pinpointing the source of the problem/s. While high levels of toxic substances, mutagens, or heavy metals would indicate industrial pollution, high levels of nitrogen and phosphorus most commonly indicate that the problem is overuse of fertilizer on yards & fields.

Pollution of rivers across the world has become a major cause of concern in past few decades. Large rivers stretches are polluted mainly due to open defecation, discharge of untreated

/partially treated sewage, discharge of industrial wastewater containing pharmaceutics and chemicals, use of antimicrobial pesticides for crops, biomedical waste generated in hospitals and clinics and from animal husbandry industries [3]. The settlement and continuous operations of industries require an adequate and lasting supply of water to carry out various industrial operations. These industries generate a huge amount of wastewater after completion of various processes and discharge the generated wastewater into the environment, often in the water bodies located in vicinity of the functioning industries. As per the national guidelines, industries must treat their wastewater using sophisticated industrial effluent treatment plants before releasing it into the environment [4]. Unfortunately, it has been observed that Indian industries often discharge partially or treated or untreated water into the nearby water bodies or rivers leading to severe water pollution and water toxicity. Continuous discharge of untreated water into rivers gradually pollutes the water and makes it useless for drinking, agriculture and further industrial use [5]. The Central Pollution Control Board (CPCB) in association with State Pollution Control Boards (SPCBs) / Pollution Control Committees (PPCs) is monitoring the quality of water bodies at 2500 locations across the country under National Water Quality Monitoring Programme (NWQMP) and their observations show that organic pollution is the predominant cause of water pollution in India. Based on the magnitude of organic pollution, CPCB in 2008 identified 150 polluted river stretches which was increased to 302 in 2015.

Aquatic environments harbour diverse freshwater bacterial communities which may be subjected to anthropogenic pressures, while domestic wastewaters receive direct loads of antibiotics and pathogenic bacteria from human excretion [6]. The nature of these environments allows them to function as 'hotspots' for resistance through selection of Antibiotic Resistant Bacteria (ARB) and the circulation of Antibiotic Resistance Genes (ARGs) through the stimulation of horizontal gene transfer between members of the microbiome/s. Antibiotics and other Active Pharmaceutical Ingredients (APIs) are released into the environment by pharmaceutical and API manufacturers leading to contamination of surrounding soil and water bodies [7]. A high concentration of antibiotic residue in water bodies then becomes a fertile ground for emergence of Multi-Drug Resistant (MDR) bacteria, also called "Super-Bugs". The emergence of such super-bugs poses a great threat to human health as infections caused by MDR bacteria are very difficult to treat. leading to a high incidence of mortality. Bacteria develop antibiotic resistance in the presence of residual levels of antibiotics, and these ARB are in turn able to spread their ARG to

other bacteria through mechanisms such as horizontal gene transfer, mediated by mobile genetic elements (e.g., plasmids, integrons) or co-selecting agents such as biocides and toxic metals [8].

In initial days, most of the antibiotics were obtained naturally by various fungi and bacterial species. However, the present manufacturing of antimicrobials is based on fermentation and semi-synthetic/synthetic routes. Moreover, the microbes used in the production of antibiotics are genetically modified to increase the yield of antibiotics. The release of these genetically modified strains into the environment further exacerbate the environmental hazard posed by pharmaceutical companies. According to an estimate, production of 1,000 kg penicillin G produces 35,000 kg of biological sludge, 10,000 kg of wet mycelium, 1,200 litres of solvents, and 56,000 litres of fermentation media indicating a serious challenge to the environment if the waste is released into the environment without due care and proper treatment [8].

An estimated global production of antimicrobial agents is approximately 100,000 tons and a whopping 63% (63,200 tons) of antibiotics are used in livestock industry. Asia is one of the largest producers of antimicrobial agents and APIs and several studies have confirmed presence of antibiotics in river water and other water bodies. The overall concentration of antibiotic reaching the wastewater systems due to human waste is much lower in comparison with localized discharge from various manufacturers because antibiotics are used by a small fraction of the population at any given time. Moreover, the concentration of antibiotic residues present in the wastewater also gets reduced during the treatment process if effective treatment standards have been followed [8]. In contrast, point discharge of antibiotics by industries can potentially lead to very high concentration of antibiotic residues in water bodies and surrounding areas [8].

A case in sight is the story of Hyderabad, a global hub for generic drug manufacturing with several pharmaceutical industries located in Patancheru-Bollarum corridor. An earlier study has reported presence of the high concentration of antibiotic ciprofloxacin, at 28 and 31 mg/l on two consecutive days, in water bodies located in Patancheru area, Hyderabad [5]. This concentration of ciprofloxacin is 1,000 times higher than the concentration required to kill bacteria [5]. Lübbert et al, 2017 [9] reported antibiotic residues from 28 environmental sampling sites in the sewers of industrial area in Hyderabad, India. Presence of drugs such as ciprofloxacin, norfloxacin, cetirizine, terbinafine, citalopram and enoxacin have also been reported in water samples taken from wells, lakes and discharge from the effluent treatment plants-[10]. Presence of antibiotics has also been reported from other Indian rivers such as Kaveri, Vellar and Tamiraparan, where

water of Kaveri river was found to contain carbamazepine and high levels of Triclosan in surface waters were observed in Tamiraparan River [11]. The same study also reported presence of parabens in river water [11] and clearly established that insufficiently treated wastewater from the pharmaceutical industries have led to a severe contamination of ground and surface water bodies highlighting the urgent need to improve the situation with paramount priority to reduce the deleterious long term consequences [10] on local biodiversity. Antibiotic-resistant genes even to high-end antibiotics were detected in Mutha river flowing through Pune, India, with 30-times higher incidence in the sediments near the city, originating from domestic and municipal sewage waste [12,]. While isolation of *Enterococci*, a commensal of human gut, was possible from river sources at several places, the rate of vancomycin-resistant *Enterococci* ranged between 22-100% from banks of river Gomti [13]. Since hospitals are the places with highest level of anti-microbial consumption, their effluent waters are expected to be the richest source of resistant bacteria and their genes. Mutiyar and Mittal [14] have reported the alarming extent to which residues of fluoroquinolones, sulphonamides and tinidazoles were recovered from a hospital effluent in Delhi, India. The high cost associated with regular monitoring of antimicrobial levels in pharmaceutical wastewater makes it a low-priority objective for India [8] and this potentially 'AMR-rich' municipal wastewater is finally discharged into the nearby water bodies.

Presence of antibiotics in river water is a global concern and Yellow River, Hai River and Liao River in northern China have also been found contaminated with several types of antibiotic residues like Ciprofloxacin, Norfloxacin, Oxytetracycline and Ofloxacin [15, 16]. Indeed, authors of another recent study led by University of York, estimated presence of 14 antibiotics in rivers of 72 countries across six continents, found that 65% of the total of 711 sites tested positive for presence of antibiotics with some of them at concentrations as high as 20-32000 nanogram/L, up to 200 times of the safe level range (as per antimicrobial resistance, 'AMR', industry alliance standards), depending on the antibiotic. Ciprofloxacin most frequently exceeded safe levels, surpassing the safety threshold at 51 places. Moreover, high-risk sites were typically adjacent to wastewater treatment systems and waste or sewage dumps. Some of the world's most iconic rivers were sampled, including the Chao Phraya, Danube, Mekong, Seine, Thames, Tiber and Tigris. The team found that safe limits were most frequently exceeded in Asia and Africa, but sites in Europe, North America and South America also had high levels emphasizing the important role of the natural environment in the antimicrobial resistance problem. In India the rate of isolation of *E. coli* resistant to third generation cephalosporin was 25, 70 and 95% when the inlet to the

treatment plant was domestic water alone, domestic waste along with hospital effluent and hospital effluent alone, respectively [17]. Of the 283 E. coli isolates, from south Indian river Cauvery in Karnataka, 100% were resistant to third generation cephalosporin [18]. The groundwater and surface water that are used for drinking and recreational purposes have been reported with 17% rate of *E. coli*, resistant to third generation cephalosporin, in central India [19], 07 % in north India (Kashmir) [20], 50% in east India (Sikkim) [21] and 100% in south India (Hyderabad) [9].

Bacteria and fungi that cause infections in people and animals are becoming increasingly resistant to antimicrobials. There is a worrying trend that pathogens are developing antibiotic resistance to a degree where last-resort antibiotics are no longer effective. This, in turn, has severe implications for public health and healthcare costs. With 700,000 people losing battle to AMR per year and another 10 million projected to die from it by 2050, AMR alone is killing more people than cancer and road traffic accidents combined together [6]. Economic projections suggest that by 2050, AMR would decrease Gross Domestic Product (GDP) by 2-3.5% with a fall in livestock by 3-8%, costing USD 100 trillion to the world [7]. The global rise of AMR has attracted the attention of WHO. WHO launched a global action plan on AMR in 2015 with 5 strategic objectives, one of which was to strengthen knowledge of spread of AMR through surveillance and research. The One Health concept highlights the inter-relatedness among human & animal health, food and environment fostering collaboration among all stakeholders dealing in these spheres [22].

As a shared global challenge, it will be important to have a globally led approach with locally relevant interventions. The World Health Assembly on May 23, 2019 passed a resolution urging member states to strengthen infection prevention and control measures, including i) water sanitation and hygiene; ii) enhance participation in global antimicrobial surveillance system; iii) ensure prudent use of quality-assured antimicrobials; and iv) support multi-sectoral annual self-assessment survey. **Antibiotic resistance is rampant in India with a label of India being 'the AMR capital of the world'** [23]. A study by scientists at BHU, Varanasi showed that a large number of bacteria in River Ganga are resistant to commonly used antibiotics [24]. As per the 'scoping report on AMR in India' (2017), under the aegis of Government of India, among the Gram-negative bacteria, more than 70% isolates of *E. coli, Klebsiella pneumoniae* and *Acinetobacter baumannii* and nearly half of all *Pseudomonas aeruginosa* were resistant to fluoroquinolones and third generation cephalosporins. Although the resistance to drug combination of piperacillin-tazobactum was still <35% for *E. coli* and *P. aeruginosa*, the presence

of multiple resistance genes, including carbapenemases, made 65% *K. pneumoniae* resistant. Among the Gram-positive organisms, 42.6% of *Staphylococcus aureus* were methicillin-resistant and 10.5% of *Enterococcus faecium* were vancomycin-resistant. Rates of resistance among *Salmonella Typhi* and *Shigella* species were 28-82%, respectively, for ciprofloxacin, 0.6-12% for ceftriaxone and 2.3-80% for co-trimoxazole. For Vibrio cholerae, resistance rates to tetracycline varied from 17-75% in different parts India [25].

2.0 Definitions

2.1 Water Hygiene

Water hygiene refers to practices which help in maintaining and preserving the health of the existing water sources such as drinking water or any other water source. Loss of water hygiene, due to the presence of organic matter and industrial pollution, is one of the major causes for several waterborne diseases. (26, 27).

2.2 Anti-Microbial Resistance (AMR)

AMR—when microbes (i.e., bacteria, viruses and fungi) develop the ability to defeat the drugs designed to combat them—is a threat to public health and a priority across the globe. Pathogenic antimicrobial-resistant microbes can cause infections in humans that are difficult, and sometimes impossible, to treat.

2.3 Quorum sensing (QS)

Quorum sensing (QS) is a molecular phenomenon in which bacterial cells display a coordinated behaviour in response to various low-molecular-weight signalling molecules called auto-inducers

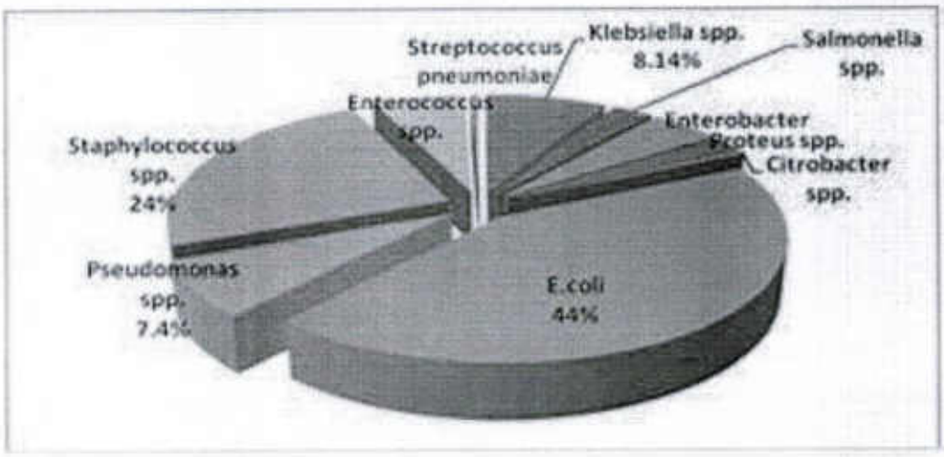
2.4 Drug Resistance

Multidrug resistant (MDR) is defined as acquired non-susceptibility to at least one agent in three or more antimicrobial categories (28).

Extensively drug resistant (XDR) is defined as non-susceptibility to at least one agent in all but two or fewer antimicrobial categories (i.e., bacterial isolates remain susceptible to only one or two antimicrobial categories) (28).

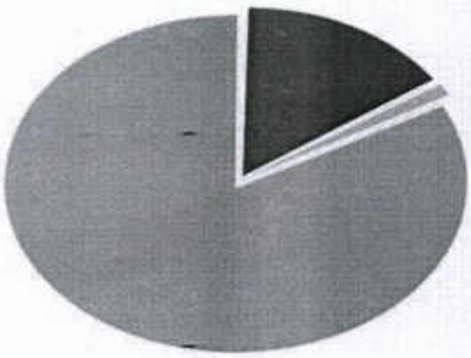
Pan-drug resistant (PDR) was defined as non-susceptibility to all agents in all antimicrobial categories (28).

2.4 Trends in Antimicrobial resistance



From: DRAGANESCU et al FARMACIA, 2016, Vol. 64(5): 770 to 774 [29]

2.5 Most frequently seen bacteria in hospital samples

Class and name of bacteria found	Frequency of each bacteria
Gram-Negative Bacteria ≤84% Uropathogenic e.coli 75% Klebsiella pneumoniae 6% Proteus mirabilis 2% Pseudomonas aeruginosa 1% Gram-Positive Bacteria ≤ 15% Staphylococcus saprophyticus 6% Enterococcus species 5% Streptococcus agalactiae (GBS) 3% Staphylococcus aureus 1% Non-Bacterial ≤1%	

3.0 Sources of various pathogenic strains in river water

Sr. No.	Bacterial species	Adverse Health Consequences
1	*E. coli*	• *E. coli* is a common gram-negative bacterium that colonizes the gut of warm-blooded animals and its presence in water indicates faecal contamination. *E.coli* also enters water from cattle rearing (30, 31). • Various strains of *E.coli* produce toxins and can cause diarrhoea, colitis, and even death in some cases (30) • Contamination of drinking water with Shigella-toxin producing *E.coli* can lead to waterborne disease outbreaks (31, 32).

2	*Klebsiella* species	• *Klebsiella* is a gram-negative bacterium and member of the family *Enterobacteriaceae*. *K. pneumonia* is one of the common bacterial pathogenic species (33). • *Klebsiella* species can reach water bodies via faecal contamination or nutrient rich waste water from certain industries such as pulp industry or sugar-cane industries (34). • *Klebsiella* species are responsible for hospital acquired infections (nosocomial infections) and *Klebsiella* from water may reach to hospital environment (34).
3	*Enterococcus* species	• *Enterococcus* species are an indicator of faecal contamination in water. Other possible sources are agricultural runoffs & sewage (35). • Infection with *Enterococcus* species can cause nosocomial infections, Urinary Tract Infection (UTI) and infections of wounds (36).
4	*Staphylococcus* species	• The presence of *Staphylococcus* species in water indicates the presence of organic matter and other organic pollutants (37). • *Staphylococcus* species can cause wound infections, food spoilage and other chronic health conditions (37).
5	*Pseudomonas* species	• *Pseudomonas* species can survive in both high-nutrient rich environment and low-nutrient rich environments (38). • *Pseudomonas* can reach water bodies via sewage pollution (38). • *Pseudomonas species* can cause several disorders such as pneumonia, urinary tract infections, meningitis, and gastrointestinal problems. It is also one of the major causes of septicaemia (38).
6	*Shigella*	• *Shigella* is one of the major causes of water-borne diarrhoea and causes 125 cases of diarrhoea annually (34). • Its presence in water indicates faecal contamination.
7	*Salmonella*	• *Salmonella* infections cause fever, gastroenteritis, vomiting, and nausea (34). • The pathogenic strains of *Salmonella* can enter into water via faecal discharge and entry from livestock and wild animals (34).
8	*Vibrio Cholera*	• *Vibrio Cholera* causes cholera (34). • It enters into water through faecal contamination (34).
9	*Acinetobacter*	• *Acinetobacter* is an occasional pathogenic organism (34). • It is commonly found in soil and sewage (34).

4.0 Materials and methods

4.1 Site description and sample collection

Musi river flows in the Deccan Plateau located in the South India. It flows through Hyderabad, one of the major Indian industrial hubs of India and the state capital of Telangana. The origin of Musi is located in the Anantagiri Hills, dense forest region located approximately 90 km from the city of Hyderabad. Musi River is a major source of water supply to Hyderabad and two major water reservoirs, Osman Sagar and Himayat Sagar, are constructed on Musi river for adequate water supply for drinking and irrigation purposes. Unfortunately, an intense & swift development of industries, especially pharmaceutical industries, has led to an unprecedented deterioration in the water quality of Musi river in past few decades. According to an estimate, approximately 600 million litres of untreated wastewater is discharged into Musi every day turning the Musi river into an open sewage drain. In recent past, Musi river has gained global attention due to presence of high level/s of antibiotic residues and active pharmaceutical intermediates (APIs) found in Musi water. Under orders from NGT and the CPCB approved work plan a total of 9 sampling sites over a stretch of 180km (see Annexure 1, Table 1a and 1b) were chosen representing the overall flow of Musi river across Hyderabad.

Water samples were collected fortnightly starting from May 2019. A team comprising of representatives from the Central Pollution Control Board, the Telangana State Pollution Control Board and BITS-Pilani, Hyderabad Campus, was involved in collection of samples. Samples were collected in sterile glass bottles and transported on pre-cooled ice gel packs to prevent any further growth of bacteria. Once the samples reached Genomics laboratory at BITS-Pilani, Hyderabad Campus, an aliquot of ~20 ml sample was removed from the parent container and centrifuged at 3,000 rpm for 5 minutes to remove all particulate matter. The remaining water (~180 ml) samples were stored frozen at -20°C for further processing for measuring antibiotic and API levels.

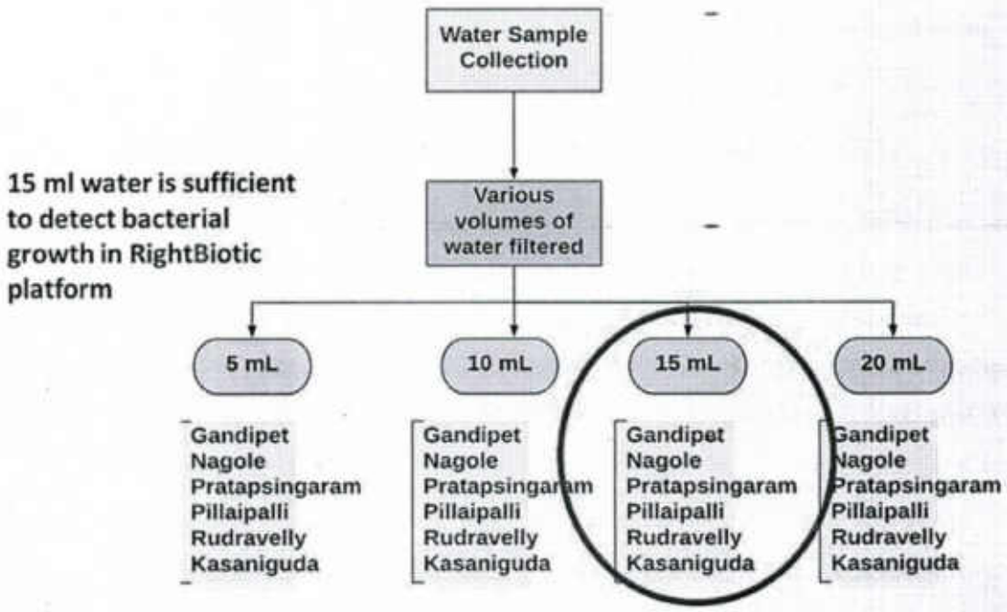
4.2 Identification of Bacterial load and type

Till date a total of fifty-four (9x6) samples have been collected. To understand the qualitative differences in the number of bacterial species present in the water samples from various sites the water samples were streaked (~10µl) on three different types of bacterial growth media (LB agar, Macconkey agar and UTI Chrome agar). Use of Macconkey agar and UTI chrome also facilitated the identification of various bacterial species present in the water samples based on the colour of

colonies obtained (summarized in Annexure 2 to 7, Tables 2 to 7). The following formula was used for calculating colony forming units in the samples plated.

(Average count) = CFU/mL (Dilution plated) (vol. (mL) plated)

The Quality control strains used for identification of bacteria on selection media are *Enterococcus faecalis* ATCC 29212, *Escherichia coli* ATCC 25922, *Klebsiella pneumoniae* ATCC 13883, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 25923 and were procured from HiMedia Laboratories, Mumbai, Maharashtra, India. The RightBiotic assay was performed as per the manufacturer's instruction using the procedure described at Annexure A. Water samples were processed as per the flow diagram shown below:



4.3 Methodology for Antimicrobial susceptibility test

Antimicrobial susceptibility test of bacterial isolates was performed in Luria Bertani Agar (M1245-50, HiMedia Laboratories, Mumbai, Maharashtra, India) using Kirby–Bauer disc diffusion method as per the standard protocol published by Hudzicki J (2009; American Society for Microbiology) [39]. The incubation period for measuring zone of inhibition was 18 hrs as per the protocol [39]. For interpretation of disk assay results, standard Clinical and Laboratory Standards Institute guidelines (CLSI) were followed [40]. The following antibiotic discs, purchased from HiMedia Laboratories, Mumbai, Maharashtra, were used in the study:

Amikacin (SD035-1CT; 30 µg), Amoxicillin (SD076-1CT; 30µg), Azithromycin (SD204-1CT;15 µg), Cefazolin (SD047-1CT; 30 µg), Cefepime (SD219-1CT; 30 µg), Cefotaxime (SD040-1CT; 30 µg), Ceftazidime (SD062A-1CT; 10 µg), Ceftriaxone (SD065-1CT; 30 µg), Cefuroxime (SD061-1CT; 30 µg), Ciprofloxacin (SD060-1CT; 5 µg), Clindamycin (SD051-1CT; 2 µg), Cloxacillin (SD166-1CT; 10 µg), Co-Trimoxazole (SD010-1CT; 25 µg), Gentamycin (SD016-1CT;10 µg), Imipenem (SD265-1CT; 10 µg), Levofloxacin (SD216-1CT; 5 µg), Lincomycin (SD084-1CT; 10 µg), Linezolid (SD215-1CT; 30 µg), Meropenem (SD727-1CT; 10 µg), Moxifloxacin (SD217-1CT; 5 µg), Netilmicin (SD046-1CT; 30 µg), Nitrofurantoin (SD023-1CT; 300 µg), Ofloxacin (SD087-1CT; 5 µg), Piperacillin-tazobactum (SD210-1CT; 10 µg), Teicoplanin (SD213-1CT; 30 µg), Tigecycline (SD278-1CT; 15 µg), Tobramycin (SD044-1CT; 10 µg), Vancomycin (SD045-1CT; 30 µg). For performing antibiotic sensitivity using RightBiotic system the readout equipment and assay kits were procured from xBITS Pvt. Ltd. India and the assay was performed as per the manufactures instructions described in Annexure A.

Well-wise arrangement of antibiotics in RightBiotic assay

Strip & Well No.	Gram-positive bacteria	Strip & Well No.	Gram-negative bacteria
P3/2	Amoxicillin	P1/2	Co-Trimoxazole
P3/3	Gentamycin	P1/3	Teicoplanin
P3/4	Amikacin	P1/4	Meropenem
P3/5	Cefepime	P1/5	Cloxacillin
P3/6	Ofloxacin	P1/6	Ceftazidime
P3/7	Ciprofloxacin	P1/7	Clindamycin
P3/8	Ceftriaxone	P1/8	Linezolid
P4/10	Piperacillin-Tazobactam	P2/10	Moxifloxacin
P4/11	Cefotaxime	P2/11	Nitrofurantoin
P4/12	Cefuroxime	P2/12	Lincomycin
P4/13	Tobramycin	P2/13	Netilmicin
P4/14	Levofloxacin	P2/14	Vancomycin
P4/15	Cefazolin	P2/15	Tigecycline
P4/16	Imipenem	P2/16	Azithromycin

5.0 Geographical and hydrological description of Musi river

River Musi is a tributary of River Krishna and flows through the state of Telangana, India. Two rivers, Moosa and Esi, merge in the Golconda area of Hyderabad and hence the converged river stream is called Musi. It originates in the Anantgiri hills in Vikarabad district and merges with River Krishna at Wadapally, Nalgonda district. The total length of Musi is around 250 kms and it divides Hyderabad into old and new city. It is important to mention that two major dams, Osman

Sagar (1920; storage capacity 110 million cubic meters) and Himayat Sagar (1927; 84 million cubic meters), have been built on Musi and Musi river serves as the major source of drinking water supply for the city of Hyderabad [41].

The overall scheme of water sample testing is summarised in Fig1

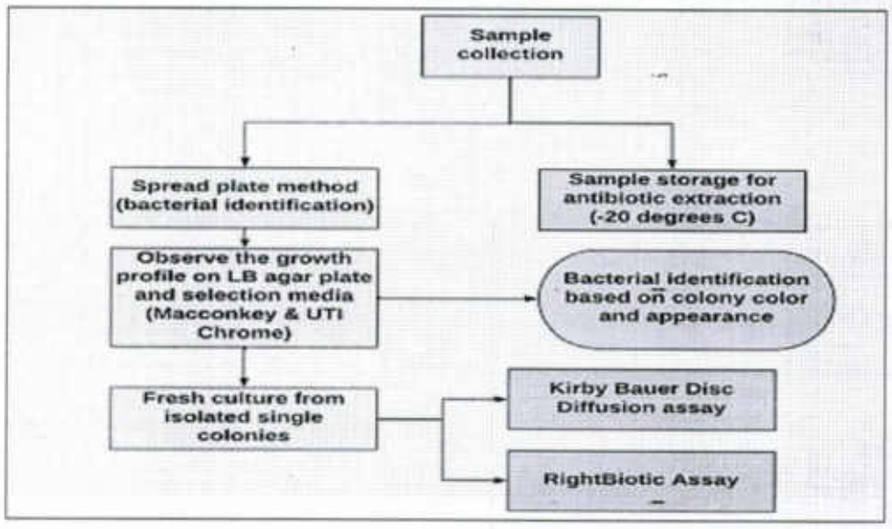


Fig. 1: Illustration of sample collection and steps for sample processing of water samples obtained from different sites (see also Table 1a and 1b)

5.1 Causes of River Musi Pollution

Although a major source of drinking water and irrigation, Musi has got global attention in recent years due to very high level of pollution contributed majorly by industrial and sewage discharge directly into the river. Major causes of Musi river pollution are discharge of untreated domestic and solid waste into the stream as it flows through the Hyderabad. Some of the major industrial clusters of the country are located in Nacharam, Uppal, Kukatpally, Jeedimetla, and Cherlapally localities and according to an estimate around 520 industries pollute the water of River Musi. Industry major in the region include drug and pharmaceutics, textiles, dairy and food processing plants, dye industry and agro-based industries. Most of these industries utilize CETPs located in the vicinity of the plant before the water is discharged into the stream. The industries located in the catchment of River Musi are treating the effluent in their own Effluent Treatment Plants and sending the treated effluent to a common effluent treatment plants (CETPs) as per their membership. The treated effluent water from CETPs is discharged through pipeline to the Amberpet STP for further treatment. However, ***it is also well established that antibiotic removal***

efficiencies depend on their chemical properties and the waste-water treatment processes used. Ghosh et al [42] reported detectable levels of antibiotics in STP discharge/s, and add that only some antibiotics can be removed in significant proportion by STPs. It can thus be concluded that the elimination of pharmaceuticals in conventional WWTPs is presently considered insufficient, and a number of substances of concern for the aquatic environment have been identified in STP effluent in several countries. Some major pharma companies in this region also follow the Zero Liquid Discharge (ZLD) system and use treated waste water in their own premises.

There is no denial that Musi is considered to be one of the most polluted rivers in the world and has earned worldwide notoriety due to the presence of very high concentration of antibiotics in its water. The higher antibiotic residues can promote the emergence of drug-tolerant bacterial strains in Musi water. Musi is now categorized under "Priority-I" list for pollution control [43]. It is important to highlight here that a recent study by IIT-Hyderabad has shown the presence of various fluoroquinolones in river Musi at 18 locations [44]. The study indicates that water treatment at Amberpet CETP is unable to remove antibiotics present in the Sewage and other effluents and is one of the major causes for antibiotics detected in Musi at downstream of Amberpet CETP.

	Fluoroquinolones (µg/L)							
Location	**CIP**	**ENR**	**NOR**	**PFL**	**DIF**	**LOM**	**OFL**	**Total**
Osman Sagar (Gandipet)	27.3	3.8	26.7	3.1	2.4	5.2	3.7	72.15
Pratapsingaram	662.3	22.1	93.0	5.5	10.4	6.8	199.6	999.6
Pillipalli	231.9	13.7	79.4	8.0	3.6	3.9	112.6	453.3
Rudravelly	86.9	15.8	49.4	2.3	4.3	4.7	56.6	219.8
Musi (Wadapally)	6.9	2.8	20.0	1.9	0.8	3.7	1.6	37.2
Krishna (Wadapally)	8.9	4.7	16.9	2.8	0.5	3.6	1.7	39.1
Confluence of Musi and Krishna at Wadapally	17.8	3.2	19.0	2.0	0.9	4.6	3.0	50.6

CIP: Ciprofloxacin; ENR: Enrofloxacin; NOR: Norfloxacin; PIF: Pefloxacin; DIF: Difloxacin; LOM: Lomefloxacin

5.2 Significance of conducting River Hygiene studies

As per literature review [45, 46], some of the major health challenges faced by human populations settled in the catchment area of polluted river/water bodies are:

1. Pathogenic infections due to bacteria, viruses and other parasites (e.g. hookworm) are common due to continued usage of contaminated water
2. Skin rashes and allergic reactions are frequently observed in individuals living in the area
3. Large scale fish death and significant loss in biodiversity has been reported due to high degree of water pollution
4. Miscarriages in livestock have been reported from catchment areas of contaminated river/s
5. Several multi-drug resistant bacterial strains have been isolated from many rivers in India and other countries.
6. Heavy metal contamination can cause liver and kidney problems. Heavy metal contaminated water also raises the risk for various cancers such as gallbladder, skin, and lungs.
7. Presence of hexavalent chromium in wastewater from industries can cause stomach cancer and higher incidence of lung and gastrointestinal cancer.

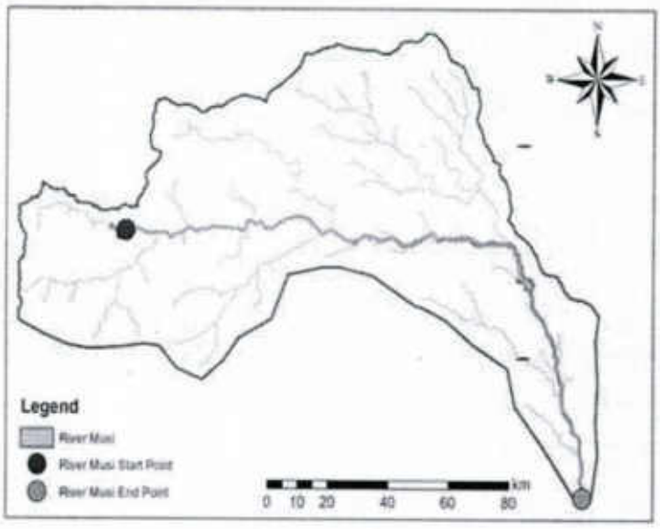


Fig. 2: The initial and final locations of River Musi during the study (adapted from Action Plan for Rejuvenation of River Stretches (Priority I and II) in Telangana State)

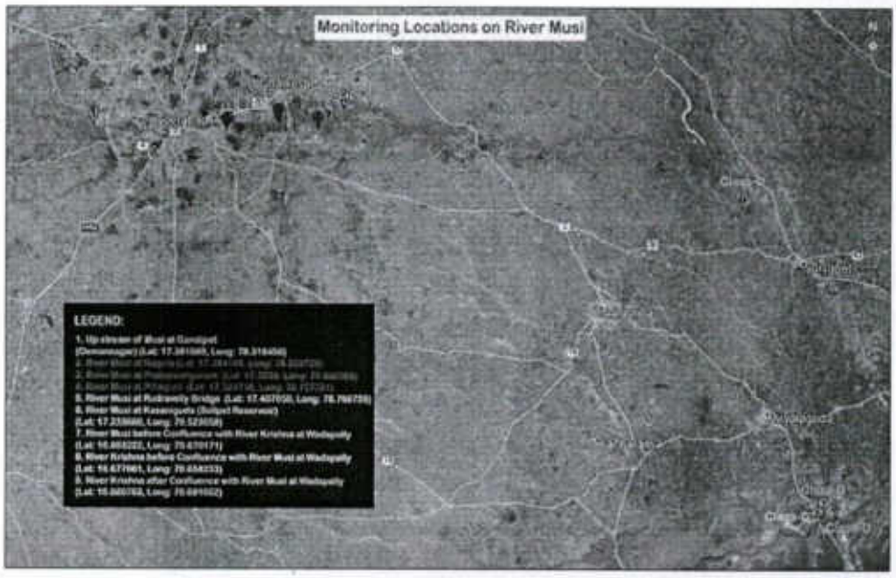


Fig. 3: Monitoring locations on River Musi with their coordinates

6.0 Results and Discussion

General parameters of water as observed during the study period and reported by TSPCB can be seen at Annexure 8. As can be seen from Figure 3, 6 out of 9 sampling sites had one or more bacteria and some had up to four different types of pathogenic bacteria, all known to cause human diseases. Three sites found to show no presence of bacteria were:

1. Musi at Wadapally (Before confluence)
2. Krishna at Wadapally (Before confluence)
3. Musi + Krishna at Wadapally (After confluence)

These sites were also found to have a pH around 8 to 8.5 and a high concentration of dissolved Ammonia probably coming from the increased agricultural runoff, containing both fertilizers and pesticides from the paddy cultivation area near these sites.

The other six sites as per the water monitoring done by TSPCB not only had a high content of total dissolved solids but also a high load of total coliform and faecal coliform bacteria. A high 8load was also observed on LB agar plates. (Annexure 9-11, Tables 8-13). Further, five out of the nine sites, namely, Nagole, Pratapsingaram, Pillaipalli, Rudravelly and Kasaniguda had higher diversity of pathogenic bacteria and overall load all through the study period.

Gandipet alone showed a fluctuating bacterial population and on four out of six sampling days no pathogenic bacteria could be isolated from the samples collected from this site. Fig 4 shows the bacteria isolated from the lone upstream site of Musi river and the numerous down-stream sites on the Musi river. The upstream site at Gandipet also serves as the source of drinking water for the city of Hyderabad. It may be noted that as the samples from Gandipet were collected before the treatment for obtaining drinking water supply, it is not surprising the pathogenic bacteria were detected in 2 out of 6 (33%) samples collected from this location. The collection dates coincide with extremely high temperatures prevalent in Hyderabad during May and substantial rains during June-July 2019, both parameters can impact water flow into the river. As can be seen from Figs 5 and 6 five other sites showed presence of two to four pathogenic bacteria and places like Nagole, Pratapsingaram, Pillaipalli, Rudravelly and Kasaniguda showed the presence of high bacterial load with high incidence of pathogenic bacteria throughout the 10-week long study.

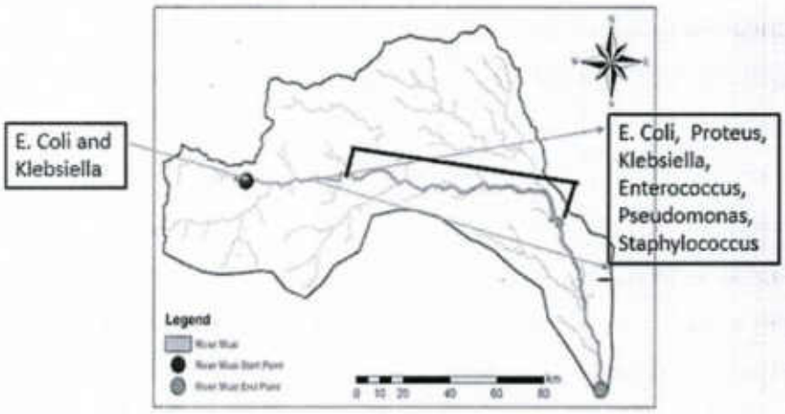


Fig 4: Pathogenic bacteria isolated from upstream and downstream locations on Musi river

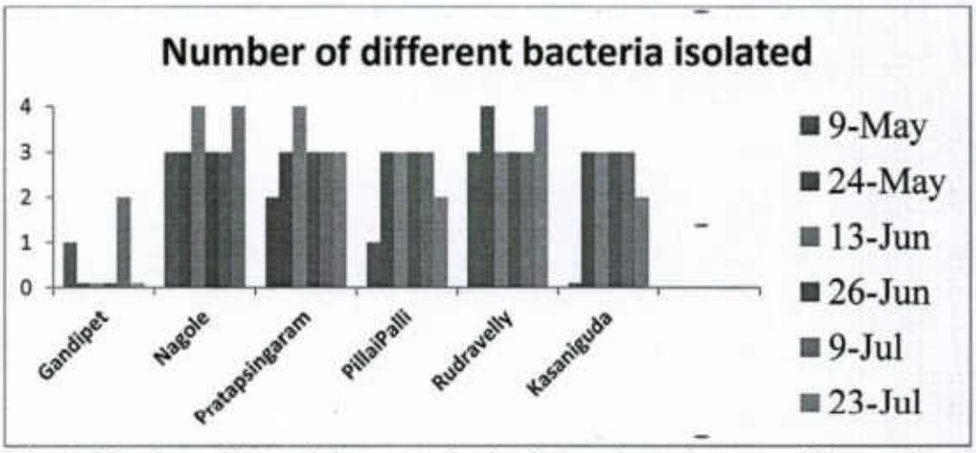


Fig. 5: Number of bacterial genera obtained at various places on different dates

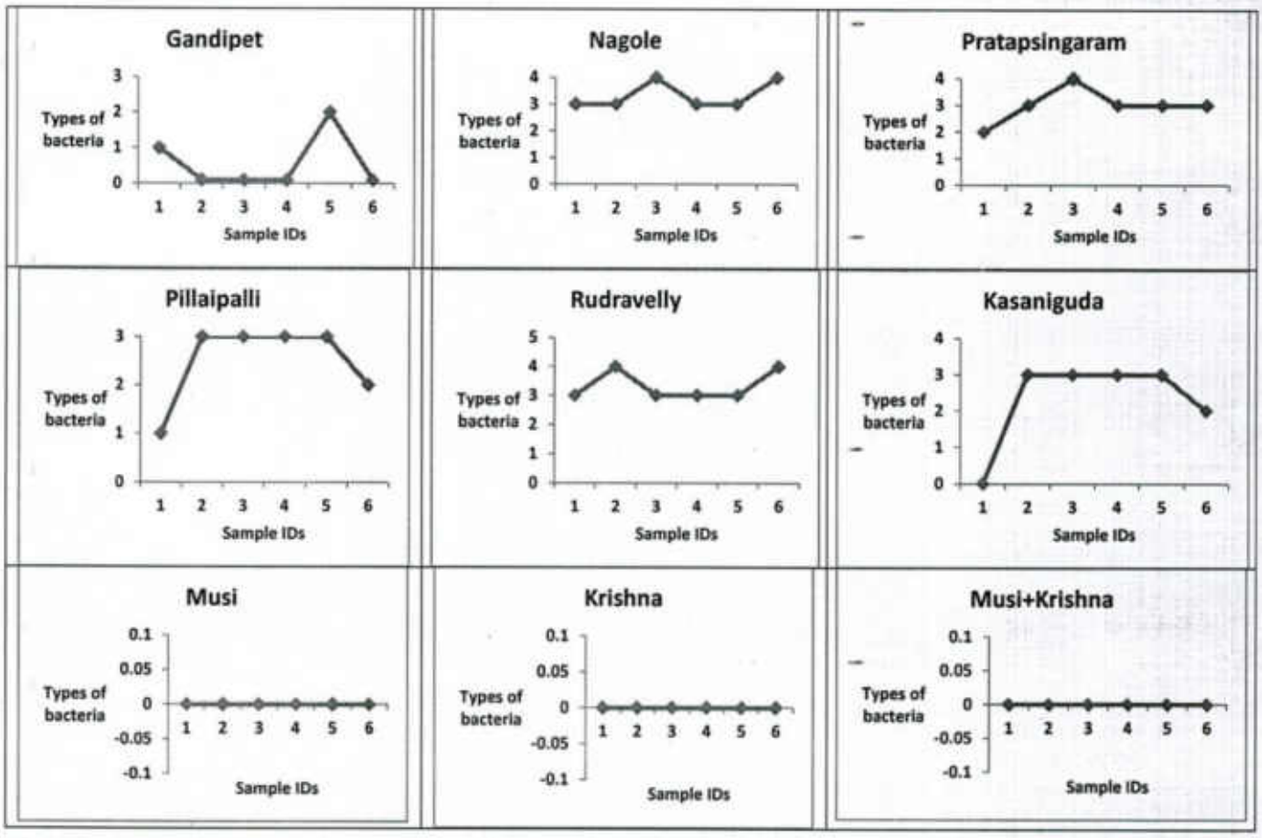


Fig.6: Line graphs representing the change in bacterial genera identified at various sampling locations during a study period

It is noteworthy to mention that these sites had frothing waters, discolouration and deposit of dyes or other metal ions on the rocks and other solid structures in the water as evident from the pictures (Annexure 12).

In light of earlier reports of high concentration of Ciprofloxacin [5, 43] being reported in the Musi river water resistance to this particular antibiotic was analysed for all gram negative bacteria isolated during the course of this study (Fig. 7). Out of 56 strains, 49 bacterial strains were resistant to Ciprofloxacin. The AMR pattern in the present study bolsters the assumption that higher antibiotic discharge in water bodies has direct implication in increasing the incidence of ciprofloxacin resistant pathogenic bacteria in Musi river.

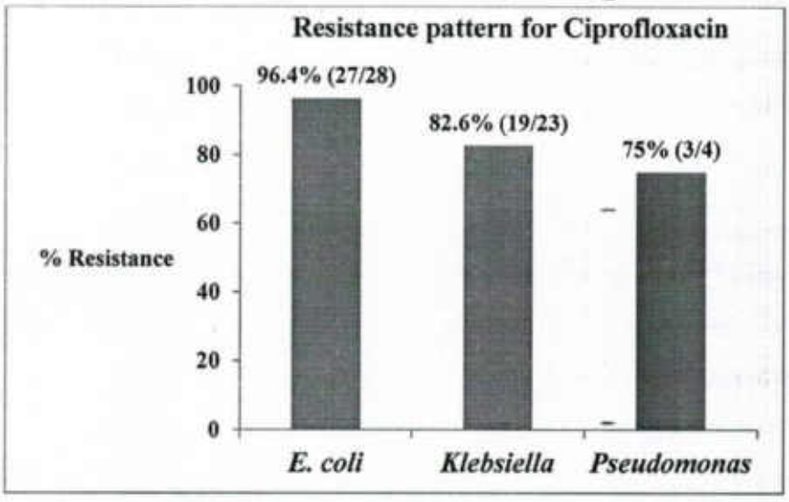


Fig.7: Resistance pattern for Ciprofloxacin among gram-negative bacteria isolated during the complete study period. Y-axis: % Resistance; X-axis: Different Gram-negative bacterial strains

It is alarming that all pathogenic bacteria isolated from the 54 water samples over the 10-week period were found to be multidrug resistant (MDR), showing resistance to more than 4 out of 14 antibiotics tested and *staphylococcus* and *pseudomonas* strains from multiple sites showed resistance to as many as 13 out of 14 antibiotics signalling XDR features, (Annexure 13, Figures 7 to18). From analyses of AMR pattern, it is evident that water samples, from 6 out of the 9 sites tested, had high bacterial load, multiple known bacterial pathogens and all the isolated bacteria showed multi-drug resistance to minimum 4 and maximum 13 antibiotics out of the panel of antibiotics tested (14 for gram negative and 14 for gram positive bacteria). As can be seen from Fig. 8, the resistance pattern covered all classes of antibiotics including the narrow and broad spectrum antibiotics, and fourth generation Cephalosporins and Fluoroquinolones. The bacterial

load present at various sites corroborated with the quality of water as reported by TSPCB (Annexure 8), with sites of class E water quality having the highest multidrug resistant bacteria.

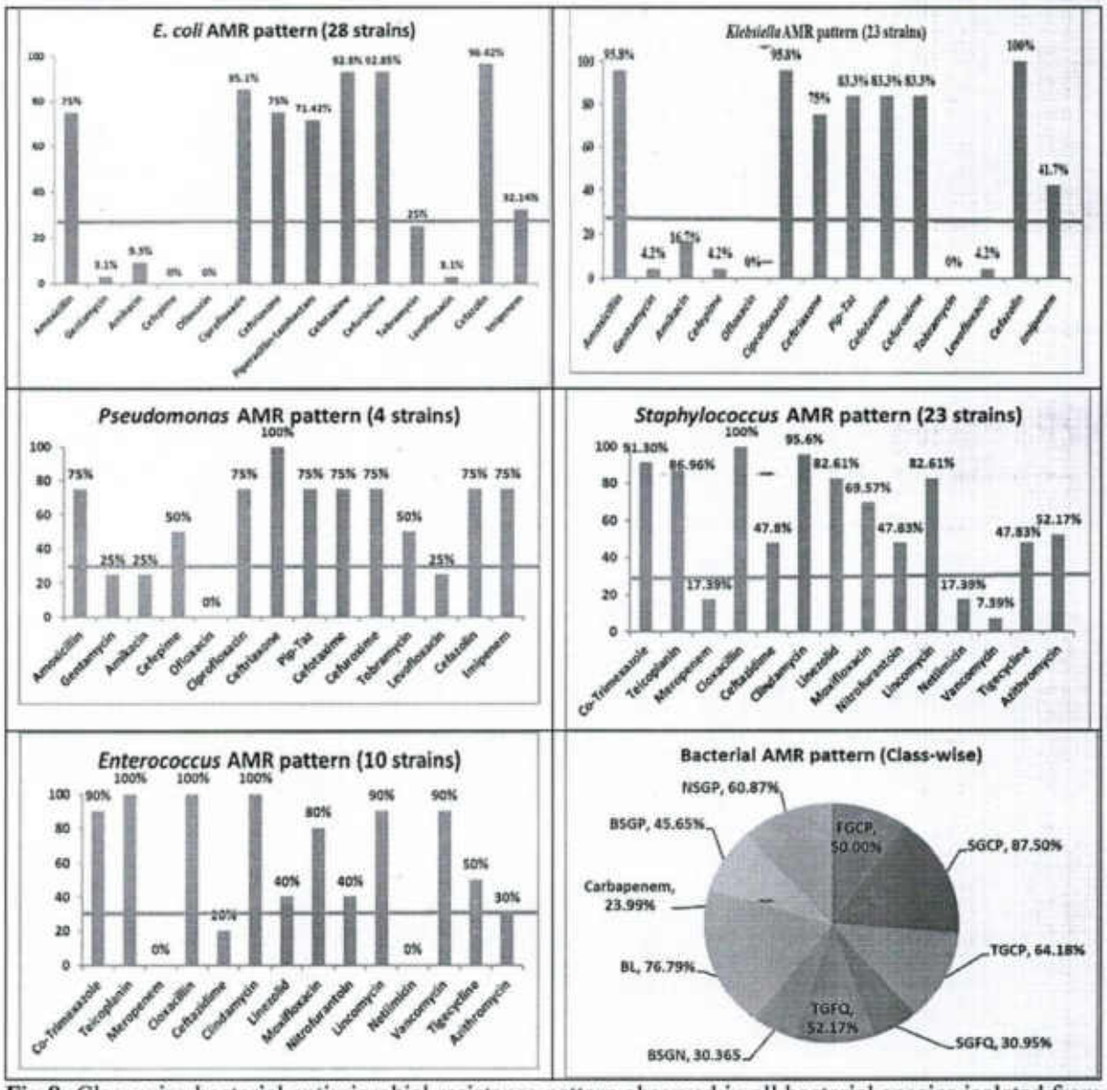


Fig 8: Class-wise bacterial antimicrobial resistance pattern observed in all bacterial species isolated from various sampling locations during the 10-week study. NSGP: Narrow Spectrum Gram positive antibiotics; FGCP: First-generation cephalosporins; SGCP: Second generation cephalosporins; TGCP: Third generation cephalosporins; SGFQ: Second generation fluoro-quinolones; TGFQ: Third generation fluoroquinolones; BSGN: Broad-spectrum Gram-negative antibiotics BL: beta-lactams; Carbapenems and BSGP: Broad-Spectrum Gram-positive antibiotics

In the present hygiene survey, the pattern of bacterial load (both types and numbers) observed was different at the same sample collection site on different time points. This can be due to multiple reasons as explained below:

1. The TSPCB report on water quality monitoring (Annexure 8) during this period reveals a fluctuation in pH at the same location on different collection dates and this would impact both the type and number of bacteria that can thrive in the minimal quality water, e.g the pH at Nagole varied between 7.1 to 8.16 during the 10-week period of study.
2. Similarly, the TSPCB report shows a range in dissolved ions and dissolved oxygen from 1161µS/cm to 1599 µS/cm and 0 to 3.6 mg/L respectively and both parameters will affect the bacterial population in the river water.
3. The rainfall during the period of study was between 40.64 mm in May, 116.84 mm in June 154.94 mm in July and this would affect both the agricultural runoff and the ground runoff into the river and hence different types of bacteria will be expected even from the same site before and after the rains.
4. Various bacterial species identified in the present hygienic survey are either members of gut microbial community of humans and/or animals or reach the water bodies via other sources such as contaminated soil and/or discharge of untreated or inappropriately treated sewage from the city of Hyderabad. The occurrence of these bacterial genera in water sample strongly suggests contamination from sewage and other biological wastes.
5. Additional reasons can be timing of discharge from the sewage treatment plants, the amount of total wastewater flowing into the river stream and type of waste discharged into the river. Hence no two samples collected from an open river stream that receives several streams (Nagole for example in case of Musi river) can be expected to be identical. Further there was a gap of 15 days between two consecutive samples which is sufficient to cause quantitative and qualitative change in the water sample.

The antibiotic resistance of the isolated pathogenic bacteria assessed by the conventional Kirby Bauer Disc diffusion assay (KB) and RightBiotic Assay (RB) are presented in Annexures 14 to 37, Tables 14 to 37). For assessing the bacterial load and identifying the bacterial genera using the RB assay the test was performed with 5ml, 10ml, 15ml and 20ml water sample. Based on volume standardization experiments just 15ml water sample is enough for RB assay and hence all other water samples were tested with 15ml water only. The results obtained are summarised in Annexure 39 to 41, Table 39 to 41). **From data summarised in Table 38 it is evident that RB assay can be used for rapid and quick hygiene survey of river and other surface and ground water surveys for assessing presence of pathogens resistant to any given panel of antibiotics for assessing the health hazard posed by ABM with an accuracy of >70%.** In case of

staphylococcus, where the number stands below 80%, it is well known that it is extremely difficult for antibiotics to act on *Staphylococcus* aureus growing as biofilms [48]. This is due to the phenomenon of quorum-sensing. Quorum sensing (QS) is a molecular phenomenon in which bacterial cells display a coordinated behaviour in response to various low-molecular-weight signalling molecules called auto-inducers [49]. In QS signalling, bacterial cell (s) secrete diffusible signalling molecules in the surrounding environment and promote behavioural change in the bacterial cells present in their vicinity, once the signalling molecule crosses a threshold limit [49]. QS signalling is a component of various bacterial survival strategies such as virulence, biofilm formation and bacterial motility [49]. Numerous studies have demonstrated that QS signalling plays an important role in conferring antibiotic resistance to bacteria. In every bacterial population, some "bacterial persistor cells" display resistance to lethal doses of antibiotics. It has been demonstrated that treatment with quorum-sensing molecules increased the number of persistent cells in *Pseudomonas aeruginosa* culture [50]. Moreover, biofilm produced due to QS signalling provides a shield to bacteria and makes it difficult to eliminate hidden bacteria because antibiotics are unable to penetrate the biofilms efficiently leading to sub-inhibitory concentrations of antibiotics inside the biofilms. Biofilms also provide a fertile ground for the transfer of antibiotic resistance genes among various bacterial species via horizontal gene transfer [51]. It is noteworthy that even when there was a mixture of bacteria present in the water sample the antibiogram assessed by the RightBiotic assay was correct in upto 70% cases and in some types it was accurate to the extent of 85 to 100% correct. **Fig. 19 clearly shows that out of 90 bacterial strains isolated from the 54 water samples all fall in the MDR and some even fall in XDR category.**

7.0 Significance

Every year, nearly 1 million people, worldwide, die from drug resistant infections. With this number projected to climb to 10 million by mid-century, medical experts now put drug resistance in the same bracket as the HIV/AIDS crisis, and are calling for a coordinated response from the international community to address the threat. In accordance with earlier reports from within India and other countries the water samples from river Musi along its track through the city of Hyderabad were found to be of **very poor quality water**, had extremely **high bacterial loads**, and **alarming resistance pattern** to almost all antibiotics indicating an imminent public health disaster, waiting to happen.

Further Krishna river at Wadapally was found to be loaded with agricultural run off with a high pH of 8.5 and it is well known that excessive levels of nitrogen and phosphorus make their way into an aquatic ecosystem when they are washed off from fields and lawns by rainwater. This nitrogen and phosphorus work as fertilizers in the water just like they do on land causing an explosion of plant growth, including algae. Algae forms a thick mat on the surface of the water. Light cannot penetrate this mat of algae, and oxygen production is reduced by bottom-dwelling plants. Plants below the algae, as well as the algae, begin to die later in the season. The decomposers that consume these dying plants consume large amounts of oxygen, which was already diminished by the lack of light-inducing photosynthesis. Algal death leads to an increase in the nutrient content of the water setting the stage for more bacterial species to thrive. In the present study, however, no bacteria were found to be in waters of Krishna water, indicating a presence of some toxic chemicals which could have inhibited the growth of bacteria at these sites. It is well established that microalgae from paddy fields produce strong broad spectrum antimicrobials and this can be another reason why no bacterial populations could be cultured from Krishna river water [47]

At the G20 in Hangzhou in September 2016, world leaders acknowledged the serious danger to public health, growth and global economic stability posed by antimicrobial resistance (AMR), a sentiment echoed at a special United Nations High-Level Meeting dedicated to the topic later on that month. However, despite this heightened sense of urgency, concrete action on tackling drug resistance remains slow and incomplete and many seasoned observers fear that we are doing too little, too late. Evidence is also piling up that global pharmaceutical companies – whose role, should be to cure sick people and channel resources into the development of new medicines, – are actually contributing to the spread of drug-resistant infections through pollution at their own production sites or those of their suppliers. A series of reports, including the present study, throw light on this fact, the third major cause of AMR, by revealing how low quality production processes and the dumping of inadequately treated manufacturing waste could be fuelling the worldwide spread of AMB and amplifying the already considerable impact of the excessive consumption of antibiotics in human medicine and their prolific use in livestock rearing.

Analysis of water samples in 2016, under the supervision of Dr Mark Holmes from the University of Cambridge found high levels of drug resistant bacteria at sites in three Indian cities namely: Hyderabad, New Delhi and Chennai and our study confirms that the situation has not changed

since then. As drug resistance in India's human and animal population continues to rise, the country's overuse of antibiotics and inappropriate disposal of the same in the environment continue to pollute and either directly or indirectly, have become the "resistance hotspots".

The national pollution index (Comprehensive Environmental Pollution Index, or CEPI), which has been in place since 2009, has been used to determine the environmental status of industrial areas across India, including the Patancheru-Bollaram cluster, which has been classified as "critically polluted". With Governments around the world scrambling to contain the devastating and very costly damage that AMR is already wreaking on public health systems worldwide, urgent action must be taken to address every single man-made source of resistance, whether of human, animal, or industrial origin. If any one of these sources is left unaddressed, we will soon lose the fight against AMB and AMR will continue to thwart all measures to treat infectious diseases. Fig. 9 clearly shows that the growing resistance to antibiotics does not spare any class of pathogenic bacteria, potentially capable of causing untreatable infections.

When it comes to tackling antibiotic resistance, addressing pollution from the manufacturing of antibiotics is a low-hanging fruit. There is growing recognition of this long an ignored cause of AMR. It is now accepted by decision-makers and leading industry players alike that manufacturing discharges must be brought under control as a matter of urgency. **Quick hygiene surveys conducted on the RightBiotic technology platform** would be very helpful in providing real-time data on the nature of bacteria thriving in river water, industrial effluents, domestic waste after treatment, etc. and help gather crucial evidence, using a uniform technology platform, of emerging patterns of antimicrobial resistance in pathogenic bacteria at an affordable cost—making large scale adoption feasible. Once the source of toxic chemicals including antibiotics in industrial effluent and domestic waste are mapped it will be easier for CPCB to adopt a remedial policy to improve the quality of water bodies and other reservoirs such as lakes, etc. and control the growing menace of widespread resistance to almost all frontline antibiotics in use today.

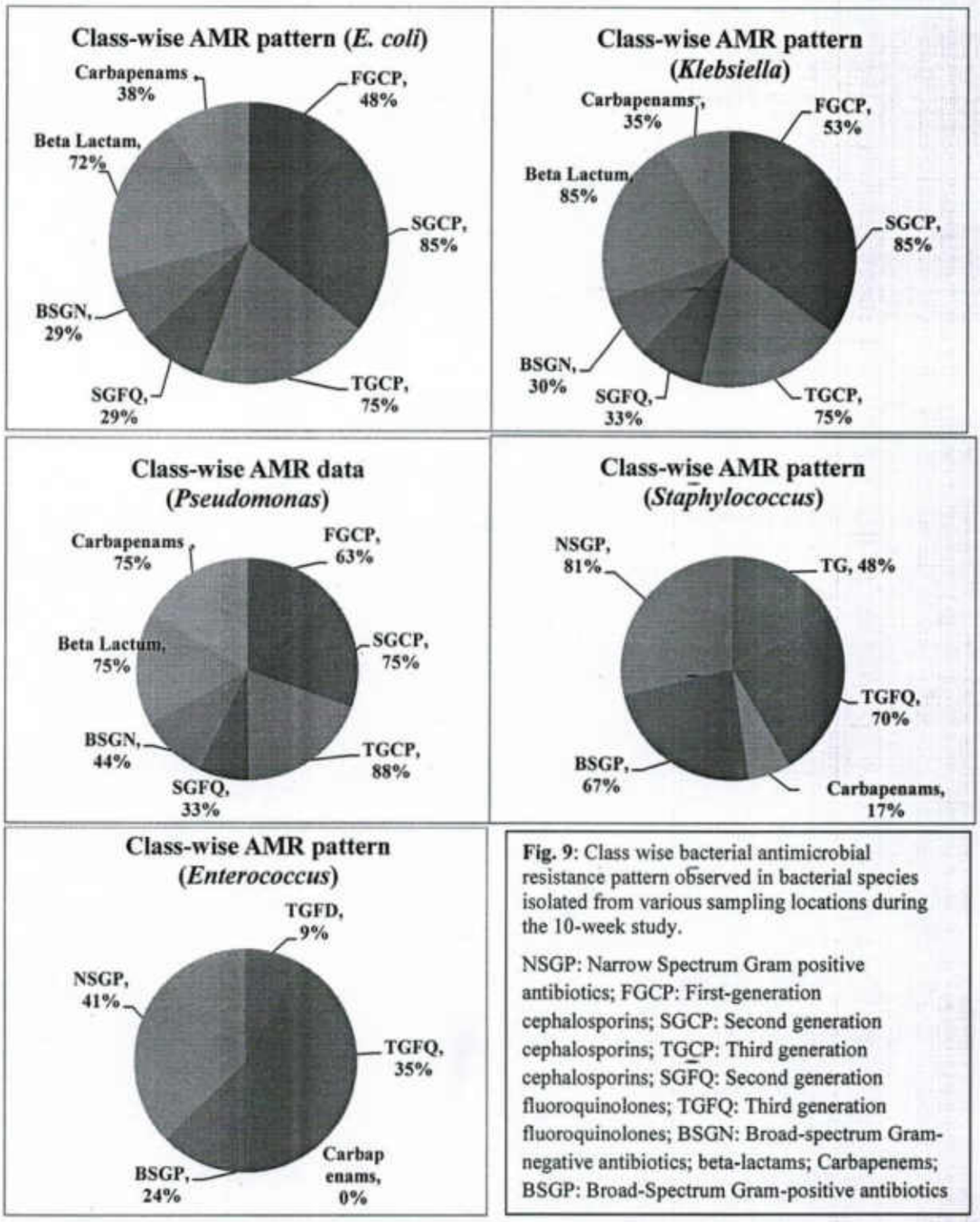


Fig. 9: Class wise bacterial antimicrobial resistance pattern observed in bacterial species isolated from various sampling locations during the 10-week study.

NSGP: Narrow Spectrum Gram positive antibiotics; FGCP: First-generation cephalosporins; SGCP: Second generation cephalosporins; TGCP: Third generation cephalosporins; SGFQ: Second generation fluoroquinolones; TGFQ: Third generation fluoroquinolones; BSGN: Broad-spectrum Gram-negative antibiotics; beta-lactams; Carbapenems; BSGP: Broad-Spectrum Gram-positive antibiotics

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Submitted by

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Study conducted under the aegis of Central Pollution Control Board, Delhi and in collaboration with Telangana State Control Board, Hyderabad

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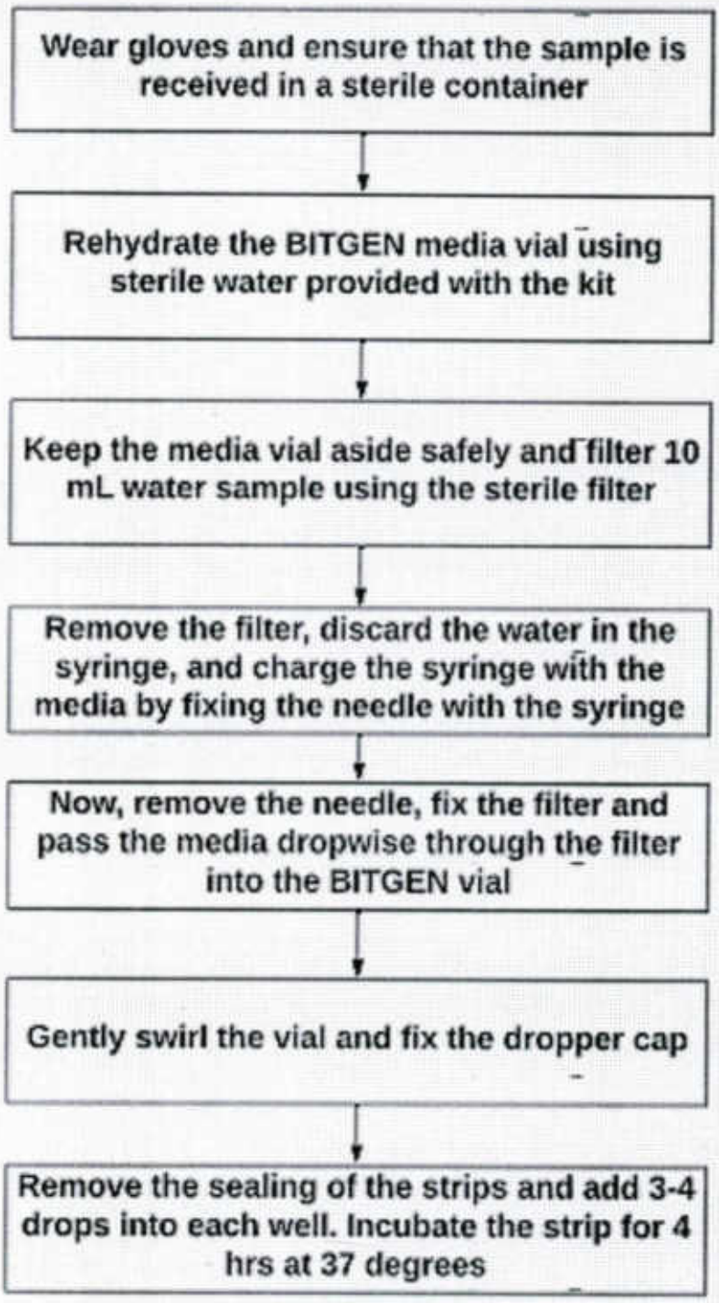
Annexure A

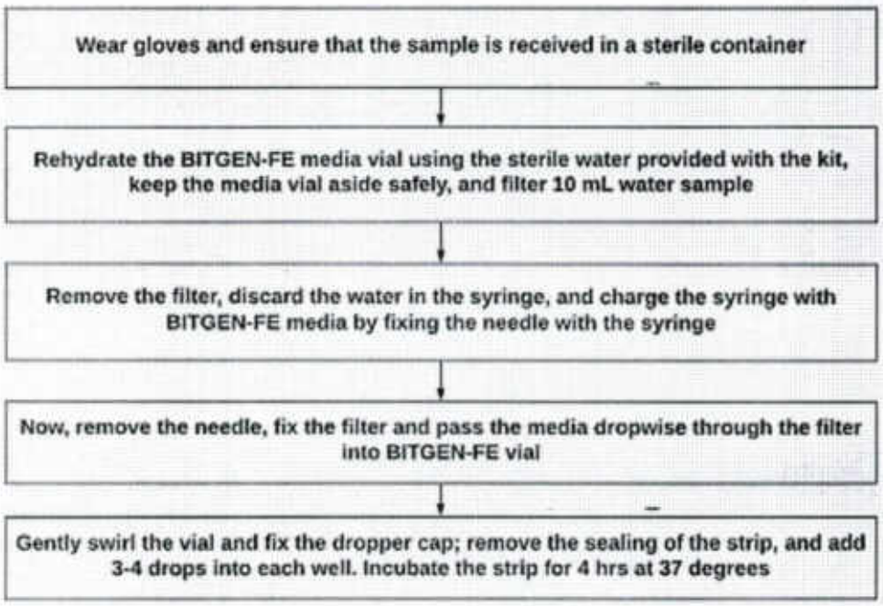
Protocol for performing RightBiotic Assay

1. Rehydrate BITGEN with 3 ml of sterile water with the help of syringe.
2. Swirl the vial for few minutes and keep it aside for 5-10 minutes so that it mixes up well
3. Attach a filter to the syringe and also attach the needle to the filter
4. Aspirate the water sample (~10ml) to harvest bacteria from the sample.
5. After aspirating the sample remove the needle and filter. Discard the filtrate and keep the filter safely aside.
6. Recharge the syringe with the BITGEN media and attach the same filter used earlier and push the media drop-wise in the vial through the filter.
7. Dispense the media in the Pi, P1and P2 or P3 and P4 strips by adding 3 drops of medium mixture to all the wells.
8. Read these strip on the RightBiotic machine as fresh Pi panel and incubate this strip at 37°C in an incubator
9. After 4 hours read the Pi and other strips and the machine will provide the results in term of sensitivity to the given panel of antibiotics
10. Keep all three strips in incubator for more time in case you suspect a low bacterial load and you can read them every hour up to 6 hrs
11. Record your readings in the prescribed note book and log the printed report appropriately
12. Store all unused, unopened kits at 4C. DO NOT STORE ANY OPENED, HALF USED KITS. DO NOT USE KITS IF YOU SEE DISCOURATION OF MEDIA PROVIDED WITH THE KIT

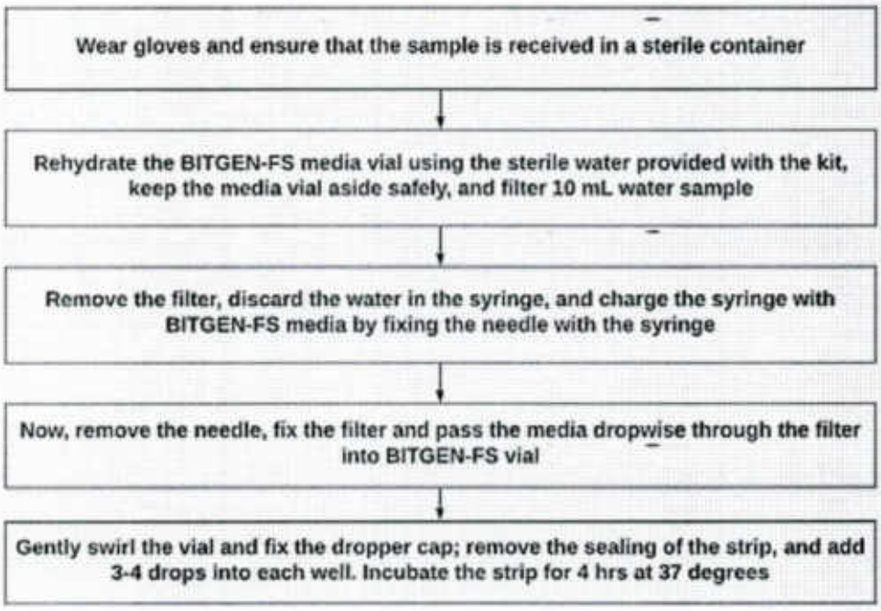
Flow chart for carrying out the RightBiotic assay



Protocol for identification of faecal coliform using RightBiotic



Protocol for identification of faecal *Streptococci* using RightBiotic



Annexure -1

Table 1a: Schedule and samples collected till date

Date	Proposed Activity
9th May 2019	Sampling at all 9 locations
23rd May 2019	Sampling at all 9 locations
13th June 2019	Sampling at all 9 locations
26th Jun 2019	Sampling at all 9 locations
9th July 2019	Sampling at all 9 locations
23th July 2019	Sampling at all 9 locations

Table 1b: Sample collection sites with their coordinates

Sl. No.	Sample collection Site	Coordinates
1	Gandipet (Osman Sagar)	17°23′N 78°18′E
2	Nagole	17°31′N 78°55′E
3	Pratapsingaram	17°38′N 78°66′E
4	Pillaipalli	17°004′N 78°60′E
5	Rudravelly	17°.4109` N, 78.7852` E
6	Kasaniguda	17°.4109`N, 79° 31' E
7	Musi at Wadapally (Before confluence)	16.698°N 79.659°E
8	Krishna at Wadapally (Before confluence)	16.698°N 79.659°E
9	Musi + Krishna at Wadapally (After confluence)	16.698°N 79.659°E

Annexure -2

Table 2: Identification of bacterial species at different locations using selective media

Date of collection: 09/05/2019

Sl. No.	Location	UTICHROME agar	Organism Identified	Macconkey agar	Organism Identified
1	Gandipet	Purple	*E. coli* (see Table 8 also)	Red	*E. coli*
2	Nagole	Purple	*E. coli* (see Table 9 also)	Red	*E.coli*
3		Blue green	*Klebsiella* (see Table 10 also)	Red with white edges	*Klebsiella*
4		White	*Staphylococcus* (see Table 11 also)	No Growth	NA
5	Pratapsingaram	White	*Staphylococcus* (see Table 15 also)	No Growth	NA
6		Purple	*E. coli* (see Table 13 also)	Red	*E.coli*
7	Rudravelly	White	*Staphylococcus* (see Table 24 also)	No Growth	NA
8		Purple	*E. coli*(see Table 22 also)	Red	*E. coli*
9		Blue green	*Klebsiella* (see Table 23 also)	Red with white edges	*Klebsiella*
10	Pillaipalli	Turquoise green	*Enterococcus* (see Table 17 also)	No Growth	NA

Annexure -3

Table 3: Identification of bacterial species at different location ns using selective mediaDate of collection:24/05/2019

Sl.No.	Location	UTICHROME agar	Organism identified	Macconkey agar	Organism identified
1	Nagole	Purple	*E. coli*(see Table 9)	Red	*E.coli*
2		Blue green	*Klebsiella* (see Table 10 also)	Red with white edges	*Klebsiella*
3		White	*Staphylococcus* (see Table 11 also)	No Growth	NA
4	Pratapsingaram	Purple	*E. coli* (see Table 13 also)	Red	*E. coli*
5		Blue green	*Klebsiella* (see Table 14 also)	Red with white edges	*Klebsiella*
6		White	*Staphylococcus* (see Table 15 also)	No Growth	NA
7	Pillaipalli	Purple	*E. coli* (see Table 18 also)	Red	*E. coli*
8		Blue green	*Klebsiella* (see Table 19 also)	Red with white edges	*Klebsiella*
9		Transparent greenish	*Pseudomonas* (see Table 20 also)	Green brown	*Pseudomonas*
10	Rudravelly	Purple	*E.coli* (see Table 22 also)	Red	*E. coli*
11		Blue green	*Klebsiella* (see Table 23 also)	Red with white edges	*Klebsiella*
12		Transparent greenish	*Pseudomonas* (see Table 25 also)	Green brown	*Pseudomonas*
13		White	*Staphylococcus* (see Table 24 also)	No Growth	NA
14	Kasaniguda	Purple	*E.coli* (see Table 27 also)	Red	*E. coli*
15		Blue green	*Klebsiella* (see Table 28 also)	Red with white edges	*Klebsiella*
16		Transparent greenish	*Pseudomonas* (see Table 29 also)	Green brown	*Pseudomonas*

Annexure -4

Table 4: Identification of bacterial species at different locations using selective media

Date of collection:13/06/2019

Sl. No.	Location	UTICHROME agar	Organism Identified	Macconkey agar	Organism identified
1	Nagole	Purple	*E. coli* (see Table 9 also)	Red	*E.coli*
2		Blue green	*Klebsiella* (see Table 10 also)	Red with white edges	*Klebsiella*
3		White	*Staphylococcus* (see Table 11 also)	No Growth	NA
4		Turquoise green	*Enterococcus* (see Table 12 also)	Colourless	*Enterococcus*
5	Pratapsingaram	White	*Staphylococcus* (see Table 15 also)	No Growth	NA
6		Purple	*E. coli* (see Table 13 also)	Red	*E. coli*
7		Blue green	*Klebsiella* (see Table 14 also)	Red with white edges	*Klebsiella*
8		Turquoise green	*Enterococcus* (See Table 16 also)	No Growth	NA
9	Pillaipalli	Purple	*E. coli* (see Table 18 also)	Red	*E. coli*
10		White	*Staphylococcus* (see Table 21 also)	No Growth	NA
11		Blue green	*Klebsiella* (see Table 19 also)	Red with white edges	*Klebsiella*
12	Rudravelly	White	*Staphylococcus* (see Table 24 also)	No Growth	NA
13		Purple	*E. coli* (see Table 22 also)	Red	*E.coli*
14		Blue green	*Klebsiella* (see Table 23 also)	Red with white edges	*Klebsiella*
15	Kasaniguda	Purple	*E. coli* (see Table 27 also)	Red	*E. coli*
16		Transparent greenish	*Pseudomonas* (see Table 29 also)	No Growth	NA
17		Blue green	*Klebsiella* (see Table 28 also)	Red with white edges	*Klebsiella*

Annexure -5

Table 5: Identification of bacterial species at different locations using selective media

Date of collection:26/06/2019

Sl. No.	Location	UTICHROME agar	Organism Identified	Macconkey agar	Organism identified
1	Nagole	Purple	*E. coli* (see Table 9 also)	Red	*E.coli*
2		Blue green	*Klebsiella* (see Table 10 also)	Red with white edges	*Klebsiella*
3		White	*Staphylococcus* (see Table 11 also)	No Growth	NA
5	Pratapsingaram	White	*Staphylococcus* (see Table 15 also)	No Growth	NA
6		Purple	*E. coli* (see Table 13 also)	Red	*E. coli*
7		Blue green	*Klebsiella* (see Table 14 also)	Red with white edges	*Klebsiella*
9	Pillaipalli	Purple	*E. coli* (see Table 17 also)	Red	*E. coli*
10		White	*Staphylococcus* (see Table 21 also)	No Growth	NA
11		Blue green	*Klebsiella* (see Table 19 also)	Red with white edges	*Klebsiella*
12	Rudravelly	White	*Staphylococcus* (see Table 24 also)	No Growth	N
13		Purple	*E. coli* (see Table 22 also)	Red	*E. coli*
14		Turquoise green	*Enterococcus* (see Table26 also)	No Growth	NA
15	Kasaniguda	Purple	*E. coli* (see Table 27 also)	Red	*E. coli*
16		White	*Staphylococcus* (see Table 30 also)	No Growth	NA
17		Blue green	*Klebsiella* (see Table 28 also)	Red with white edges	*Klebsiella*

Annexure -6

Table 6: Identification of bacterial species at different locations using selective media

Date of collection:09/07/2019

Sl. No.	Location	UTICHROME agar	Organism Identified	Macconkey agar	Organism identified
1	Gandipet	Purple	*E.coli* (see Table8 also)	Red	*E.coli*
2		Blue green	*Klebsiella* (see Table also)	Red with white edges	*Klebsiella*
3	Nagole	Purple	*E.coli* (see Table 9 also)	Red	*E.coli*
4		Blue green	*Klebsiella* (see Table 10 also)	Red with white edges	*Klebsiella*
5		White	*Staphylococcus* (see Table 11 also)	No Growth	NA
6	Pratapsingaram	White	*Staphylococcus* (see Table 15 also)	No Growth	NA
7		Purple	*E.coli* (see Table 13 also)	Red	*E. coli*
8		Blue green	*Klebsiella*(see Table 14 also)	Red with white edges	*Klebsiella*
9	Pillaipalli	Purple	*E. coli (*see Table 18 also)	Red	*E.coli*
10		White	*Staphylococcus* (see Table 21 also)	No Growth	NA
11		Turquoise green	*Enterococcus* (see Table17also)	No Growth	NA
12	Rudravelly	White	*Staphylococcus*(see Table 24 also)	No Growth	NA
13		Purple	*E. coli*(see Table 22 also)	Red	*Escherichia coli*
14		Blue green	*Klebsiella*(see Table 23 also)	Red with white edges	*Klebsiella*
15	Kasaniguda	Purple	*E. coli*(see Table 27 also)	Red	*Escherichia coli*
16		White	*Staphylococcus*(see Table 30 also)	No Growth	NA
17		Turquoise green	*Enterococcus* (see Table 31 also)	No Growth	NA

Annexure -7

Table 7: Identification of bacterial species at different locations using selective media

Date of collection:23/07/2019

Sl. No.	Location	UTICHROME agar	Organism Identified	Macconkey agar	Organism identified
1	Nagole	Purple	*E.coli*(see Table 9 also)	Red	*E.coli*
2		Blue green	*Klebsiella* (see Table 10 also)	Red with white edges	*Klebsiella*
3		White	*Staphylococcus*(see Table 11 also)	No Growth	NA
4		Turquoise green	*Enterococcus* (see table 12 also)	No Growth	NA
5	Pratapsingaram	White	*Staphylococcus* (see Table 15 also)	No Growth	NA
6		Turquoise green	*Enterococcus* (see Table 16 also)	No Growth	NA
7		Blue green	*Klebsiella* (see Table14 also)	Red with white edges	*Klebsiella*
8	Pillaipalli	Purple	*E.coli* (see Table 17 also)	Red	*E. coli*
9		Turquoise green	*Enterococcus* (see Table 17 also)	No Growth	NA
10	Rudravelly	White	*Staphylococcus*(see Table 24 also)	No Growth	NA
11		Purple	*E.coli*(see Table 22 also)	Red	*E. coli*
12		Blue green	*Klebsiella* (see Table 23 also)	Red with white edges	*Klebsiella*
13		Turquoise green	*Enterococcus* (see Table 26 also)	Colourless	*Enterococcus*
14	Kasaniguda	Turquoise green	*Enterococcus* (see Table 31 also)	No Growth	NA
15		Blue green	*Klebsiella* (see Table 28 also)	Red with white edges	*Klebsiella*

Annexure 8

TELANGANA STATE POLLUTION CONTROL BOARD

Paryavaran Bhavan, A-3, Industrial Estate, Sanathnagar, Hyderabad – 500 018
Ph: 040-23887500

CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/5203-5207

Collected on: 10/05/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 17/05/2019

Collected by: SE S, ZL, Warangal along with CPCB Officials
Received on: 10/05/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi

Sample code	:	Sample details / collection point
5203	-	Upstream of River Musi at Gandipet (Osmansagar)
5204	-	River Musi at Nagole bridge, R.R.Dist
5205	-	River Musi at Pratapsingaram, R R dist
5206	-	River Musi at Pillaipalli, RR dist
5207	-	River Musi at Rudravelly Bridge

Parameters	Unit	Results				
		5203	5204	5205	5206	5207
pH	-	7.9	7.3	7.3	7.3	7.2
Electrical conductivity	µS/cm	382	1489	1543	1382	1490
Dissolved oxygen	mg/L	6.2	Nil	Nil	2.1	*
Chemical Oxygen Demand	mg/L	21	252	157	126	110
BOD 3 at 27°C	mg/L	3	72	42	34	28
Total Suspended Solids	mg/L	8	137	32	18	29
Total Dissolved Solids	mg/L	270	1022	986	795	850
Free Ammonia	mg/L	0.24	0.20	0.27	0.22	0.16
SAR	-	1.0	3.5	5.6	5.1	5.2
Boron	mg/L	BDL	BDL	BDL	BDL	BDL
Nitrates	mg/L	4	17	13	27	25
Total coliform	MPN/100ml	49	540	920	>1600	1600
Fecal coliform	MPN/100ml	Nil	79	110	94	140
CPCB water quality criteria class		B	E	E	E	-

Note: Results related to sample as received.
BDL – Below Detectable Limit
(*) - Sample not collected.

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
Joint Chief Environmental Scientist (FAC)

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TELANGANA STATE POLLUTION CONTROL BOARD

Paryavaran Bhavan, A-3, Industrial Estate, Sanathnagar, Hyderabad – 500 018
Ph: 040-23887500

CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/5208-5211

Collected on: 10/05/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 17/05/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 10/05/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi

Sample code : Sample details / collection point

- 5208 - River Musi at Kazamiguda
- 5209 - River Musi before confluence with River Krishna at wadapally
- 5210 - River Krishna before confluence with River Musi at Wadapally
- 5211 - River Krishna after confluence with River Musi at Wadapally

Parameters	Unit	Results			
		5208	5209	5210	5211
pH	-	7.6	8.2	8.2	8.2
Electrical conductivity	µS/cm	2120	1210	485	608
Dissolved oxygen	mg/L	4.2	5.6	4.0	5.6
Chemical Oxygen Demand	mg/L	145	50	26	20
BOD 3 at 27°C	mg/L	30	4.0	3.0	3.0
Total Suspended Solids	mg/L	25	5	8	<5
Total Dissolved Solids	mg/L	1348	690	314	390
Free Ammonia	mg/L	0.5	0.7	0.02	0.02
SAR	-	10.3	6.7	3.4	2.8
Boron	mg/L	BDL	BDL	BDL	BDL
Nitrates	mg/L	17	6	3	18
Total coliform	MPN/100ml	17	33	130	350
Fecal coliform	MPN/100ml	<2	<2	<2	33
CPCB water quality criteria class		**D**	**D**	**C**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/5510-5514

Collected on: 25/05/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 01/06/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 25/05/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi

Sample code	:	Sample details / collection point
5510	-	Upstream of River Musi at Gandipet (Osmansagar)
5511	-	River Musi at Nagole bridge, R.R.Dist
5512	-	River Musi at Pratapsingaram, R R dist
5513	-	River Musi at Pillaipalli, RR dist
5514	-	River Musi at Rudravelly Bridge

Parameters	Unit	Results				
		5510	5511	5512	5513	5514
pH	-	8.0	7.5	7.4	7.5	7.6
Electrical conductivity	µS/cm	454	1320	1381	1389	1404
Dissolved oxygen	mg/L	5.9	Nil	Nil	2.4	*
Chemical Oxygen Demand	mg/L	40	173	141	120	84
BOD 3 at 27°C	mg/L	3.0	43	32	28	21
Total Suspended Solids	mg/L	5	97	41	16	24
Total Dissolved Solids	mg/L	294	887	932	934	943
Free Ammonia	mg/L	0.16	0.6	0.4	0.4	0.5
SAR	-	7.1	3.1	3.6	4.3	4.1
Boron	mg/L	BDL	BDL	BDL	BDL	BDL
Nitrates	mg/L	9	87	86	87	86
Total coliform	MPN/100ml	08	350	1600	1600	920
Fecal coliform	MPN/100ml	<2	49	130	79	49
CPCB water quality criteria class		B	E	E	E	-

Note: Results related to sample as received.
BDL – Below Detectable Limit
(*) - Sample not collected.

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
Joint Chief Environmental Scientist (FAC)

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TELANGANA STATE POLLUTION CONTROL BOARD

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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/5515-5518

Collected on: 25/05/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 01/06/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 25/05/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi

Sample code	:	Sample details / collection point
5515	-	River Musi at Kasaniguda
5516	-	River Musi before confluence with River Krishna at wadapally
5517	-	River Krishna before confluence with River Musi at Wadapally
5518	-	River Krishna after confluence with River Musi at Wadapally

Parameters	Unit	Results			
		5515	5516	5517	5518
pH	-	8.1	8.5	8.5	8.4
Electrical conductivity	µS/cm	2150	1315	828	952
Dissolved oxygen	mg/L	4.0	5.8	4.0	5.4
Chemical Oxygen Demand	mg/L	120	58	32	18
BOD 3 at 27°C	mg/L	27	4.2	3.0	3.0
Total Suspended Solids	mg/L	10	< 5	7	< 5
Total Dissolved Solids	mg/L	1250	882	620	609
Free Ammonia	mg/L	0.96	0.54	0.02	0.02
SAR	-	3.6	3.9	2.9	2.9
Boron	mg/L	BDL	BDL	BDL	BDL
Nitrates	mg/L	34	9	8	7
Total coliform	MPN/100ml	13	33	130	350
Fecal coliform	MPN/100ml	< 2	08	17	22
CPCB water quality criteria class		**D**	**D**	**C**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/6212-6216

Collected on: 12/06/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 21/06/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 14/06/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi

Sample code	:	Sample details / collection point
6212	-	Upstream of River Musi at Gandipet (Osmansagar)
6213	-	River Musi at Nagole bridge, R.R.Dist
6214	-	River Musi at Pratapsingaram, R R dist
6215	-	River Musi at Pillaipalli, RR dist
6216	-	River Musi at Rudravelly Bridge

Parameters	Unit	Results				
		6212	6213	6214	6215	6216
pH	-	8.40	8.12	7.94	7.78	7.64
Electrical conductivity	µS/cm	378	1161	1220	1248	1253
Dissolved oxygen	mg/L	5.4	Nil	Nil	4.9	3.4
Chemical Oxygen Demand	mg/L	35	172	100	72	92
BOD 3 at 27°C	mg/L	3	43	24	18	23
Total Suspended Solids	mg/L	< 5	46	30	14	15
Total Dissolved Solids	mg/L	218	722	759	839	772
Free Ammonia	mg/L	0.31	1.1	1.04	0.80	0.61
SAR	-	1.7	4.7	4.9	5.5	5.8
Boron	mg/L	BDL	BDL	0.33	BDL	BDL
Nitrates	mg/L	4.6	19.1	73.1	73.1	26.1
Total coliform	MPN/100ml	17	540	>1600	540	1600
Fecal coliform	MPN/100ml	< 2	94	170	79	170
CPCB water quality criteria class		**B**	**E**	**E**	**D**	**E**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/6217-6220

Collected by: SES, ZL, Warangal along with CPCB Officials

Collected on: 12/06/2019

Received on: 14/06/2019

Test method: Standard Methods of APHA, 23rd Edition

Quantity of the sample: 1 Ltr. sample each

Issue date: 21/06/2019

Page No.: 1 of 1

Source: River Musi

Sample code	:	Sample details / collection point
6217	-	River Musi at Kasaniguda
6218	-	River Musi before confluence with River Krishna at wadapally
6219	-	River Krishna before confluence with River Musi at Wadapally
6220	-	River Krishna after confluence with River Musi at Wadapally

Parameters	Unit	Results			
		6217	6218	6219	6220
pH	-	8.11	8.80	8.76	8.68
Electrical conductivity	µS/cm	2167	1251	806	909
Dissolved oxygen	mg/L	4.3	2.1	5.0	5.8
Chemical Oxygen Demand	mg/L	112	72	20	52
BOD 3 at 27°C	mg/L	28	18	4	3
Total Suspended Solids	mg/L	30	< 5	< 5	7
Total Dissolved Solids	mg/L	1392	872	420	536
Free Ammonia	mg/L	1.10	0.71	0.02	0.02
SAR	-	12.4	7.8	5.8	6.0
Boron	mg/L	0.36	0.97	BDL	BDL
Nitrates	mg/L	26.1	5.7	6.1	4.9
Total coliform	MPN/100ml	08	49	94	170
Fecal coliform	MPN/100ml	< 2	08	13	13
CPCB water quality criteria class		**D**	**E**	**D**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/6469-6473

Collected on: 26/06/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 05/07/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 27/06/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi under Hygenic Survey Programme

Sample code	:	Sample details / collection point
6469	-	Upstream of River Musi at Gandipet (Osmansagar)
6470	-	River Musi at Nagole bridge, R.R.Dist
6471	-	River Musi at Pratapsingaram, R R dist
6472	-	River Musi at Pillaipalli, RR dist
6473	-	River Musi at Rudravelly Bridge

Parameters	Unit	Results				
		6469	6470	6471	6472	6473
pH	-	8.33	7.38	7.75	7.80	7.70
Electrical conductivity	µS/cm	457	1312	1301	1168	1248
Dissolved oxygen	mg/L	5.1	Nil	Nil	3.6	4.8
Chemical Oxygen Demand	mg/L	25	180	147	129	90
BOD 3 at 27°C	mg/L	3	36	24	32	23
Total Suspended Solids	mg/L	< 5	48	24	16	14
Total Dissolved Solids	mg/L	224	714	738	820	754
Free Ammonia	mg/L	0.21	0.7	0.76	0.8	0.6
SAR	-	2.7	5.7	6.5	6.9	7.6
Boron	mg/L	BDL	BDL	0.03	BDL	BDL
Nitrates	mg/L	5	22	76	75	77
Total coliform	MPN/100ml	33	540	920	>1600	920
Fecal coliform	MPN/100ml	< 2	74	94	79	49
CPCB water quality criteria class		**B**	**E**	**E**	**E**	**D**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/6474-6477

Collected by: SES, ZL, Warangal along with CPCB Officials

Collected on: 26/06/2019

Received on: 27/06/2019

Test method: Standard Methods of APHA, 23rd Edition

Quantity of the sample: 1 Ltr. sample each

Issue date: 05/07/2019

Page No.: 1 of 1

Source: River Musi under Hygenic Survey Programme

Sample code	:	Sample details / collection point
6474	-	River Musi at Kasaniguda
6475	-	River Musi before confluence with River Krishna at wadapally
6476	-	River Krishna before confluence with River Musi at Wadapally
6477	-	River Krishna after confluence with River Musi at Wadapally

Parameters	Unit	Results			
		6474	6475	6476	6477
pH	-	8.2	8.5	8.5	8.5
Electrical conductivity	µS/cm	2200	1537	828	827
Dissolved oxygen	mg/L	4.4	3.7	4.8	5.0
Chemical Oxygen Demand	mg/L	196	38	18	20
BOD 3 at 27°C	mg/L	49	5	3	3
Total Suspended Solids	mg/L	26	<5	<5	<5
Total Dissolved Solids	mg/L	1520	984	522	529
Free Ammonia	mg/L	0.71	0.8	0.02	0.12
SAR	-	18	11	9	9
Boron	mg/L	0.42	0.94	BDL	BDL
Nitrates	mg/L	29	7	12	8
Total coliform	MPN/100ml	46	170	140	220
Fecal coliform	MPN/100ml	08	17	33	33
CPCB water quality criteria class		**D**	**E**	**C**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	**A**	**B**	**C**	**D**	**E**
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or <2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/7245-7249

Collected by: SES, ZL, Warangal along with CPCB Officials

Collected on: 09/07/2019

Received on: 10/07/2019

Test method: Standard Methods of APHA, 23rd Edition

Quantity of the sample: 1 Ltr. sample each

Issue date: 16/07/2019

Source: River Musi under Hygenic Survey Programme

Sample code	:	Sample details / collection point
7245	-	Upstream of River Musi at Gandipet (Osmansagar)
7246	-	River Musi at Nagole bridge, R.R.Dist
7247	-	River Musi at Pratapsingaram, R.R dist
7248	-	River Musi at Pillaipalli, RR dist
7249	-	River Musi at Rudravelly ftridge

Parameters	Unit	Results				
		7245	7246	7247	7248	7249
pH	-	7.92	7.4	7.5	7.6	7.56
Electrical conductivity	µS/cm	468	1328	1415	1522	1749
Dissolved oxygen	mg/L	5.8	Nil	NIL	3.6	4.1
Chemical Oxygen Demand	mg/L	27	165	120	87	76
BOD 3 at 27°C	mg/L	3	26	18	18	19
Total Suspended Solids	mg/L	<5	36	28	28	24
Total Dissolved Solids	mg/L	304	850	891	944	1018
Free Ammonia	mg/L	0.3	0.84	0.43	0.42	0.30
SAR	-	0.9	9.5	3.7	5.6	3.5
Boron	mg/L	BDL	BDL	0.004	0.034	BDL
Nitrates	mg/L	5	22	23	24	25
Total coliform	MPN/100ml	49	920	920	920	540
Fecal coliform	MPN/100ml	08	94	110	79	94
CPCB water quality criteria class		B	E	E	E	D

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	**A**	**B**	**C**	**D**	**E**
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
Joint Chief Environmental Scientist (FAC)

TELANGANA STATE POLLUTION CONTROL BOARD

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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/7250-7253

Collected by: SES, ZL, Warangal along with CPCB Officials

Collected on: 09/07/2019

Received on: 10/07/2019

Test method: Standard Methods of APHA, 23rd Edition

Quantity of the sample: 1 Ltr. sample each

Issue date: 16/07/2019

Page No.: 1 of 1

Source: River Musi under Hygenic Survey Programme

Sample code	:	Sample details / collection point
7250	-	River Musi at Kasaniguda
7251	-	River Musi before confluence with River Krishna at wadapally
7252	-	River Krishna before confluence with River Musi at Wadapally
7253	-	River Krishna after confluence with River Musi at Wadapally

Parameters	Unit	Results			
		7250	7251	7252	7253
pH	-	7.71	8.59	8.39	8.50
Electrical conductivity	µS/cm	2222	1739	1117	1166
Dissolved oxygen	mg/L	4.0	3.4	4.2	4.6
Chemical Oxygen Demand	mg/L	172	35	19	25
BOD 3 at 27°C	mg/L	43	10	3	4
Total Suspended Solids	mg/L	60	<5	<5	<5
Total Dissolved Solids	mg/L	1680	998	645	662
Free Ammonia	mg/L	0.85	0.75	0.02	0.17
SAR	-	9.1	3.9	2.5	2.7
Boron	mg/L	0.49	BDL	BDL	BDL
Nitrates	mg/L	24	7	5	7
Total coliform	MPN/100ml	170	49	140	140
Fecal coliform	MPN/100ml	17	17	17	23
CPCB water quality criteria class		**D**	**E**	**C**	**D**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
Joint Chief Environmental Scientist (FAC)

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CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/7494-7498

Collected on: 23/07/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 31/07/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 24/07/2019
Quantity of the sample: 1 Ltr. sample each
Page No.: 1 of 1

Source: River Musi under Hygenic Survey Programme

Sample code	:	Sample details / collection point
7494	-	Upstream of River Musi at Gandipet (Osmanasagar)
7495	-	River Musi at Nagole bridge, R.R.Dist
7496	-	River Musi at Pratapsingaram, R R dist
7497	-	River Musi at Pillaipalli, RR dist
7498	-	River Musi at Rudravelly Bridge

Parameters	Unit	Results				
		7494	7495	7496	7497	7498
pH	-	6.13	7.10	7.40	7.50	7.60
Electrical conductivity	µS/cm	540	1599	1611	1660	1662
Dissolved oxygen	mg/L	5.1	Nil	Nil	4.0	4.7
Chemical Oxygen Demand	mg/L	29	210	131	68	74
BOD 3 at 27°C	mg/L	3	42	20	18	20
Total Suspended Solids	mg/L	< 5	46	32	22	34
Total Dissolved Solids	mg/L	346	991	999	1046	1030
Free Ammonia	mg/L	0.19	0.90	0.47	0.49	0.62
SAR	-	2.5	5.2	5.9	6.6	6.3
Boron	mg/L	BDL	BDL	0.04	BDL	BDL
Nitrates	mg/L	12	34	94	80	75
Total coliform	MPN/100ml	33	920	1600	540	920
Fecal coliform	MPN/100ml	05	79	170	94	79
CPCB water quality criteria class		**B**	**E**	**E**	**D**	**D**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
Joint Chief Environmental Scientist (FAC)

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TELANGANA STATE POLLUTION CONTROL BOARD

Paryavaran Bhavan, A-3, Industrial Estate, Sanathnagar, Hyderabad – 500 018
Ph: 040-23887500

CENTRAL LABORATORY

Analysis Report

Reg. No.SR/05/TSPCB/HO/R00/LAB/2019/7499-7502

Collected on: 23/07/2019
Test method: Standard Methods of APHA, 23rd Edition
Issue date: 31/07/2019

Collected by: SES, ZL, Warangal along with CPCB Officials
Received on: 24/07/2019
Quantity of the sample: 1 Ltr. sample each

Source: River Musi under Hygenic Survey Programme

Sample code	:	Sample details / collection point
7499	-	River Musi at Kasaniguda
7500	-	River Musi before confluence with River Krishna at wadapally
7501	-	River Krishna before confluence with River Musi at Wadapally
7502	-	River Krishna after confluence with River Musi at Wadapally

Parameters	Unit	Results			
		7499	7500	7501	7502
pH	-	8.2	8.4	8.4	8.4
Electrical conductivity	µS/cm	2190	1672	1142	1714
Dissolved oxygen	mg/L	4.8	3.3	5.0	5.3
Chemical Oxygen Demand	mg/L	118	27	14	20
BOD 3 at 27°C	mg/L	24	6	3	4
Total Suspended Solids	mg/L	36	8	<5	<5
Total Dissolved Solids	mg/L	1862	1070	708	928
Free Ammonia	mg/L	0.78	0.69	0.02	1.01
SAR	-	11.4	8.7	7.7	5.0
Boron	mg/L	0.64	1.0	BDL	0.3
Nitrates	mg/L	40	11	23	14
Total coliform	MPN/100ml	55	110	94	140
Fecal coliform	MPN/100ml	12	17	17	22
CPCB water quality criteria class		**D**	**E**	**B**	**D**

Note: Results related to sample as received.
BDL – Below Detectable Limit

CPCB Water Quality Criteria					
Parameters	A	B	C	D	E
pH	6.5 – 8.5	6.5 – 8.5	6.0 – 9.0	6.5 – 8.5	6.0 – 8.5
Electrical conductivity	-	-	-	-	Max 2250
Dissolved oxygen	6 or >6	5 or >5	4 or >4	4 or >4	-
BOD 3 at 27°C	2 or < 2	3 or < 3	3 or < 3	-	-
Free Ammonia	-	-	-	1.2 or <1.2	-
SAR	-	-	-	-	Max 26
Boron	-	-	-	-	Max 2
Total coliform	50 or < 50	500 or < 500	5000 or < 5000	-	-

Below E : Not meeting A, B, C, D, E criteria

(N.Murali Mohan)
Joint Chief Environmental Scientist (FAC)

Annexure -9

Table 8: Comparison of total bacterial load in water samples collected from different plaees on 09/05/2019

Sl.No.	Collection site (09/05/2019)	Bacterial load on UTI Chrome N*CFU/ml*dilution factor)	Bacterial load on LB Agar (N*CFU/ml*dilution factor)	Bacterial load on Macconkey agar (N*CFU/ml*dilution factor)
1	Gandipet	$2*10^6$	10^6	No-Growth
2	Nagole	$136*10^6$	$254*10^6$	$32*10^6$
3	Pratapsingaram	$10*10^6$	$81*10^6$	No-Growth
4	Pillaipalli	$3*10^6$	$254*10^6$	No-Growth
5	Rudravelly	$18*10^6$	$11*10^6$	No-Growth
6	Kasaniguda	No-Growth	No Growth	No-Growth
7	Musi before confluence	No-Growth	No-Growth	No-Growth
8	Krishna before confluence	No-Growth	No-Growth	No-Growth
9	Musi & Krishna after confluence	No-Growth	No-Growth	No-Growth

Table 9: Comparison of total bacterial load in water samples collected from various places on 24/05/2019

Sl.No.	Collection site	Growth on UTIChrome N*CFU/ ml* dilution factor)	Growth on LB Agar (N*CFU/ml*dilution factor)	Growth on Macconkey agar (N*CFU/ml*dilution factor)
1	Gandipet	No-Growth	No-Growth	No-Growth
2	Nagole	$28*10^6$	$26*10^6$	$18*10^6$
3	Pratapsingaram	$311*10^6$	$200*10^6$	$197*10^6$
4	Pillaipalli	$84*10^6$	$118*10^6$	$57*10^6$
5	Rudravelly	Mat Growth	$420*10^6$	Mat Growth*
6	Kasaniguda	Mat Growth	Mat Growth	$96*10^6$
7	Musi before confluence	No-Growth	No-Growth	No-Growth
8	Krishna before confluence	No-Growth	No-Growth	No-Growth
9	Musi & Krishna after confluence	No-Growth	No-Growth	No-Growth

* Bacterial lawn is a term used by microbiologists to describe the appearance of bacterial colonies when all the individual colonies on a petri dish agar plate merge to form a field or mat of bacteria.

R04

Annexure -10

Table 10: A comparison of total bacterial load in water samples collected from various places on 13/06/2019

Sl.No.	Collection site (13/06/2019)	Bacterial load on UTI Chrome (N*CFU/ml*dilution factor)	Bacterial load on LB Agar (N*CFU/ml*dilution factor)	Bacterial load on Macconkey agar (N*CFU/ml*dilution factor)
1	Gandipet	No-Growth	No-Growth	No-Growth
2	Nagole	$258*10^6$	$171*10^6$	$48*10^6$
3	Pratapsingaram	$245*10^6$	$155*10^6$	$14*10^6$
4	Pillaipalli	Matt Growth	$250*10^6$	$28*10^6$
5	Rudravelly	$240*10^6$	$165*10^6$	$149*10^5$
6	Kasaniguda	Matt Growth	Matt Growth	$96*10^6$
7	Musi before confluence	No-Growth	No-Growth	No-Growth
8	Krishna before confluence	No-Growth	No-Growth	No-Growth
9	Musi and Krishna after confluence	No-Growth	No-Growth	No-Growth

Table 11: A comparison of total bacterial load in water samples collected from various places on 26/06/2019

Sl. No.	Collection site (26/06/2019)	Bacterial load on UTI Chrome (N*CFU/ml*dilution factor)	Bacterial load on LB Agar (N*CFU/ml*dilution factor)	Bacterial load on Macconkey agar (N*CFU/ml*dilution factor)
1	Gandipet	No-Growth	No-Growth	No-Growth
2	Nagole	$156*10^4$	$146*10^4$	$160*10^4$
3	Pratapsingaram	$45*10^4$	$155*10^4$	$150*10^4$
4	Pillaipalli	$33*10^4$	$110*10^4$	$50*10^4$
5	Rudravelly	$70*10^4$	$73*10^4$	$70*10^4$
6	Kasaniguda	$70*10^4$	$80*10^4$	$56*10^4$
7	Musi before confluence	No-Growth	No-Growth	No-Growth
8	Krishna before confluence	No-Growth	No-Growth	No-Growth
9	Musi& Krishna after confluence	No-Growth	No-Growth	No-Growth

Annexure -11

Table 12: A comparison of total bacterial load in water samples collected from various places on 09/07/2019

Sl. No.	Collection site (09/07/2019)	Bacterial load on UTI Chrome N*CFU/ml*dilution factor)	Bacterial load on LB Agar N*CFU/ml*dilution factor)	Bacterial load on Macconkey agar (N*CFU/ml*dilution factor)
1	Gandipet	$360*10^4$	$500*10^4$	$320*10^4$
2	Nagole	$500*10^4$	$523*10^4$	$500*10^4$
3	Pratapsingaram	$500*10^4$	$500*10^4$	$300*10^4$
4	Pillaipalli	$600*10^4$	$500*10^4$	$500*10^4$
5	Rudravelly	$644*10^4$	$700*10^4$	$600*10^4$
6	Kasaniguda	$500*10^4$	Mat Growth	Mat Growth
7	Musi before confluence	No-Growth	No-Growth	No-Growth
8	Krishna before confluence	No-Growth	No-Growth	No-Growth
9	Musi and Krishna after confluence	No-Growth	No-Growth	No-Growth

Table 13: A comparison of total bacterial load in water samples collected from various places on 23/07/2019

Sl. No.	Collection site (23/07/2019)	Bacterial load on UTI Chrome (N*CFU/ml*dilution factor)	Bacterial load on LB Agar (N*CFU/ml*dilution factor)	Bacterial load on Macconkey agar (N*CFU/ml*dilution factor)
1	Gandipet	No-Growth	No-Growth	No-Growth
2	Nagole	$400*10^4$	$350*10^4$	$250*10^4$
3	Pratapsingaram	$250*10^4$	$220*10^4$	$10*10^4$
4	Pillaipalli	$200*10^4$	$164*10^4$	$16*10^4$
5	Rudravelly	$300*10^4$	$450*10^4$	$85*10^4$
6	Kasaniguda	$200*10^4$	$500*10^4$	$131*10^4$
7	Musi before confluence	No-Growth	No-Growth	No-Growth
8	Krishna before confluence	No-Growth	No-Growth	No-Growth
9	Musi & Krishna after confluence	No-Growth	No-Growth	No-Growth

Annexure 12

Sample Collection Sites

Musi at Osman sagar

Dead Fish at Gandipet (Osman sagar)

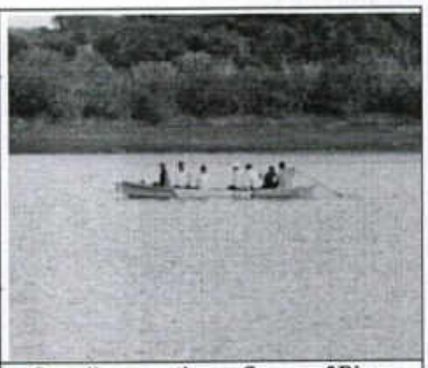
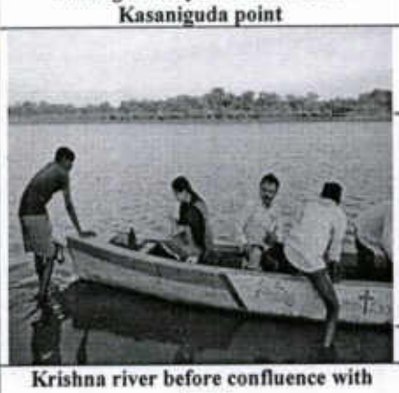
Solid waste dumped around Musi river near the Nagole bridge

Picture depicting no dissolved oxygen in Musi river at Nagole point

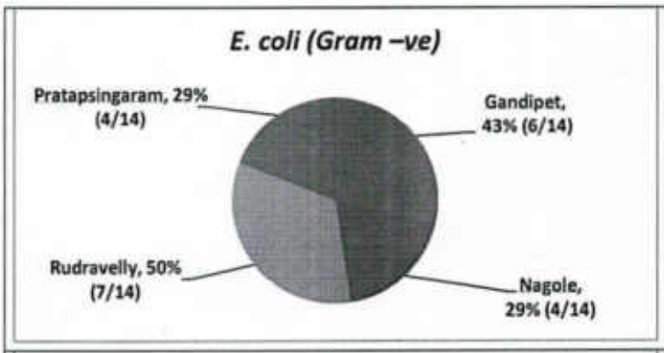
Extermely dirty, unclean, and frothy water of Musi at Nagole collection site

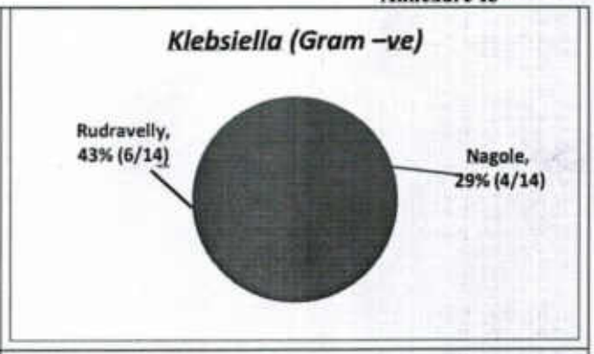
Dirty, coloured, frothy and extremely polluted water of Musi at Pillaipalli

		
Dark and polluted water of Musi at Rudravelly	Picture depicting no dissolved oxygen in Musi river at Pratapsingaram	Water from the agricultural fields entering Musi at Pratapsingaram
		
Musi at Kasaniguda	Dyed water entering Musi at Pillaipalli turning the nearby rocks are coloured	Musi river before confluence with Krishna

		
Highly polluted and dark water of Musi at Pratapsingaram collection site	Fishing activity in Musi river at Kasaniguda point	Sampling near the confluence of River Krishna and Musi
		
Confluence of Musi river with Krishna river	Krishna river before confluence with Musi	Clear water of Musi at Wadapally (Before confluence)

Annexure 13





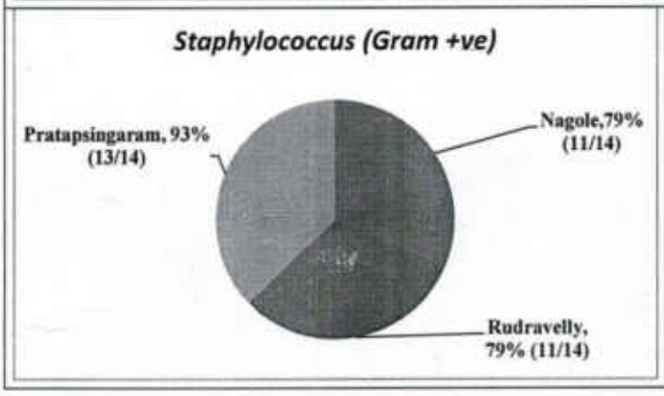


Fig. 7: Antibiotic Resistance Profile of *E. coli*, *Klebsiella* and *Staphylococcus* isolated from various sampling sites on 09/05/2019.

Every sampling site showed presence of Multidrug Resistance Bacteria with resistance to at least 2 antibiotics out of 14 antibiotics tested.

The *Staphylococcus* isolated from Nagole and Rudravelly was resistant to 11 antibiotics (79%) and that isolated from Pratapsingaram was resistance to 13 antibiotics (93%).

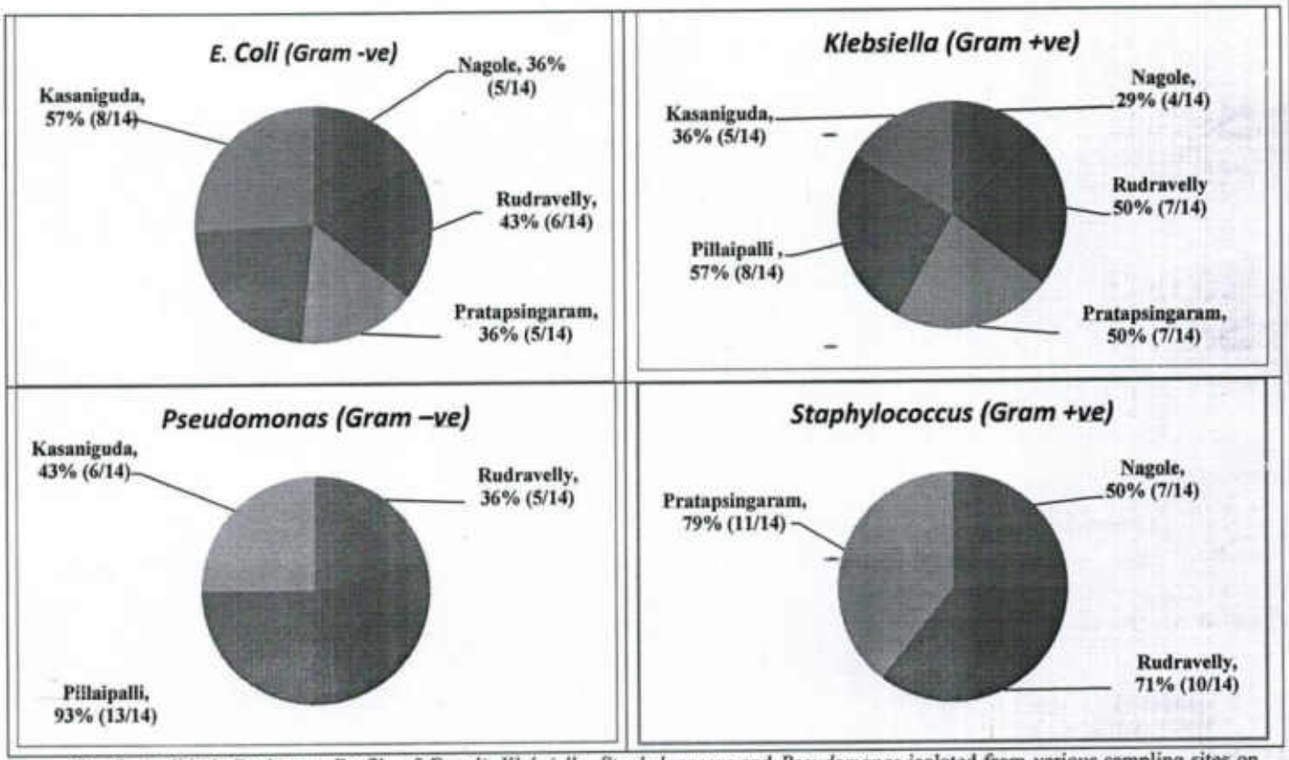


Fig. 8: Antibiotic Resistance Profile of *E. coli, Klebsiella, Staphylococcus* and *Pseudomonas* isolated from various sampling sites on 23/05/2019. Every sampling site showed the presence of Multidrug Resistance Bacteria with resistance to at least 4 or more antibiotics out of 14 antibiotics tested. The Staphylococcus and Pseudomonas isolated from Pillaipalli were resistance to 11 and 13 antibiotics respectively bordering on pan-drug resistance.

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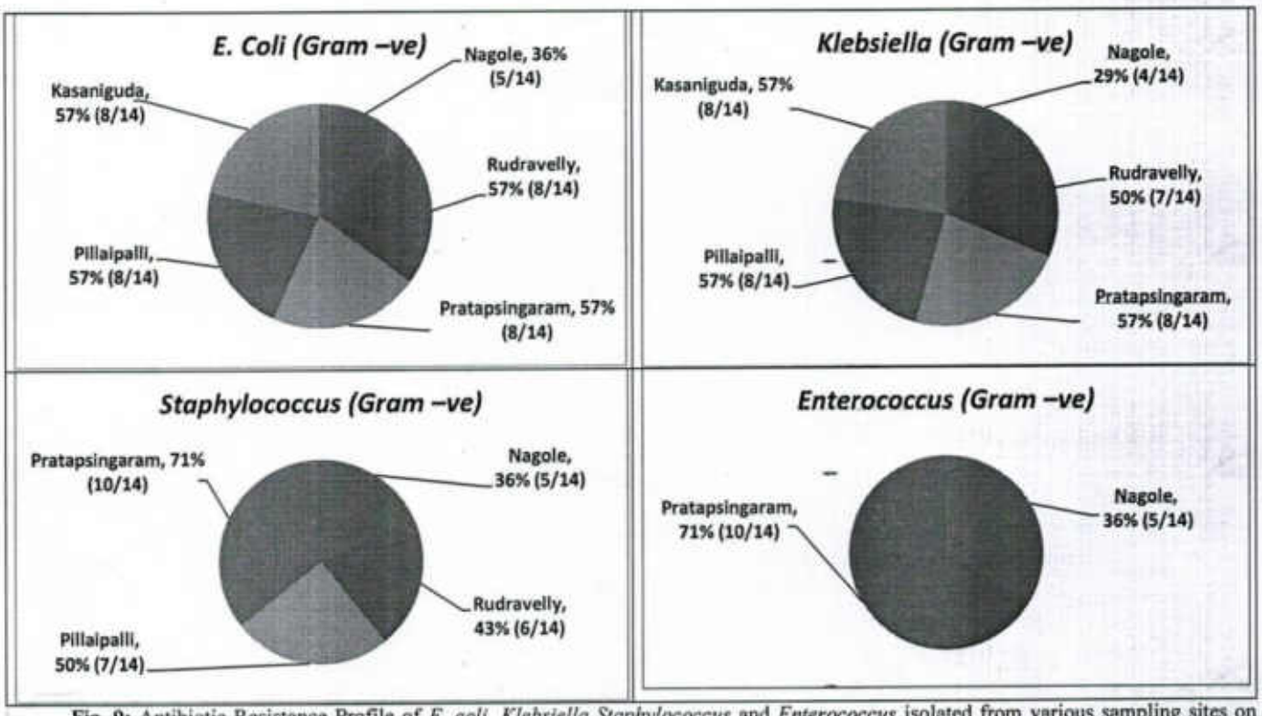
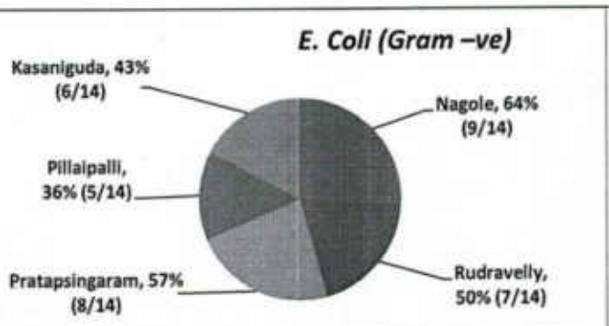
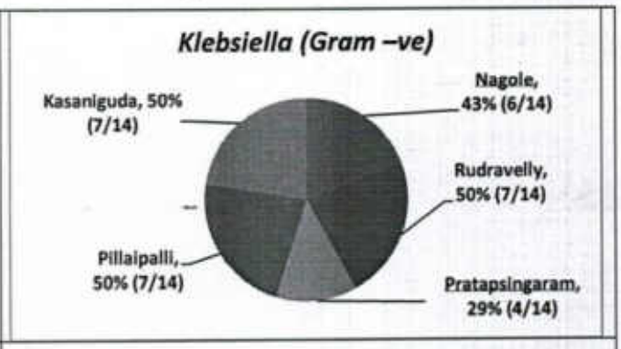


Fig. 9: Antibiotic Resistance Profile of *E. coli, Klebsiella Staphylococcus* and *Enterococcus* isolated from various sampling sites on 13/06/2019. Every sampling site showed the presence of Multidrug Resistance Bacteria with resistance to at least 5 antibiotics out of 14 antibiotics tested. The *Staphylococcus* isolated from Pratapsingaram was resistance to as many as 10 antibiotics out of 14 antibiotics tested





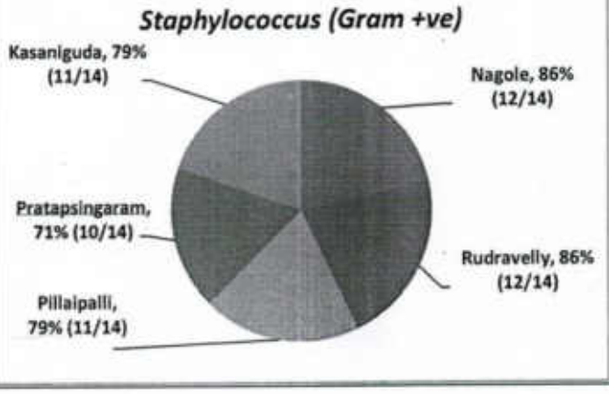


Fig.10: Antibiotic Resistance Profile of *E. coli, Klebsiella* and *Staphylococcus* isolated from various sampling sites on 26/06/2019.

Every sampling site showed the presence of Multidrug Resistance Bacteria with resistance to at least 4 antibiotics out of 14 antibiotics tested.

Staphylococcus isolated from Pillaipalli and Rudravelly were resistance to 11 and 12 antibiotics out of 14 antibiotics tested

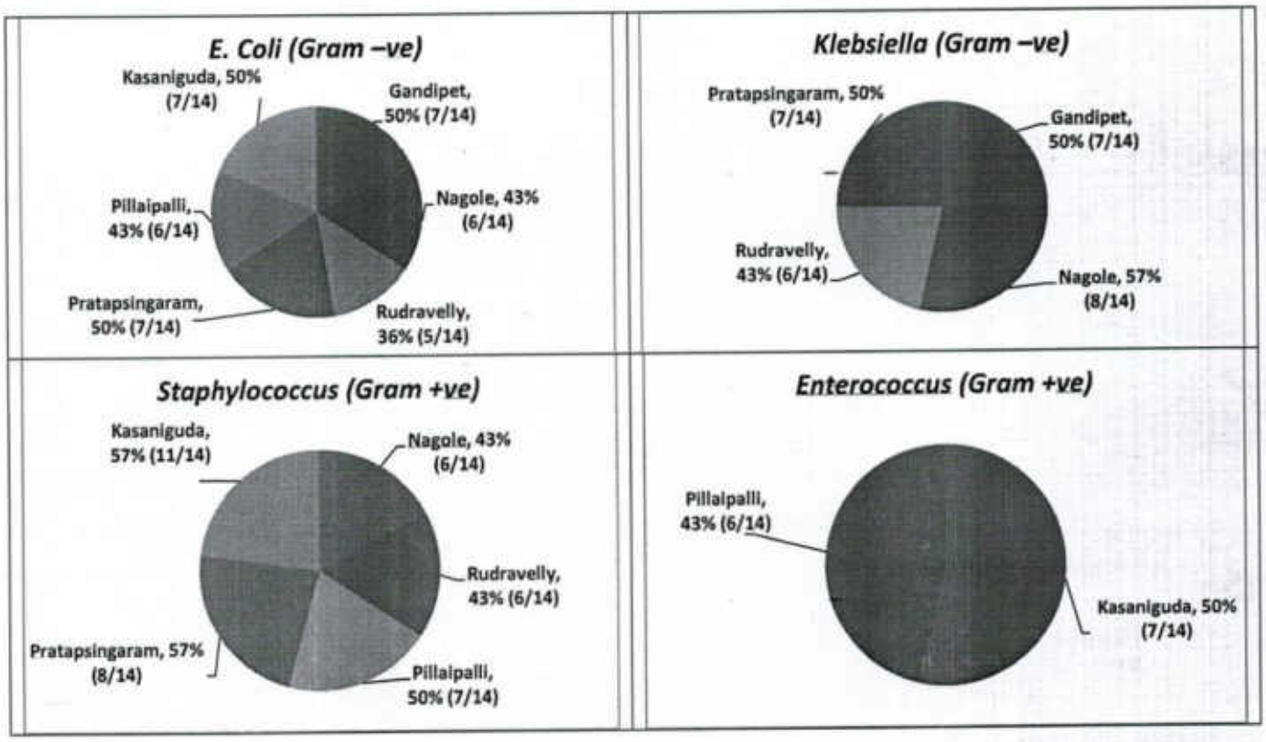


Fig.11: Antibiotic Resistance Profile of *E. coli, Klebsiella, Staphylococcus* and *Enterococcus* isolated from various sampling sites on 9/07/2019. Every sampling site showed the presence of Multidrug Resistance Bacteria with resistance to at least 5 antibiotics out of 14 antibiotics tested. Staphylococcus strains displayed resistance to 8 antibiotics out of 14 antibiotics tested

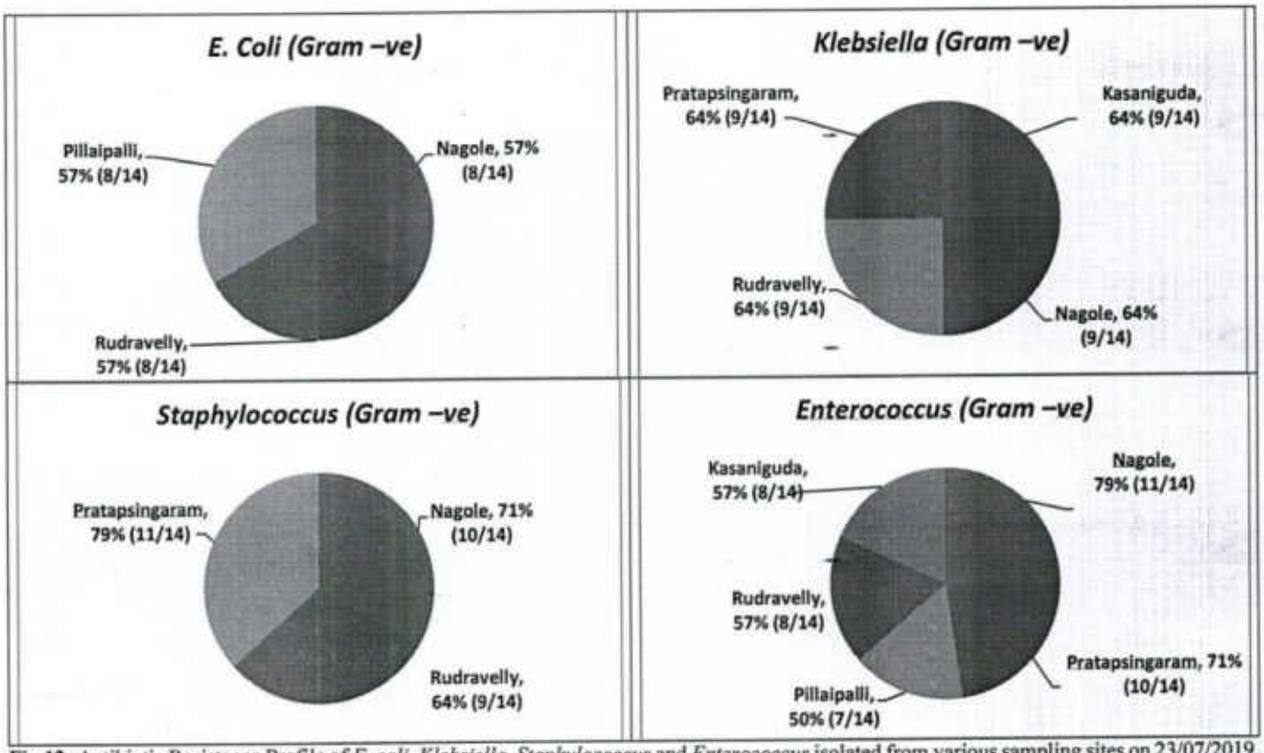
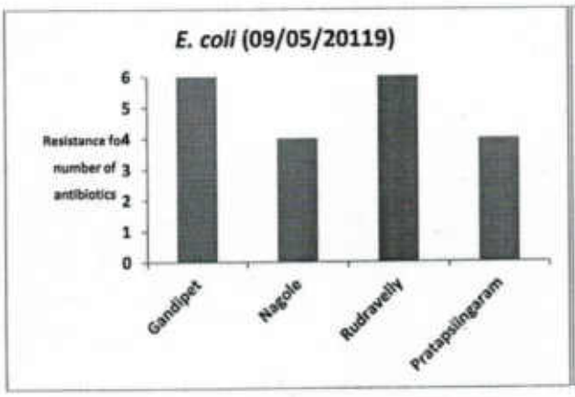
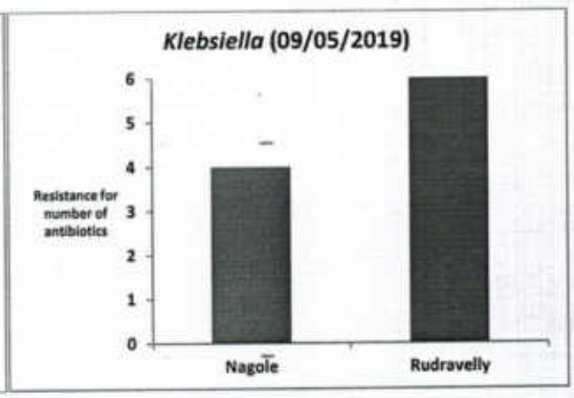


Fig.12: Antibiotic Resistance Profile of *E. coli, Klebsiella, Staphylococcus* and *Enterococcus* isolated from various sampling sites on 23/07/2019. Every sampling site showed the presence of Multidrug Resistance pathogenic bacteria with resistance to at least 7 antibiotics out of 14 antibiotics tested. The Staphylococcus at Pratapsingaram and Enterococcus at Nagole displayed AMR for 11 antibiotics out of 14 antibiotics tested.





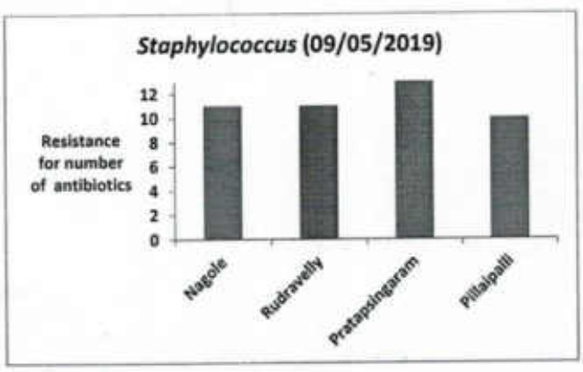


Fig. 13: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from different sampling locations on 9th May 2019.

Y-axis represents the total number of antibiotics for which a bacterial species was resistant out of 14 antibiotics tested.

X-axis are the sampling location.

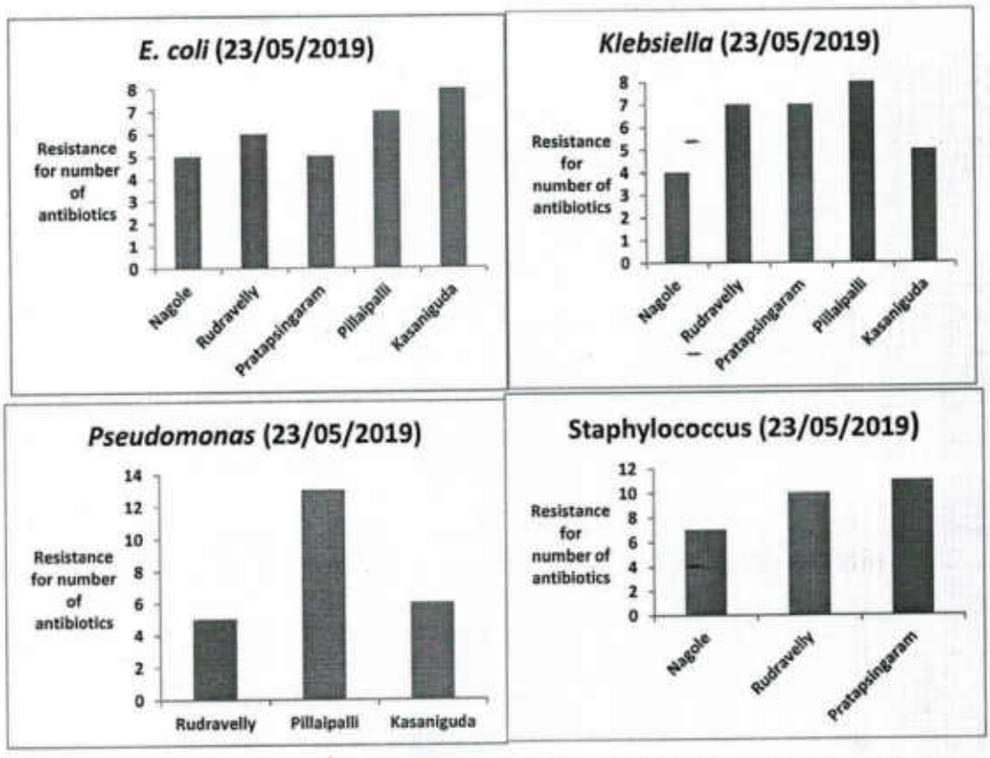


Fig. 14: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from different sampling locations on 23rd May 2019. Y-axis represents the total number of antibiotics for which a bacterial species was resistant out of 14 antibiotics tested.

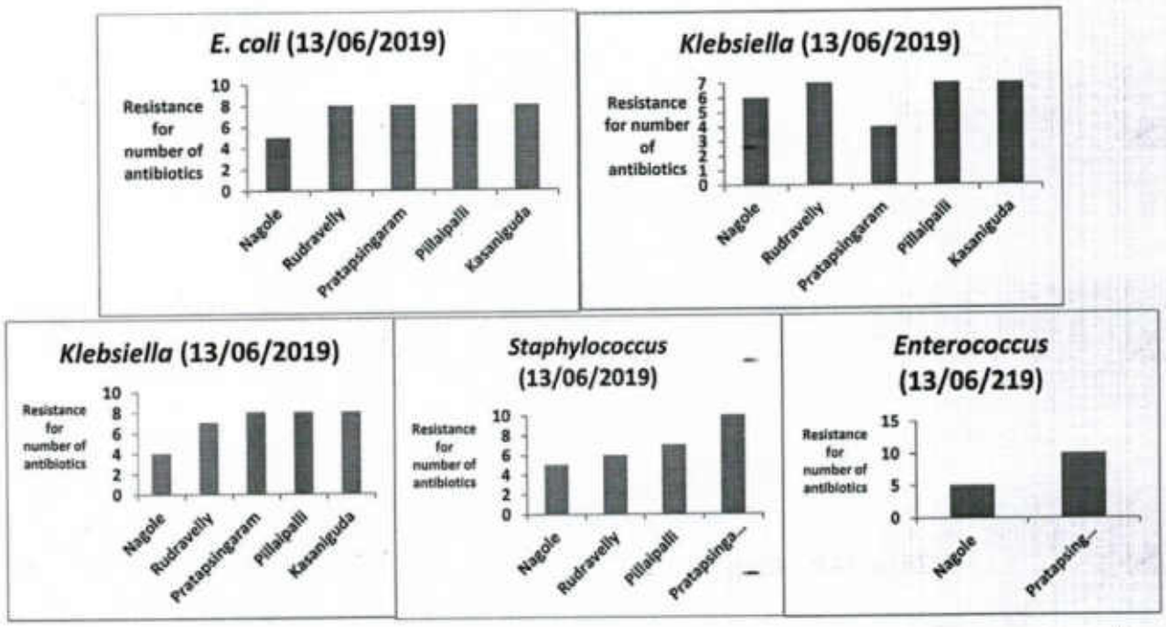


Fig. 15: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from various sampling locations on 13th June 2019. X-axis represents the total number of antibiotics for which a pathogenic bacterial species was resistant out of 14 antibiotics tested.

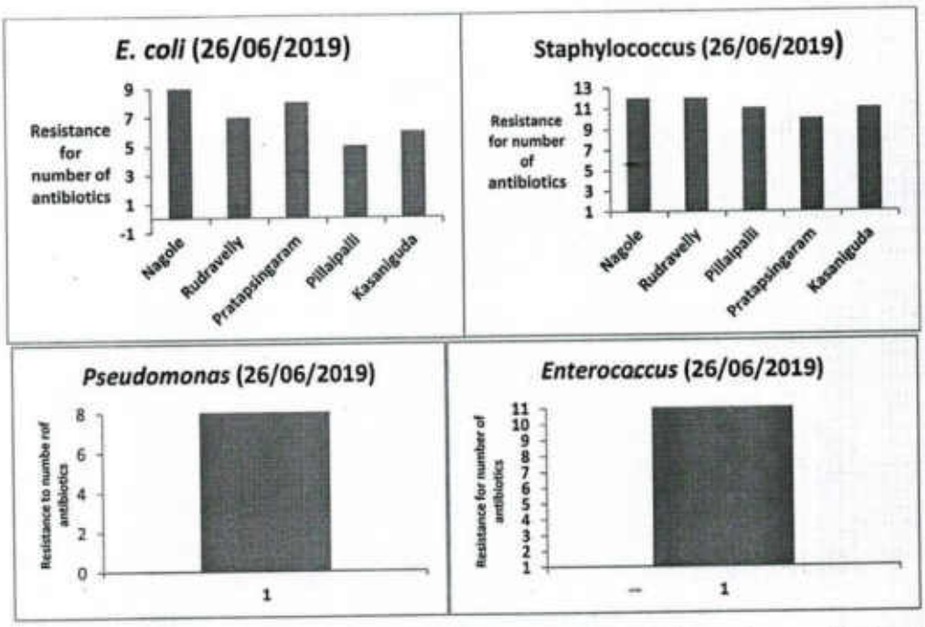


Fig. 16: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from various sampling locations on 26thJune 2019. Y-axis represents the total number of antibiotics for which a bacterial species was resistant out of 14 antibiotics tested.

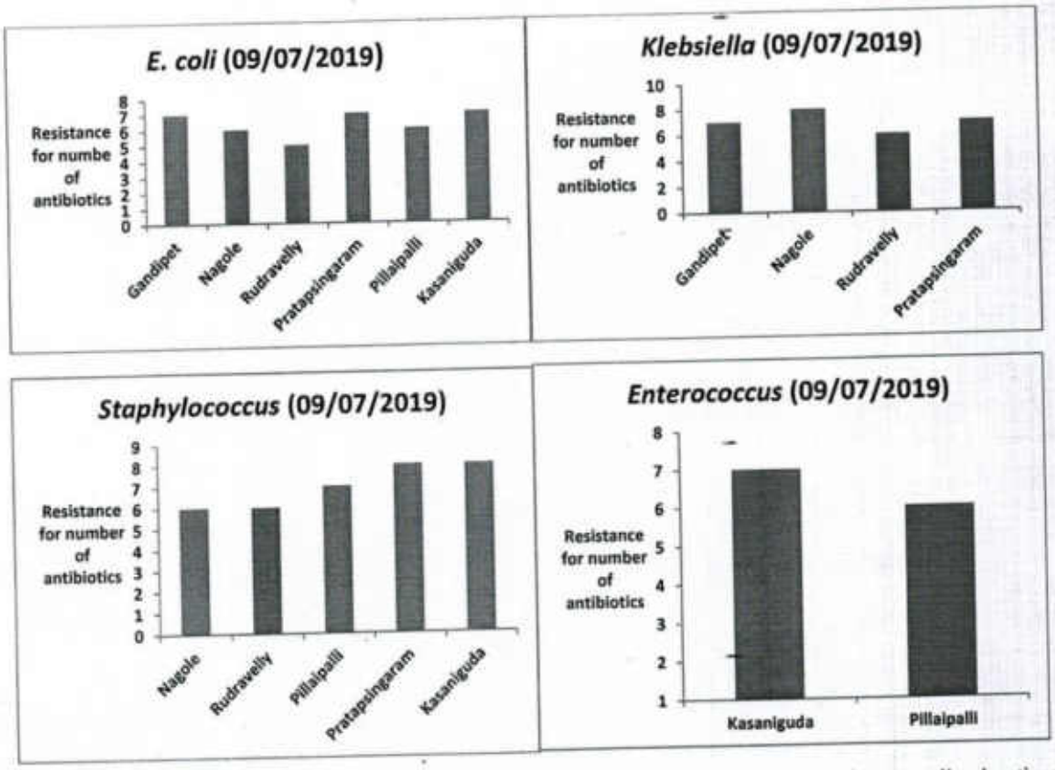


Fig. 17: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from various sampling locations on 9th July 2019. Y-axis represents the total number of antibiotics for which a bacterial species was resistant out of 14 antibiotics tested.

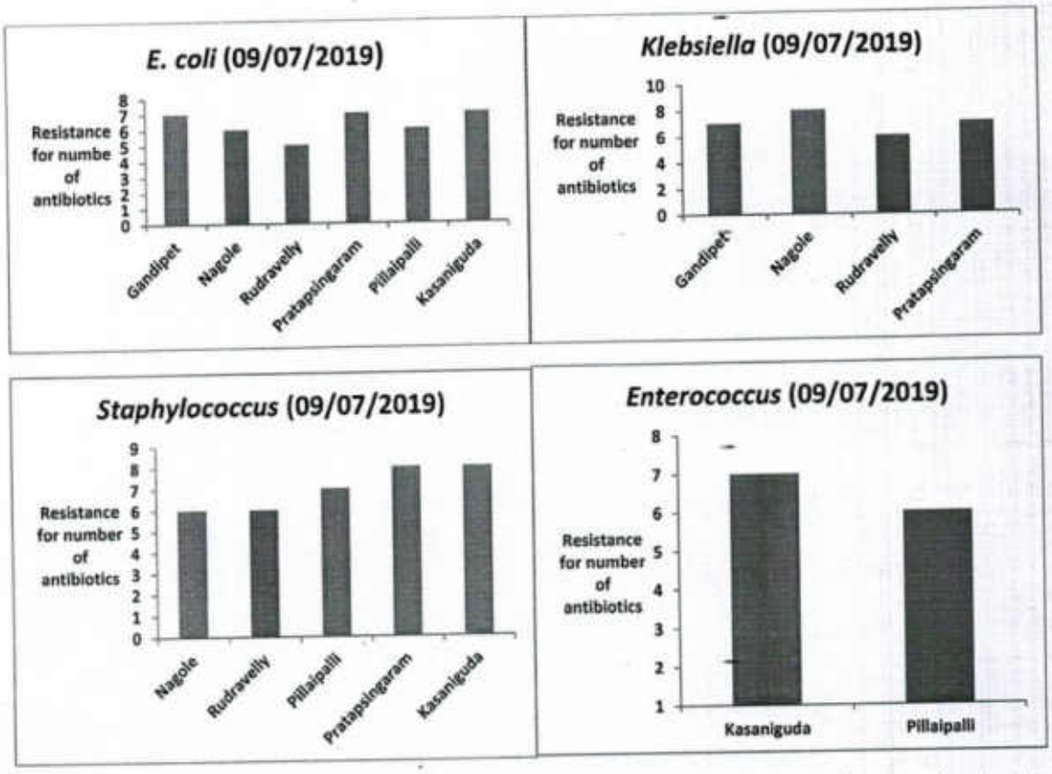


Fig. 17: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from various sampling locations on 9th July 2019. Y-axis represents the total number of antibiotics for which a bacterial species was resistant out of 14 antibiotics tested.

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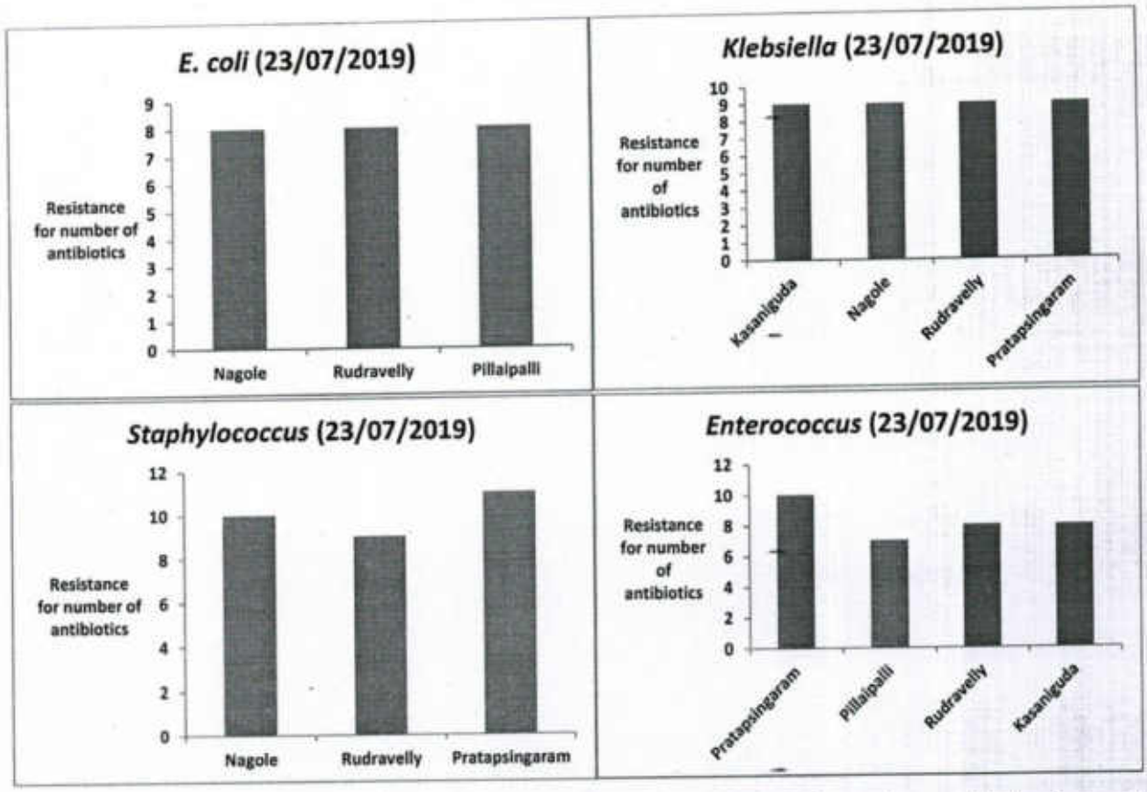

Fig. 18: Antimicrobial resistance pattern of various pathogenic bacterial species isolated from various sampling locations on 23rd July 2019. Y-axis represents the total number of antibiotics for which a bacterial species was resistant out of 14 antibiotics tested.

Annexure 14

Table 14: **Comparison of antibiotic sensitivity profile of *E. coli* obtained at Gandipet site (Osman Sagar) using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)**

		Gandipet, *E. coli*					
		09/05/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics panel	KB	RB	KB	RB	KB	RB
1	Amoxicillin	RES	RES	RES	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN	SEN	SEN
4	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN
6	Ciprofloxacin	RES	RES	INT	SEN	INT	SEN
7	Ceftriaxone	RES	RES	RES	SEN	RES	SEN
8	Piperacillin-Tazobactam	SEN	SEN	INT	SEN	SEN	SEN
9	Cefotaxime	RES	RES	RES	SEN	RES	SEN
10	Cefuroxime	RES	RES	RES	SEN	RES	SEN
11	Tobramycin	SEN	SEN	SEN	SEN	SEN	SEN
12	Imipenem	SEN	SEN	SEN	SEN	SEN	SEN
13	Levofloxacin	SEN	SEN	RES	SEN	RES	SEN
14	Cefazolin	RES	RES	SEN	RES	RES	INT

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 15

Table 15: Comparison of antibiotic sensitivity profile of *E. coli* obtained at Nagole site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Nagole, *E. coli*											
		09/05/2019		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN	RES	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	INT	SEN	SEN
6	Ciprofloxacin	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	INT	SEN	RES	SEN
7	Ceftriaxone	SEN	SEN	INT	SEN	INT	SEN	RES	SEN	SEN	SEN	RES	SEN
8	Piperacillin-Tazobactam	SEN	SEN	INT	RES	INT	SEN	RES	SEN	INT	SEN	RES	SEN
9	Cefotaxime	INT	SEN	RES	INT	RES	RES	RES	RES	RES	SEN	RES	SEN
10	Cefuroxime	INT	SEN	RES	INT	RES	INT	RES	RES	RES	SEN	SEN	SEN
11	Tobramycin	SEN	SEN	INT	RES	SEN	RES	RES	SEN	SEN	SEN	SEN	SEN
12	Imipenem	SEN	SEN	SEN	INT	SEN	SEN	RES	SEN	SEN	SEN	SEN	SEN
13	Levofloxacin	SEN	SEN	SEN	INT	SEN	SEN	RES	RES	RES	SEN	RES	SEN
14	Cefazolin	INT	SEN	RES	RES	RES	RES	RES	SEN	SEN	RES	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate–

Annexure 16

Table 16: Comparison of antibiotic sensitivity profile of *Klebsiella* obtained at Nagole site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (EB)

		Nagole, *Klebsiella*											
		09/05/2019		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1.	Amoxicillin	INT	SEN	INT	SEN	INT	SEN	RES	SEN	INT	SEN	RES	SEN
2.	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN	SEN	SEN	SEN
3.	Amikacin	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4.	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
5.	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	INT	SEN	SEN
6.	Ciprofloxacin	INT	SEN	INT	SEN	SEN	SEN	INT	SEN	INT	SEN	RES	SEN
7.	Ceftriaxone	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	INT	SEN	RES	SEN
8.	Piperacillin-Tazobactam	SEN	SEN	SEN	SEN	RES	INT	RES	RES	RES	SEN	INT	SEN
9.	Cefotaxime	SEN	SEN	SEN	SEN	SEN	INT	INT	SEN	RES	SEN	RES	SEN
10	Cefuroxime	INT	SEN	INT	SEN	INT	SEN	SEN	SEN	RES	SEN	RES	SEN
11	Tobramycin	SEN	SEN	SEN	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN
12	Imipenem	SEN	SEN	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Levofloxacin	SEN	SEN	SEN	INT	SEN	SEN	RES	RES	RES	SEN	RES	SEN
14	Cefazolin	INT	SEN	RES	RES	RES	RES	RES	SEN	RES	RES	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.)
SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 17

Table 17: Comparison of antibiotic sensitivity profile of *Staphylococcus* obtained at Nagole site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Nagole, *Staphylococcus*											
		09/05/2019		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl.No	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1.	Co-Trimoxazole	RES	RES	INT	SEN	SEN	SEN	RES	SEN	RES	SEN	RES	RES
2.	Teicoplanin	INT	SEN	INT	SEN	INT	SEN	RES	SEN	RES	INT	RES	RES
3.	Meropenem	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN	SEN	SEN	SEN	SEN
4.	Cloxacillin	RES	RES	INT	SEN	INT	SEN	RES	SEN	RES	SEN	RES	RES
5.	Ceftazidime	RES	RES	RES	SEN	RES	SEN	SEN	SEN	RES	SEN	SEN	SEN
6.	Clindamycin	RES	RES	RES	SEN	RES	SEN	RES	SEN	RES	SEN	RES	SEN
7.	Linezolid	RES	RES	RES	SEN	RES	SEN	SEN	SEN	RES	SEN	RES	SEN
8.	Moxifloxacin	INT	RES	SEN	RES	SEN	RES	RES	SEN	SEN	SEN	RES	SEN
9.	Nitrofurantoin	SEN	SEN	SEN	SEN	SEN	SEN	INT	RES	SEN	RES	RES	RES
10.	Lincomycin	RES	RES	RES	SEN	SEN	SEN	RES	SEN	SEN	SEN	RES	SEN
11.	Netilmicin	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN	SEN	SEN	SEN	SEN
12.	Vancomycin	RES	INT	SEN	SEN	SEN	SEN	RES	SEN	SEN	SEN	RES	SEN
13.	Tigecycline	INT	INT	SEN	RES	SEN	RES	RES	SEN	SEN	SEN	SEN	SEN
14.	Azithromycin	INT	RES	SEN	RES	SEN	RES	RES	SEN	SEN	SEN	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.)
SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 18

Table 18: Comparison of antibiotic sensitivity profile of *Enterococcus* obtained at Nagole site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Nagole, *Enterococcus*			
		13/06/2019		23/07/2019	
Sl. No	Antibiotics Name	KB	RB	KB	RB
1	Co-Trimoxazole	SEN	SEN	RES	SEN
2	Teicoplanin	RES	INT	RES	RES
3	Meropenem	SEN	SEN	SEN	RES
4	Cloxacillin	RES	INT	RES	RES
5	Ceftazidime	RES	INT	SEN	INT
6	Clindamycin	RES	INT	RES	INT
7	Linezolid	RES	INT	RES	SEN
8	Moxifloxacin	SEN	INT	RES	SEN
9	Nitrofurantoin	SEN	SEN	RES	RES
10	Lincomycin	SEN	SEN	RES	SEN
11	Netilmicin	SEN	SEN	SEN	SEN
12	Vancomycin	SEN	SEN	RES	RES
13	Tigecycline	SEN	INT	INT	SEN
14	Azithromycin	SEN	INT	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 19

Table 19 **Comparison of antibiotic sensitivity profile of *E. coli* obtained at Pratapsingaram site using the Kirby Bauer disc diffusion assay and the RightBiotic Assay**

		Pratapsingaram, *E.coli*									
		09/05/2019		24/05/2019		13/06/2019		26/06/2019		09/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	SEN	SEN	SEN	SEN	INT	RES	RES	SEN	INT	SEN
2	Gentamycin	SEN	INT	SEN	SEN	SEN	SEN	INT	SEN	SEN	SEN
3	Amikacin	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
4	Cefepime	SEN	SEN	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
6	Ciprofloxacin	INT	SEN	INT	SEN	INT	SEN	RES	SEN	INT	SEN
7	Ceftriaxone	SEN	INT	INT	SEN	INT	SEN	RES	SEN	RES	SEN
8	Piperacillin-Tazobactam	SEN	SEN	INT	SEN	INT	SEN	RES	SEN	INT	SEN
9	Cefotaxime	SEN	SEN	INT	SEN	INT	SEN	RES	RES	RES	INT
10	Cefuroxime	RES	INT	INT	SEN	INT	SEN	RES	RES	SEN	SEN
11	Tobramycin	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Levofloxacin	SEN	SEN	SEN	SEN	SEN	SEN-	SEN	SEN	SEN	SEN
13	Cefazolin	RES	RES	RES	RES	RES	INT	RES	RES	RES	SEN
14	Imipenem	SEN	SEN	SEN	SEN	INT	SEN	SEN	SEN	INT	RES

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

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Annexure 20

Table 20: Comparison of antibiotic sensitivity profile of *Klebsiella* obtained at Pratapsingaram site using the Kirby Bauer disc diffusion assay (KB) and RightBiotic assay RB)

		Pratapsingaram, *Klebsiella*									
		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotic name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	INT	SEN	INT	RES	RES	SEN	RES	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	INT	SEN	SEN
6	Ciprofloxacin	INT	SEN	INT	SEN	INT	SEN	INT	SEN	INT	SEN
7	Ceftriaxone	INT	SEN	INT	SEN	SEN	SEN	RES	SEN	RES	SEN
8	Piperacillin-Tazobactam	INT	SEN	INT	SEN	RES	INT	INT	SEN	RES	SEN
9	Cefotaxime	INT	RES	RES	INT	SEN	INT	INT	INT	RES	SEN
10	Cefuroxime	RES	SEN	RES	RES	SEN	INT	INT	SEN	RES	SEN
11	Tobramycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Imipenem	SEN	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Levofloxacin	SEN	SEN	SEN	SEN	RES	RES	RES	SEN	RES	SEN
14	Cefazolin	RES	RES	INT	RES	SEN	SEN	SEN	RES	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 21

Table 21: Comparison of antibiotic sensitivity profile of *Staphylococcus* obtained at Pratapsingaram site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay RB)

		Pratapsingaram, *Staphylococcus*											
		09/05/2019		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Co-Trimoxazole	INT	SEN	INT	SEN	INT	SEN	RES	SEN	RES	SEN	RES	SEN
2	Teicoplanin	INT	SEN	INT	SEN	INT	SEN	RES	INT	RES	SEN	RES	SEN
3	Meropenem	SEN	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
4	Cloxacillin	INT	SEN	INT	SEN	INT	SEN	RES	SEN	RES	SEN	RES	SEN
5	Ceftazidime	INT	SEN	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN
6	Clindamycin	INT	SEN	INT	SEN	INT	SEN	RES	SEN	RES	SEN	RES	SEN
7	Linezolid	RES	SEN	RES	INT	RES	SEN	RES	SEN	RES	SEN	RES	SEN
8	Moxifloxacin	RES	INT	RES	INT	RES	RES	RES	SEN	SEN	SEN	RES	SEN
9	Nitrofurantoin	INT	RES	INT	SEN	INT	SEN	RES	RES	SEN	RES	RES	RES
10	Lincomycin	RES	INT	RES	INT	RES	INT	RES	SEN	RES	SEN	RES	SEN
11	Netilmicin	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Vancomycin	INT	SEN	INT	SEN	SEN	SEN	INT	SEN	RES	SEN	RES	SEN
13	Tigecycline	INT	RES	INT	RES	INT	RES	INT	SEN	SEN	SEN	INT	SEN
14	Azithromycin	INT	SEN	SEN	SEN	INT	RES	SEN	RES	INT	SEN	INT	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 22

Table 22: Comparison of antibiotic sensitivity profile of *Enterococcus* obtained at Pratapsingaram site using the Kirby Bauer disc diffusion assay (KB) and the RightBiotic Assay (RB)

		Pratapsingaram, *Enterococcus*			
		13/06/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB
1	Co-Trimoxazole	RES	INT	RES	SEN
2	Teicoplanin	SEN	SEN	RES	SEN
3	Meropenem	SEN	SEN	SEN	SEN
4	Cloxacillin	RES	INT	RES	SEN
5	Ceftazidime	RES	INT	SEN	SEN
6	Clindamycin	SEN	SEN	RES	SEN
7	Linezolid	RES	INT	RES	SEN
8	Moxifloxacin	RES	RES	RES	SEN
9	Nitrofurantoin	SEN	SEN	RES	RES
10	Lincomycin	SEN	SEN	RES	SEN
11	Netilmicin	SEN	SEN	SEN	SEN
12	Vancomycin	SEN	SEN	RES	SEN
13	Tigecycline	INT	RES	INT	SEN
14	Azithromycin	INT	RES	INT	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 23

Table 23: Comparison of antibiotic sensitivity profile of *Enterococcus* obtained at Pillaipalli site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Pillaipalli, *Enterococcus*					
		09/05/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB
1	Co-Trimoxazole	RES	INT	RES	SEN	RES	SEN
2	Teicoplanin	RES	INT	RES	INT	RES	RES
3	Meropenem	SEN	SEN	SEN	SEN	SEN	SEN
4	Cloxacillin	RES	INT	RES	RES	RES	INT
5	Ceftazidime	RES	INT	SEN	SEN	SEN	INT
6	Clindamycin	RES	INT	RES	SEN	RES	SEN
7	Linezolid	INT	SEN	SEN	SEN	SEN	SEN
8	Moxifloxacin	INT	SEN	SEN	SEN	RES	SEN
9	Nitrofurantoin	SEN	SEN	SEN	RES	SEN	RES
10	Lincomycin	RES	RES	RES	RES	RES	SEN
11	Netilmicin	SEN	SEN	SEN	SEN	SEN	SEN
12	Vancomycin	RES	INT	RES	RES	INT	SEN
13	Tigecycline	RES	RES	SEN	SEN	SEN	SEN
14	Azithromycin	SEN	SEN	SEN	RES	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 24

Table 24: Comparison of antibiotic sensitivity profile of *E. coli* obtained at Pillaipalli site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Pillaipalli, *E.coli*									
		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	RES	INT	INT	RES	SEN	SEN	INT	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
6	Ciprofloxacin	INT	SEN	INT	SEN	INT	SEN	INT	SEN	INT	SEN
7	Ceftriaxone	RES	RES	RES	INT	INT	SEN	SEN	SEN	RES	SEN
8	Piperacillin-Tazobactam	INT	SEN	INT	SEN	SEN	SEN	INT	SEN	SEN	INT
9	Cefotaxime	RES	RES	RES	INT	INT	SEN	RES	INT	RES	INT
10	Cefuroxime	RES	RES	RES	INT	RES	SEN	RES	SEN	RES	INT
11	Tobramycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Levofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Cefazolin	RES	RES	RES	RES	RES	INT	RES	SEN	RES	INT
14	Imipenem	SEN	SEN	INT	SEN	SEN	SEN	SEN	RES	RES	INT

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 25

Table 25: Comparison of antibiotic sensitivity profile of *Klebsiella* obtained at Pillaipalli site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Pillaipalli, *Klebsiella*					
		24/05/2019		13/06/2019		26/06/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB
1	Amoxicillin	RES	INT	INT	RES	RES	SEN
2	Gentamycin	INT	SEN	INT	SEN	SEN	SEN
3	Amikacin	SEN	INT	INT	SEN	SEN	SEN
4	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN
6	Ciprofloxacin	INT	SEN	INT	SEN	RES	SEN
7	Ceftriaxone	INT	SEN	INT	SEN	INT	SEN
8	Piperacillin-Tazobactum	RES	INT	INT	INT	RES	SEN
9	Cefotaxime	RES	INT	RES	INT	INT	SEN
10	Cefuroxime	RES	INT	RES	RES	RES	SEN
11	Tobramycin	SEN	SEN	SEN	SEN	SEN	SEN
12	Levofloxacin	INT	SEN	SEN	SEN	SEN	SEN
13	Ceflazolin	RES	INT	RES	RES	RES	SEN
14	Imipenem	SEN	SEN	INT	SEN	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 26

Table 26: Comparison of antibiotic sensitivity profile of *Pseudomonas* obtained at Pillaipalli site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Pillaipalli, *Pseudomonas*,24/05/2019	
Sl. No.	**Antibiotics Name**	**KB**	**RB**
1	Amoxicillin	RES	INT
2	Gentamycin	RES	INT
3	Amikacin	INT	SEN
4	Cefepime	INT	SEN
5	Ofloxacin	SEN	SEN
6	Ciprofloxacin	INT	RES
7	Ceftriaxone	INT	SEN
8	Piperacillin-Tazobactam	RES	RES
9	Cefotaxime	INT	SEN
10	Cefuroxime	INT	SEN
11	Tobramycin	INT	SEN
12	Levofloxacin	INT	SEN
13	Cefazolin	INT	SEN
14	Imipenem	INT	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 27

Table 27: Comparison of antibiotic sensitivity profile of *Staphylococcus* obtained at Pillaipalli site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Pillaipalli, *Staphylococcus*					
		13/06/2019		26/06/2019		09/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB
1	Co-Trimoxazole	INT	SEN	INT	SEN	RES	SEN
2	Teicoplanin	SEN	SEN	RES	SEN	RES	INT
3	Meropenem	SEN	SEN	RES	SEN	SEN	SEN
4	Cloxacillin	RES	INT	RES	SEN	RES	RES
5	Ceftazidime	RES	INT	SEN	SEN	SEN	SEN
6	Clindamycin	SEN	SEN	RES	SEN	RES	SEN
7	Linezolid	RES	INT	RES	SEN	RES	SEN
8	Moxifloxacin	RES	RES	RES	SEN	SEN	SEN
9	Nitrofurantoin	SEN	SEN	INT	SEN	SEN	RES
10	Lincomycin	SEN	SEN	RES	SEN	RES	RES
11	Netilmicin	SEN	SEN	SEN	SEN	SEN	SEN
12	Vancomycin	SEN	SEN	RES	SEN	RES	RES
13	Tigecycline	SEN	RES	SEN	SEN	SEN	SEN
14	Azithromycin	INT	RES	INT	SEN	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 28

Table 28: Comparison of antibiotic sensitivity profile of *E. coli* obtained at Rudravelly site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Rudravelly, *E.coli*											
		09/05/2019		24/05/2019		13/06/2019		24/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	INT	SEN	SEN	SEN	INT	SEN	INT	SEN	SEN	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4	Cefepime	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN	SEN
6	Ciprofloxacin	INT	SEN	INT	SEN	INT	SEN	INT	SEN	INT	SEN	INT	SEN
7	Ceftriaxone	RES	RES	INT	SEN	RES	RES	INT	SEN	SEN	SEN	SEN	SEN
8	Piperacillin-Tazobactam	SEN	SEN	INT	SEN	SEN	SEN	RES	SEN	RES	SEN	RES	SEN
9	Cefotaxime	RES	RES	SEN	SEN	RES	RES	INT	SEN	RES	RES	RES	SEN
10	Cefuroxime	RES	RES	INT	SEN	RES	RES	RES	SEN	RES	SEN	RES	SEN
11	Tobramycin	INT	SEN	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Levofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Cefazolin	RES	RES	INT	SEN	RES	RES	RES	SEN	RES	SEN	RES	RES
14	Imipenem	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN	RES	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 29

Table 29: Comparison of antibiotic sensitivity profile of *Klebsiella* obtained at Rudravelly site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Rudravelly, *Klebsiella*									
		09/05/2019		24/05/2019		13/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	RES	Mixed Culture	INT	SEN	INT	SEN	RES	SEN	RES	SEN
2	Gentamycin	SEN	Mixed Culture	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	Mixed Culture	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4	Cefepime	SEN	Mixed Culture	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	Mixed Culture	SEN	SEN	SEN	SEN	SEN	RES	SEN	SEN
6	Ciprofloxacin	INT	Mixed Culture	INT	SEN	INT	SEN	SEN	SEN	RES	SEN
7	Ceftriaxone	INT	Mixed Culture	INT	SEN	INT	SEN	RES	SEN	INT	SEN
8	Piperacillin-Tazobactam	SEN	Mixed Culture	INT	SEN	INT	SEN	INT	SEN	RES	SEN
9	Cefotaxime	RES	Mixed Culture	INT	SEN	INT	SEN	RES	SEN	RES	SEN
10	Cefuroxime	RES	Mixed Culture	INT	SEN	INT	SEN	SEN	SEN	INT	SEN
11	Tobramycin	SEN	Mixed Culture	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Levofloxacin	SEN	Mixed Culture	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Cefazolin	RES	Mixed Culture	RES	RES	RES	RES	RES	SEN	RES	SEN
14	Imipenem	SEN	Mixed Culture	SEN	SEN	SEN	SEN	INT	SEN	RES	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 30

Table 30: Comparison of antibiotic sensitivity profile of *Staphylococcus* obtained at Rudravelly site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Rudravelly, *Staphylococcus*											
		09/05/2019		24/05/2019		13/06/2019		26/06/2019		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB	KB	RB
1	Co-Trimoxazole	INT	SEN	INT	SEN	INT	SEN	RES	SEN	RES	SEN	RES	SEN
2	Teicoplanin	RES	SEN	SEN	SEN	SEN	SEN	RES	INT	RES	SEN	RES	SEN
3	Meropenem	SEN	SEN	INT	SEN	SEN	SEN	RES	SEN	SEN	SEN	SEN	SEN
4	Cloxacillin	INT	SEN	INT	SEN	INT	SEN	RES	SEN	RES	SEN	RES	SEN
5	Ceftazidime	INT	SEN	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN
6	Clindamycin	INT	SEN	RES	RES	SEN	SEN	RES	SEN	RES	SEN	RES	SEN
7	Linezolid	INT	SEN	INT	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN	SEN
8	Moxifloxacin	INT	SEN	SEN	INT	RES	RES	RES	SEN	SEN	SEN	RES	SEN
9	Nitrofurantoin	SEN	SEN	INT	SEN	SEN	SEN	INT	INT	SEN	INT	INT	RES
10	Lincomycin	RES	RES	SEN	SEN	SEN	SEN	RES	INT	RES	SEN	RES	SEN
11	Netilmicin	SEN	SEN	INT	SEN	SEN	SEN	RES	SEN	SEN	SEN	SEN	SEN
12	Vancomycin	INT	SEN	INT	SEN	SEN	SEN	RES	SEN	INT	SEN	INT	SEN
13	Tigecycline	RES	RES	RES	INT	INT	RES	RES	SEN	SEN	SEN	INT	SEN
14	Azithromycin	INT	SEN	SEN	SEN	INT	RES	RES	SEN	SEN	SEN	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Annexure 31

Table 31: Comparison of antibiotic sensitivity profile of *Pseudomonas* obtained at Rudravelly site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Rudravelly, *Pseudomonas*, 24/05/2019	
Sl. No.	**Antibiotics Name**	**KB**	**RB**
1	Amoxicillin	RES	INT
2	Gentamycin	SEN	SEN
3	Amikacin	SEN	SEN
4	Cefepime	SEN	SEN
5	Ofloxacin	SEN	SEN
6	Ciprofloxacin	INT	SEN
7	Ceftriaxone	INT	SEN
8	Piperacillin-Tazobactam	RES	INT
9	Cefotaxime	INT	RES
10	Cefuroxime	SEN	SEN
11	Tobramycin	SEN	SEN
12	Levofloxacin	SEN	SEN
13	Cefazolin	INT	RES
14	Imipenem	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Table 32: Comparison of antibiotic sensitivity profile of *Enterococcus*, obtained at Rudravelly site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Rudravelly, *Enterococcus*			
		26/06/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB
1	Amoxicillin	RES	SEN	RES	SEN
2	Gentamycin	RES	INT	RES	SEN
3	Amikacin	SEN	SEN	SEN	SEN
4	Cefepime	RES	INT	RES	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN
6	Ciprofloxacin	RES	SEN	RES	SEN
7	Ceftriaxone	RES	SEN	SEN	SEN
8	Piperacillin-Tazobactam	INT	SEN	RES	SEN
9	Cefotaxime	INT	RES	INT	RES
10	Cefuroxime	RES	INT	RES	SEN
11	Tobramycin	SEN	SEN	SEN	SEN
12	Levofloxacin	RES	RES	INT	SEN
13	Cefazolin	INT	SEN	SEN	SEN
14	Imipenem	INT	SEN	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

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Table 33: Comparison of antibiotic sensitivity profile of *E. coli* obtained at Kasaniguda site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Kasaniguda, *E.coli*							
		24/05/2019		13/06/2019		26/06/2019		09/07/2019	
Sl. No.	Antibiotics Name	KB	RESB	KB	RESB	KB	RESB	KB	RESB
1	Amoxicillin	INT	SEN	INT	RES	INT	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	INT	SEN	SEN	SEN	SEN	SEN	SEN
4	Cefepime	SEN	SEN	SEN	RES	SEN	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	INT
6	Ciprofloxacin	INT	SEN	INT	SEN	INT	SEN	INT	SEN
7	Ceftriaxone	RES	RES	INT	SEN	SEN	SEN	RES	SEN
8	Piperacillin-Tazobactam	INT	SEN	INT	RES	RES	SEN	INT	SEN
9	Cefotaxime	RES	RES	RES	INT	INT	SEN	RES	INT
10	Cefuroxime	RES	RES	RES	RES	RES	SEN	RES	SEN
11	Tobramycin	INT	SEN	SEN	SEN	INT	SEN	SEN	SEN
12	Levofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Cefazolin	RES	RES	RES	RES	SEN	INT	RES	SEN
14	Imipenem	SEN	SEN	INT	RES	SEN	SEN	SEN	RES

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

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Table 34: Comparison of antibiotic sensitivity profile of *Klebsiella* obtained at Kasaniguda site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Kasaniguda, *Klebsiella*							
		24/05/2019		13/06/2019		23/06/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB	KB	RB	KB	RB
1	Amoxicillin	SEN	SEN	INT	RES	RES	SEN	RES	SEN
2	Gentamycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN	SEN	SEN	RES	SEN
4	Cefepime	SEN	SEN	SEN	INT	SEN	SEN	RES	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
6	Ciprofloxacin	INT	SEN	INT	SEN	INT	SEN	INT	SEN
7	Ceftriaxone	INT	SEN	INT	RES	INT	SEN	RES	SEN
8	Piperacillin-Tazobactam	INT	SEN	INT	SEN	RES	SEN	INT	SEN
9	Cefotaxime	RES	INT	RES	RES	INT	SEN	RES	RES
10	Cefuroxime	SEN	INT	RES	RES	RES	SEN	RES	SEN
11	Tobramycin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
12	Levofloxacin	SEN	SEN	SEN	SEN	SEN	SEN	SEN	SEN
13	Cefazolin	RES	RES	RES	RES	RES	SEN	RES	SEN
14	Imipenem	SEN	SEN	INT	SEN	SEN	SEN	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Table 35: Comparison of antibiotic sensitivity profile of *Pseudomonas* obtained at Kasaniguda site using the Kirby Bauer disc diffusion (KB) and the RightBiotic Assay (RB)

		Kasaniguda, *Pseudomonas*			
		24/05/2019		13/06/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB
1	Amoxicillin	SEN	SEN	INT	SEN
2	Gentamycin	SEN	SEN	SEN	SEN
3	Amikacin	SEN	SEN	SEN	SEN
4	Cefepime	INT	SEN	SEN	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN
6	Ciprofloxacin	SEN	SEN	INT	SEN
7	Ceftriaxone	INT	SEN	INT	SEN
8	Piperacillin-Tazobactam	SEN	INT	INT	RES
9	Cefotaxime	SEN	SEN	INT	SEN
10	Cefuroxime	RES	RES	RES	INT
11	Tobramycin	INT	SEN	SEN	SEN
12	Levofloxacin	SEN	SEN	SEN	SEN
13	Cefazolin	INT	SEN	INT	SEN
14	Imipenem	INT	SEN	INT	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Table 36: Comparison of antibiotic sensitivity profile of *Staphylococcus* obtained at Kasaniguda site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Kasaniguda *Staphylococcus*			
		23/06/2019		09/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB
1	Co-Trimoxazole	RES	SEN	RES	SEN
2	Teicoplanin	RES	INT	RES	SEN
3	Meropenem	RES	SEN	SEN	SEN
4	Cloxacillin	RES	SEN	RES	RES
5	Ceftazidime	SEN	SEN	SEN	SEN
6	Clindamycin	RES	SEN	RES	SEN
7	Linezolid	RES	SEN	RES	SEN
8	Moxifloxacin	RES	SEN	SEN	SEN
9	Nitrofurantoin	INT	SEN	SEN	RES
10	Lincomycin	RES	SEN	RES	RES
11	Netilmicin	SEN	SEN	SEN	SEN
12	Vancomycin	RES	SEN	RES	RES
13	Tigecycline	SEN	SEN	RES	SEN
14	Azithromycin	INT	SEN	SEN	RES

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

Table 37: Comparison of antibiotic sensitivity profile of *Enterococcus*, obtained at Kasaniguda site using the Kirby Bauer disc diffusion (KB) assay and the RightBiotic Assay (RB)

		Kasaniguda, *Enterococcus*			
		09/07/2019		23/07/2019	
Sl. No.	Antibiotics Name	KB	RB	KB	RB
1	Amoxicillin	RES	SEN	RES	SEN
2	Gentamycin	RES	SEN	RES	SEN
3	Amikacin	SEN	SEN	SEN	SEN
4	Cefepime	RES	RES	RES	SEN
5	Ofloxacin	SEN	SEN	SEN	SEN
6	Ciprofloxacin	RES	SEN	RES	SEN
7	Ceftriaxone	SEN	SEN	SEN	SEN
8	Piperacillin-Tazobactam	INT	SEN	RES	SEN
9	Cefotaxime	SEN	RES	SEN	SEN
10	Cefuroxime	RES	INT	RES	SEN
11	Tobramycin	SEN	SEN	SEN	SEN
12	Levofloxacin	RES	INT	INT	SEN
13	Cefazolin	SEN	SEN	INT	SEN
14	Imipenem	SEN	INT	SEN	SEN

For interpretation of Kirby Bauer disc assay guideline by Clinical and Laboratory Standards Institute were followed (CLSI Document M100-S25. Performance standards for antimicrobial susceptibility testing: twenty eighth informational supplement edition. CLSI; Jan 2018.) SEN: Sensitive; RES: Resistance; INT: Intermediate

RYS

Fig. 20: Sensitivity profile of RightBiotic assay in comparison with Kirby Bauer method. % match and mismatch for all strains of *Staphylococcus* and *Klebsiella* during the 10-week study.

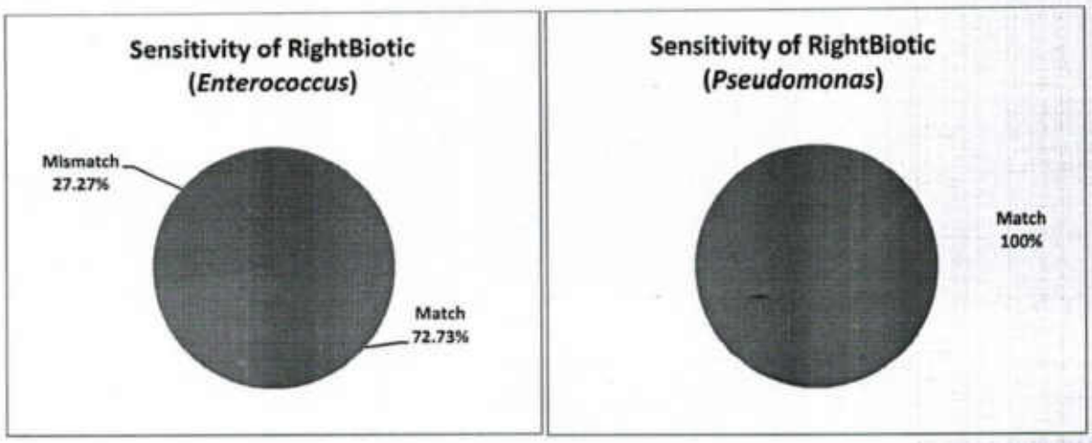

Fig. 21: Sensitivity profile of RightBiotic assay in comparison with Kirby Bauer method. % match and mismatch for all strains of *Enterococcus* and *Pseudomonas* during the 10-week study.

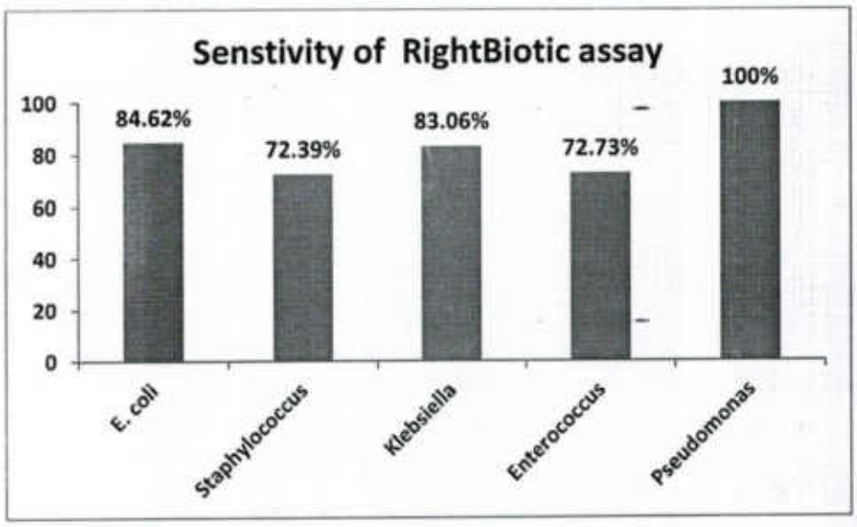

Fig. 22: A bar chart representing the sensitivity profile of RightBiotic assay in comparison with Kirby Bauer method of various bacterial strains isolated during the complete study.

Table 39: Comparison of bacterial identification between agar plate assay and RightBiotic assay for water samples collected on 09/05/2019

Sample collection site	Volume of water sample filtered or pure colony	Identification (RightBiotic)	Identification (Plate assay)	Colony Forming Units/mL
Nagole (a)	15ml	*E. coli*	*E. coli*	10^5 cells/ml
Nagole (b)	15ml	Gram-ve	*Klebsiella*	10^5 cells/ml
Nagole (c)	15ml	Contamination	*Staphylococcus*	Not applicable
Pillaipalli	15ml	Gram +ve	*Enterococcus*	10^5 cells/ml
Gandipet	15ml	Contamination	*E. coli*	Not applicable
Rudravelly (a)	15ml	Gram –ve	*Staphylococcus*	10^5 cells/ml
Rudravelly (b)	15ml	*E. coli* (Gram -ve) *Pseudomonas*	*E. coli*	10^5 cells/ml
Rudravelly (c)	15ml	Contamination	*Klebsiella*	Not applicable
Pratapsingaram (a)	15ml	Gram +ve	*Staphylococcus*	10^5 cells/ml
Pratapsingaram (b)	15ml	*E. coli* (Gram -ve) *Pseudomonas*	*E. coli*	10^5 cells/ml

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Table 40: A comparison of bacterial identification between agar plate assay and RightBiotic assay for water samples collected on 24/05/2019

Sample collection site	Vol. of sample filtered/pure colony	Identification (RightBiotic)	Identification (Plate assay)	CFUs/mL
Gandipet	15ml	Gram-ve	Mixed Culture	10^4 cells/ml
Nagole	15ml	Gram-ve)	Mixed Culture	10^5 cells/ml
Pratapsingaram	10ml	Contamination	Mixed Culture	Not applicable
Pillaipalli	15ml	Gram-ve	Mixed Culture	10^4 cells/ml
Rudravelly	15ml	Gram-ve	Mixed Culture	10^5 cells/ml
Kasaniguda	15ml	Contamination	Mixed Culture	Not applicable
Musi (before confluence)	15ml	Bacteria Absent	No Growth	Not applicable
Krishna (before confluence)	15ml	Bacteria Absent	No Growth	Not applicable
Musi and Krishna after confluence	15ml	Bacteria Absent	No Growth	Not applicable
Gandipet (i)	5ml	Gram-ve	Mixed Culture	10^4 cells/ml
Gandipet (ii)	10ml	Gram-ve	Mixed Culture	10^4 cells/ml
Nagole (i)	5ml	Gram-ve	Mixed Culture	10^5 cells/ml
Nagole (ii)	10ml	Gram-ve	Mixed Culture	10^5 cells/ml
Pratapsingaram (i)	5ml	Gram-ve	Mixed Culture	10^5 cells/ml
Pratapsingaram (ii)	10ml	Gram-ve	Mixed Culture	10^5 cells/ml
Pillaipalli (i)	5ml	Gram-ve	Mixed Culture	10^4 cells/ml
Pillaipalli (ii)	10ml	Gram-ve	Mixed Culture	10^5 cells/ml
Rudravelly (i)	5ml	Gram-ve	Mixed Culture	10^4 cells/ml
Rudravelly (ii)	10ml	Gram-ve	Mixed Culture	10^5 cells/ml
Kasaniguda (i)	5ml	Gram-ve	Mixed Culture	10^4 cells/ml
Kasaniguda (ii)	10ml	Gram+ve	Mixed Culture	10^5 cells/ml
Musi (before confluence)	20ml	Bacteria Absent	No Growth	Not applicable
Krishna (before confluence)	20ml	Bacteria Absent	No Growth	Not applicable
Musi & Krishna after confluence	20ml	Bacteria Absent	No Growth	Not applicable
Rudravelly (a)	Colony	Gram -ve	*E. coli*	10^4 cells/ml
Rudravelly (b)	Colony	Gram -ve	*Klebsiella*	10^5 cells/ml
Rudravelly (c)	Colony	Gram -ve	*Pseudomonas*	10^5 cells/ml
Rudravelly (d)	Colony	Others	*Staphylococcus*	10^5 cells/ml

Pillaipalli (a)	Colony	Gram -ve	*E. coli*	10^4 cells/ml
Pillaipalli (b)	Colony	Others	*Klebsiella*	10^5 cells/ml
Pillaipalli (c)	Colony	Gram -ve	*Pseudomonas*	10^4 cells/ml
Pratapsingaram (a)	Colony	*E. coli* Gram-ve	*E. coli*	10^4 cells/ml
Pratapsingaram (b)	Colony	Gram -ve	*Klebsiella*	10^5 cells/ml
Pratapsingaram (c)	Colony	Gram +ve	*Staphylococcus*	10^4 cells/ml
Kasaniguda (a)	Colony	Gram -ve	*E. coli*	10^5 cells/ml
Kasaniguda (b)	Colony	Gram -ve	*Klebsiella*	10^5 cells/ml
Kasaniguda (c)	Colony	Gram -ve	*Pseudomonas*	10^5 cells/ml
Nagole (a)	Colony	Others	*E. coli*	10^5 cells/ml
Nagole (b)	Colony	Others	*Klebsiella*	10^5 cells/ml
Nagole (c)	Colony	Others	*Staphylococcus*	10^5 cells/ml

Annexure 41

Table 41: Comparison of bacterial identification between agar plate assay and RightBiotic assay for water samples collected on 13/06/2019 (volume required and CFU observed using RightBiotic assay)

Sample collection site	Volume of water sample filtered or pure colony	Identification (RightBiotic)	Identification (Agar Plate assay)	Colony Forming Units/mL
Gandipet	15ml	Bacteria Absent	Bacteria Absent	----
Nagole	5ml	Gram +ve	Mixed culture	10^5 cells/ml
Pillaipalli	10ml	Others	Mixed culture	10^5 cells/ml
Pratapsingaram	10ml	Gram +ve	Mixed culture	10^5 cells/ml
Rudravelly	10ml	Others	Mixed culture	10^4 cells/ml
Kasaniguda	10ml	Others	Mixed culture	10^5 cells/ml
Musi (before confluence)	20ml	Bacteria Absent	No Growth	Not applicable
Musi (before confluence)	20ml	Bacteria Absent	No Growth	Not applicable
Krishna (before confluence)	20ml	Bacteria Absent	No Growth	Not applicable
Krishna (before confluence)	20ml	Bacteria Absent	No Growth	Not applicable
Musi and Krishna after confluence	20ml	Bacteria Absent	No Growth	Not applicable
Musi and Krishna after confluence	20ml	Bacteria Absent	No Growth	Not applicable
Nagole (a)	Colony	Others	*E.coli*	10^5 cells/ml
Nagole (b)	Colony	*Staphylococcus* Gram +ve	*Staphylococcus*	10^5 cells/ml
Nagole (c)	Colony	Others	*Klebsiella*	10^5 cells/ml
Nagole (d)	Colony	Others	*Enterococcus*	10^5 cells/ml
Pratapsingaram (a)	Colony	*Staphylococcus* Gram +ve	*Staphylococcus*	10^5 cells/ml
Pratapsingaram (b)	Colony	Gram -ve	*E.coli*	10^5 cells/ml
Pratapsingaram (c)	Colony	Gram -ve	*Klebsiella*	10^5 cells/ml
Pratapsingaram (d)	Colony	Gram +ve	*Enterococcus*	10^5 cells/ml
Pillaipalli (a)	Colony	Gram -ve	*E.coli*	10^5 cells/ml
Pillaipalli (b)	Colony	*Staphylococcus* Gram +ve	*Staphylococcus*	10^5 cells/ml

Pillaipalli (c)	Colony	Others	*Klebsiella*	10^4 cells/ml
Rudravelly (a)	Colony	*Staphylococcus* Gram +ve	*Staphylococcus*	10^4 cells/ml
Rudravelly (b)	Colony	Gram -ve	*E.coli*	10^5 cells/ml
Rudravelly (c)	Colony	Gram -ve	*Klebsiella*	10^5 cells/ml
Kasaniguda (a)	Colony	Others	*E.coli*	10^5 cells/ml
Kasaniguda (b)	Colony	Others	*Pseudomonas*	10^5 cells/ml
Kasaniguda (c)	Colony	Gram -ve	*Klebsiella*	10^4 cells/ml

Table 42: Comparison of available methods for identification of pathogens and Antibiotic sensitivity testing including the RightBiotic system

Method	Target	Advantages	Disadvantages	Cost/technical requirements
Standard laboratory culture	Pathogens and AST (Antibiotic sensitivity testing)	1. Considered as the gold standard 2. Quantitative, provides MIC values	1. Proper laboratory setup required 2. Only culturable microbes can be studied 3. Takes ≥72hrs	Low/Medium
RightBiotic	Pathogens & AST (Antibiotic sensitivity testing)	1. Pre culture of microbes not required 2.Provides bacterial identification and AST results in 4 hrs, MIC possible 3. Field operable with least human intervention	1. Does not provide genetic basis of resistance	**Lowest/Lowest**
VITEK 2	Pathogens & AST (Antibiotic sensitivity testing)	1. Pre culture of microbes required 2.Provides bacterial identification and AST, MIC possible	1. High-cost 2. Requirement of trained personnel 3. Human intervention Turbidity needs to be adjusted. 4. Accessory instruments required 5. Field operation not possible 6. Does not provide genetic basis of resistance 7. Takes ≥29 hrs	High/High

PHOENIX	Pathogens & AST (Antibiotic sensitivity testing)	1. Pre culture of microbes required 2.Provides bacterial identification and AST, MIC possible	1. High-cost 2. Requirement of trained person 3. Human intervention Turbidity needs to be adjusted 4. Accessory instruments required 5. Field operation not possible 6. Does not provide genetic basis of resistance 7. Takes ≥29 hrs	High/High
MICROPRO BCS	Pathogens & AST	1. Pre culture of microbes required 2.Provides bacterial identification and AST, MIC possible	1. High-cost 2. Requirement of trained person 3. Human intervention: Turbidity needs to be adjusted 4. Accessory instrument required 5. Does not provide genetic basis of resistance 6. Takes ≥46 hrs.	Higher than RightBiotic /Lower than Vitek and Phoenix
qPCR	Gene based	1. Pre-culture nor required 2.Quantitative determination	1. High technical expertise required 2.Not suitable for all target genes 3. Takes ≥22 hrs	High/High
Metagenomics	Gene based	1.Detection of all resistance genes 2.Culture not required	1. Cannot link genes to host organisms 2. Limit of detection not known 3. Takes ≥22 hrs	High/High
Whole Genome Sequencing	Gene based	1.Used for identification of resistant genes 2. Can link genes to host organisms	1. Culture of microorganism is necessary 2. MIC cannot be determined 3. Non-quantitative 4. Takes ≥22 hrs	High/High

Ref: Initiatives for Addressing Antimicrobial Resistance in the Environment: Current Situation and Challenges. 2018. https://wellcome.ac.uk/sites/default/files/antimicrobial-resistance-environment -report.pdf

Glossary of words used and composition of various broth used for bacterial culture

Antibiotics: Antibacterial agents that are used to kill or slow down the growth of bacterial infections.

Agricultural runoff: Water discharged from farms or agricultural fields and contains pesticides, fertilizers, animal waste, and soil particles. They are usually discharged in lakes or rivers and leads to severe water pollution.

Antimicrobial resistance (AMR): The ability of bacterial species to reduce the effectiveness of antibiotics. In certain cases, the bacteria are resistant to several antibiotics of various classes and which makes the treatment very difficult.

Antimicrobial stewardship: Prudent and right use of antibiotics which helps in reducing AMR.

Bacterial load: Measurable quantity of bacteria in a given sample.

Antibiotic Susceptibility test (AST): Tests used to determine the antibiotic susceptibility of pathogenic bacteria.

Broad spectrum antibiotics: Antibiotics which can be used to kill a wide-variety of bacterial infections.

Beta lactams: A class of antibiotics that contain beta-lactam ring in their molecular structure.

Contamination: The introduction of a harmful or foreign substance into an environment.

Dissolved oxygen (DO): The quantity of oxygen dissolved in the water through various processes such as diffusion from the atmosphere, photosynthesis, and aeration of water due to its movement.

Effluent: A liquid waste discharged from industries or sewage treatment plants and generally discharged into the nearby water bodies.

Gram positive bacteria: Bacteria which give positive tests in the Gram-stain test.

Gram-negative bacteria: Bacteria which do not give positive tests in the Gram-stain test.

Horizontal gene transfer: The transfer of genetic material from one bacterial strain to another bacterial strain in the environment.

Gut microbiome: Beneficial bacteria living in the gut of organisms. They form a symbiotic association with the host and perform several functions.

Narrow Spectrum antibiotics: Antibiotics which can be used to treat a selected group of bacterial infections.

Pathogen: A microbe which can cause disease in living animals or plants.

Macconkey Agar: Macconkey Agar is recommended for selective isolation of Escherichia coli from pharmaceutical products and is in accordance with harmonized methodology of BP. It is also recommended for selective isolation and differentiation of lactose fermenting and lactose non fermenting enteric bacteria.

Ingredients	**Gms / Litre**
Peptones (meat and casein)	3.000
Pancreatic digest of gelatin	17.000
Lactose monohydrate	10.000
Bile salts	1.500
Sodium chloride	5.000
Crystal violet	0.001
Neutral red	0.030
Agar	13.500
pH after sterilization (at 25°C) 7.1±0.2	

Luria Bertani Agar: It is used for the cultivation and maintenance of recombinant strains of Escherichia coli and may be used for routine cultivation of not particularly fastidious microorganisms.

Ingredients	**Gms / Litre**
Casein enzymic hydrolysate	10.000
Yeast extract	5.000

Sodium chloride	5.000
Agar	10.000
Final pH (at 25°C) 7.2±0.2	

HiCrome UTI Agar: HiCrome UTI Agar is a differential medium recommended for presumptive identification of microorganisms mainly causing urinary tract infections.

Ingredients Gms / Litre

Peptic digest of animal tissue	15.000
Chromogenic mixture	26.800
Agar	15.000
Final pH (at 25°C) 6.8±0.2	

ANNEXURE-XX

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D/C 128/49/MS 06/09

TELANGANA STATE POLLUTION CONTROL BOARD

Paryavarana Bhavan, A-3, Industrial Estate, Sanathnagar,
Hyderabad – 500018, Phone: 040 – 23887500

Lr.No.1023/TSPCB/LAB/Musi River/2018 – 1283 Date: 28.08.2019

To
The Member Secretary,
Central Pollution Control Board,
Parivesh Bhavan,
East Arjun Nagar,
Delhi

Sir,

Sub: TSPCB – Furnishing of final report pertaining to quick hygienic survey of River Musi - Reg.
Ref: Directions of Hon'ble NGT in OA No.426/2018

****

Kind attention is invited to the subject cited. As per the directions of Hon'ble NGT in O.A. No.426/2018, TSPCB in co-ordination with BITS, Hyderabad and CPCB, RD(S), Bangalore have collected samples during 9th May 2019 to 23rd July 2019 under Hygienic survey of River Musi.

The final report including the inference of the analysis data pertaining to the study is communicated for information.

Encl: Analysis reports

Yours faithfully,

28/8/19

Jt. Chief Environmental Scientist (FAC)

Copy to:

1. Divisional Dead, Scientist-E, Water Quality Management Division, CPCB, Delhi for information.
2. The Regional Directore, CPCB(South), A-Block, Nisarga Bhavan, 1st and 2nd Floors, 7th D Cross, Thimmaiah Road, Shivanagar, Bengaluru-560079 for information.
3. The Senior Environmental Scientist, TSPCB, Zonal Laboratory, Warangal for information.

Report of Quick Hygienic Survey of River Musi and Krishna in compliance to Hon'ble NGT Principal Bench, Delhi vide its order dated April 5, 2019 in the matter of OA 426 of 2018

1) Preamble:

The Hon'ble NGT in its order dated: 05.04.2019 with regard to O.A.No.426/2018 directed Central Pollution Control Board and Telangana State Pollution Control Board to carryout a quick hygienic survey of the Musi river by engaging Prof.Suman Kapur, Dean, International Programmes and Collaborations and Senior Professor, Department of Biological Sciences, BITS-Pilani, Hyderabad campus and submit a report by 31.07.2019 for river Musi and any other clean river in the state falling in the category of "A" and or "B". Krishna River at Wadapally, Nalgonda District was selected for the study as it was falling under the "B" category based on the analysis report obtained from TSPCB for the year 2018.

In compliance to above mentioned order, CPCB, Regional Directorate (South) deputed officials to carry out the Hygienic Survey along the Musi river stretch in coordination with Telangana State Pollution Control Board officials. A team comprising following officials from CPCB, Regional Directorate (South), Bengaluru and Telangana State Pollution Control Board (TSPCB), conducted joint monitoring during 9th May – 23rd July 2019.

The following officials were nominated to carry out 'hygienic survey of river Musi and Krishna' along with Professor Suman Kapur from BITS-Pilani, Hyderabad campus and her team members:

1. Dr. B. S. Anupama, Scientist C, CPCB, RD(S), Bengaluru
2. Dr. M. S. Satyanarayana Rao, Senior Environmental Scientist, TSPCB, Zonal Laboratory, Warangal.
3. Sh A.Rajender, Project Analyst, Zonal Laboratory, TSPCB, Warangal.
4. Sh. B.Venkateshwar Rao, Field Technician, Zonal Laboratory, TSPCB, Warangal
5. Dr. Suman Kapur, Senior Professor, BITS-Pilani, Hyderabad campus
6. Sh. Pavan Mujawdiya, Ph.D Student, BITS-Pilani, Hyderabad campus

2) Monitoring locations / schedule:

In view of the above, a meeting was convened by TSPCB on 02.05.2019 with the officials of CPCB, TSPCB and Dr. Suman Kapur, BITS, Hyderabad at TSPCB, Board Office, Hyderabad to discuss the methodology of survey, sampling points, frequency of monitoring and parameters to be analysed. In the meeting, the monitoring locations and schedule of monitoring for quick hygienic survey of river Musi was finalised which is tabulated below:

Table-1

Monitoring locations	Monitoring schedule
1. Up stream of River Musi at Gandipet 2. River Musi at Nagole 3. River Musi at Pratapasingaram 4. River Musi at Pillaypalli 5. River Musi at Rudravelli bridge 6. River Musi at Kasaniguda 7. River Musi before confluence with River Krishna at Wadapally 8. River Krishna before confluence with River Musi at Wadapally 9. River Krishna after confluence with River Musi at Wadapally	1. 9th May 2019 2. 24th May 2019 3. 13th June 2019 4. 26th June 2019 5. 9th July 2019 6. 23rd July 2019

3) Musi River

Musi River originates from Anantagiri Hills near Vikarabad District and joins River Krishna at Wadapally in Nalgonda District. Has aggregate length of 250 kms and it passes through Hyderabad city. Musi river is a major source of water supply to Hyderabad and two major water reservoirs, Osman Sagar and Himayat Sagar, are constructed on Musi river for adequate water supply for drinking and irrigation purposes. It is the only river that flows through the centre of the city. The river Musi watershed covers an approximate area of 10,858 sq.km and depicted in **Fig 1. and Fig2** . The length of the stretch is 224.058 km of which the stretch from Osmansagar to Wadapally is about 180 km.

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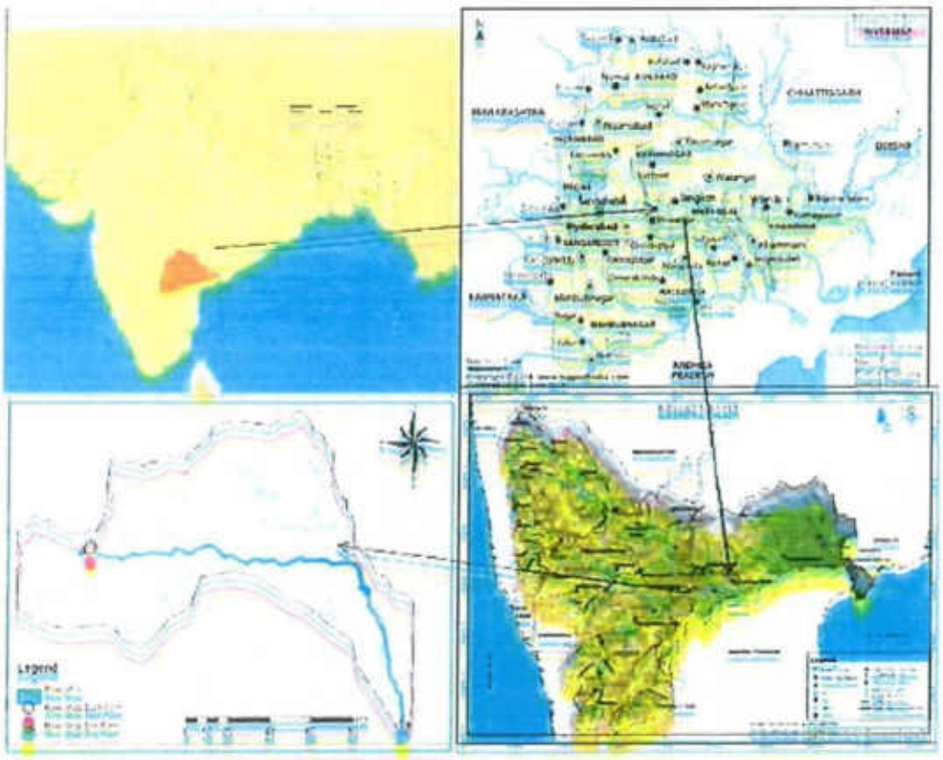

Figure 1: Presented below is the map of Musi river depicting the monitoring locations.

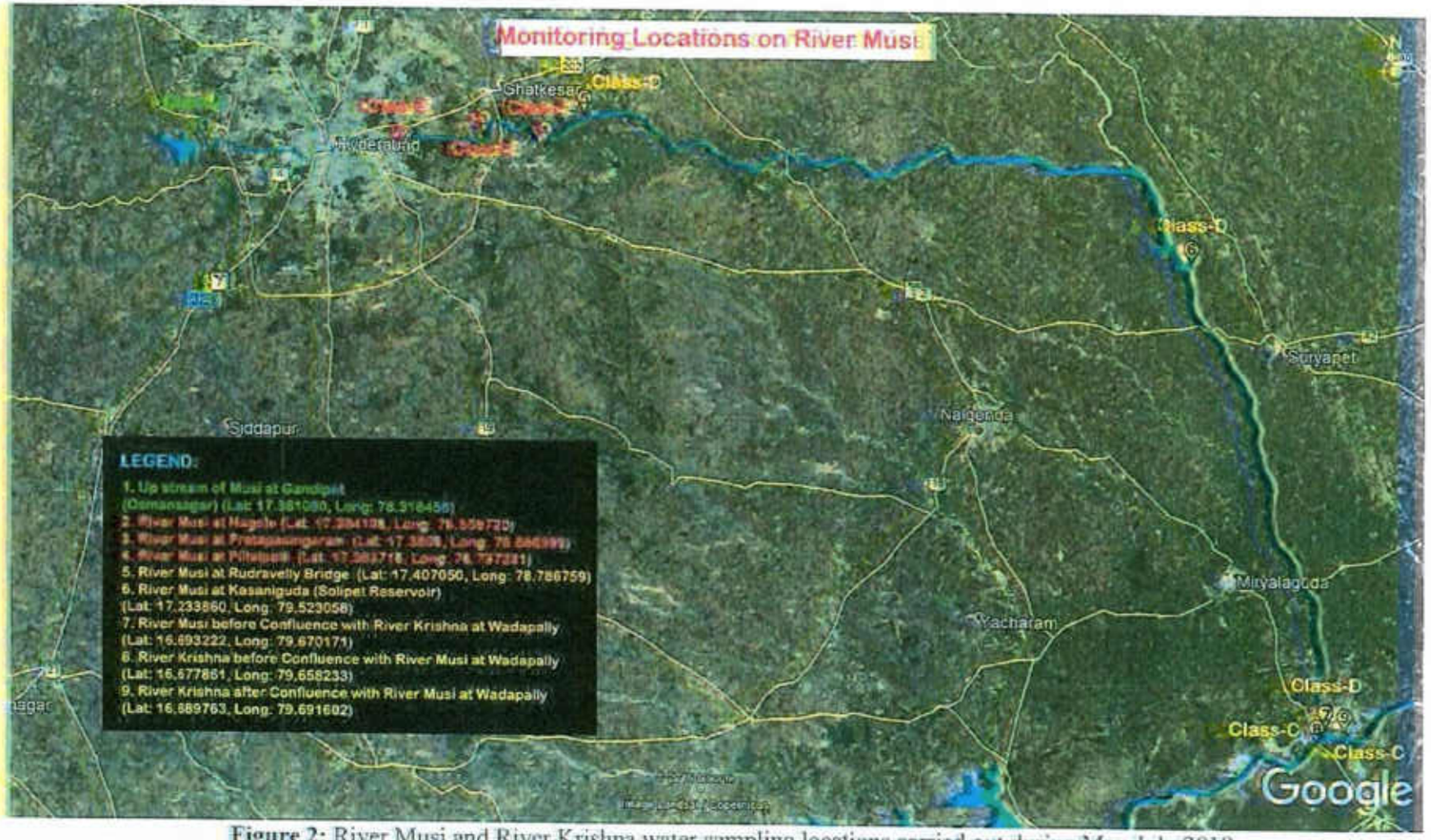

Figure 2: River Musi and River Krishna water sampling locations carried out during May-July 2019

In the present study, Monitoring was carried out at 9 locations along the Musi River Stretch in Six rounds during May to July 2019.Sampling was carried out following the SOP and preserved at 4°C and transferred to Central Laboratory, TSPCB for analysis of Physicochemical parameters, Total Coliform and Fecal Coliform. All the tests were carried out as per the standard methods mentioned in APHA (23rd Edition) in TSPCB Laboratory, Hyderabad except other Biological parameters and Antimicrobial resistance study which was carried out by BITS, Hyderabad campus.

4) Analysis Results:

Table 1: Musi River water quality data for sampling carried out on 9.5.2019

Parameters	Unit	Musi river at				
		Osman Sagar	Nagole bridge	Pratapsin garam	Pillayipalli	Rudravelly
pH	-	7.9	7.3	7.3	7.3	7.2
Electrical conductivity	µS/cm	382	1489	1543	1382	1490
Dissolved oxygen	mg/L	6.2	Nil	Nil	2.1	*
Chemical Oxygen Demand	mg/L	21	252	157	126	110
BOD 3 at 27°C	mg/L	3	72	42	34	28
Total Suspended Solids	mg/L	8	137	32	18	29
Total Dissolved Solids	mg/L	270	1022	986	795	850
Free Ammonia	mg/L	0.24	0.20	0.27	0.22	0.16
SAR	-	1.0	3.5	5.6	5.1	5.2
Boron	mg/L	BDL	BDL	BDL	BDL	BDL
Nitrates	mg/L	4	17	13	27	25
Total coliform	MPN/100ml	49	540	920	>1600	1600
Fecal coliform	MPN/100ml	Nil	79	110	94	140
CPCB water quality criteria class		**B**	**E**	**E**	**E**	-

Parameters	Unit	Musi river at			
		Kasaniguda	Before confluence with River Krishna at Wadapally	River Krishna before confluence with River Musi at Wadapally	River Krishna after confluence with River Musi at Wadapally
pH	-	7.6	8.2	8.2	8.2
Electrical conductivity	µS/cm	2120	1210	485	608
Dissolved oxygen	mg/L	4.2	5.6	4.0	5.6
Chemical Oxygen Demand	mg/L	145	50	26	20

BOD 3 at 27^{O}C	mg/L	30	4.0	3.0	3.0
Total Suspended Solids	mg/L	25	5	8	< 5
Total Dissolved Solids	mg/L	1348	690	314	390
Free Ammonia	mg/L	0.5	0.7	0.02	0.02
SAR	-	10.3	6.7	3.4	2.8
Boron	mg/L	BDL	BDL	BDL	BDL
Nitrates	mg/L	17	6	3	18
Total coliform	MPN/100 ml	17	33	130	350
Fecal coliform	MPN/100 ml	< 2	< 2	< 2	33
CPCB water quality criteria class		**D**	**D**	**C**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

Table 2: Musi River water quality data for sampling carried out on 24.5.2019

Parameters	**Unit**	**Musi river at**				
		Osman Sagar	**Nagole bridge**	**Pratapsin garam**	**Pillayipalli**	**Rudravelly**
pH	-	8.0	7.5	7.4	7.5	7.6
Electrical conductivity	µS/cm	454	1320	1381	1389	1404
Dissolved oxygen	mg/L	5.9	Nil	Nil	2.4	*
Chemical Oxygen Demand	mg/L	40	173	141	120	84
BOD 3 at 27^{O}C	mg/L	3.0	43	32	28	21
Total Suspended Solids	mg/L	5	97	41	16	24
Total Dissolved Solids	mg/L	294	887	932	934	943
Free Ammonia	mg/L	0.16	0.6	0.4	0.4	0.5
SAR	-	7.1	3.1	3.6	4.3	4.1
Boron	mg/L	BDL	BDL	BDL	BDL	BDL
Nitrates	mg/L	9	87	86	87	86
Total coliform	MPN/100ml	08	350	1600	1600	920
Fecal coliform	MPN/100ml	< 2	49	130	79	49
CPCB water quality criteria class		**B**	**E**	**E**	**E**	-

Note: Results related to sample as received.
BDL – Below Detectable Limit
(*) - Sample not collected.

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Parameters	Unit	Musi river at			
		Kasaniguda	Before confluence with River Krishna at Wadapally	River Krishna before confluence with River Musi at Wadapally	River Krishna after confluence with River Musi at Wadapally
pH	-	8.1	8.5	8.5	8.4
Electrical conductivity	µS/cm	2150	1315	828	952
Dissolved oxygen	mg/L	4.0	5.8	4.0	5.4
Chemical Oxygen Demand	mg/L	120	58	32	18
BOD 3 at 27°C	mg/L	27	4.2	3.0	3.0
Total Suspended Solids	mg/L	10	< 5	7	< 5
Total Dissolved Solids	mg/L	1250	882	620	609
Free Ammonia	mg/L	0.96	0.54	0.02	0.02
SAR	-	3.6	3.9	2.9	2.9
Boron	mg/L	BDL	BDL	BDL	BDL
Nitrates	mg/L	34	9	8	7
Total coliform	MPN/100ml	13	33	130	350
Fecal coliform	MPN/100ml	< 2	08	17	22
CPCB water quality criteria class		**D**	**D**	**C**	**B**

Table 3: Musi River water quality data for sampling carried out on 13.6.2019

Parameters	Unit	Musi river at				
		Osman Sagar	Nagole bridge	Pratapsingaram	Pillayipalli	Rudravelly
pH	-	8.40	8.12	7.94	7.78	7.64
Electrical conductivity	µS/cm	378	1161	1220	1248	1253
Dissolved oxygen	mg/L	5.4	Nil	Nil	4.9	3.4
Chemical Oxygen Demand	mg/L	35	172	100	72	92
BOD 3 at 27°C	mg/L	3	43	24	18	23
Total Suspended Solids	mg/L	< 5	46	30	14	15
Total Dissolved Solids	mg/L	218	722	759	839	772
Free Ammonia	mg/L	0.31	1.1	1.04	0.80	0.61
SAR	-	1.7	4.7	4.9	5.5	5.8
Boron	mg/L	BDL	BDL	0.33	BDL	BDL
Nitrates	mg/L	4.6	19.1	73.1	73.1	26.1
Total coliform	MPN/100ml	17	540	>1600	540	1600
Fecal coliform	MPN/100ml	< 2	94	170	79	170
CPCB water quality criteria class		**B**	**E**	**E**	**D**	**E**

Parameters	Unit	Musi river at			
		Kasaniguda	Before confluence with River Krishna at Wadapally	River Krishna before confluence with River Musi at Wadapally	River Krishna after confluence with River Musi at Wadapally
pH	-	8.11	8.80	8.76	8.68
Electrical conductivity	µS/cm	2167	1251	806	909
Dissolved oxygen	mg/L	4.3	2.1	5.0	5.8
Chemical Oxygen Demand	mg/L	112	72	20	52
BOD 3 at 27°C	mg/L	28	18	4	3
Total Suspended Solids	mg/L	30	< 5	< 5	7
Total Dissolved Solids	mg/L	1392	872	420	536
Free Ammonia	mg/L	1.10	0.71	0.02	0.02
SAR	-	12.4	7.8	5.8	6.0
Boron	mg/L	0.36	0.97	BDL	BDL
Nitrates	mg/L	26.1	5.7	6.1	4.9
Total coliform	MPN/100ml	08	49	94	170
Fecal coliform	MPN/100ml	< 2	08	13	13
CPCB water quality criteria class		**D**	**E**	**D**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

Table 4: Musi River water quality data for sampling carried out on 26.6.2019

Parameters	Unit	Musi river at				
		Osman Sagar	Nagole bridge	Pratapsingaram	Pillayipalli	Rudravelly
pH	-	8.33	7.58	7.75	7.80	7.70
Electrical conductivity	µS/cm	457	1312	1301	1168	1248
Dissolved oxygen	mg/L	5.1	Nil	Nil	3.6	4.8
Chemical Oxygen Demand	mg/L	25	180	147	129	90
BOD 3 at 27°C	mg/L	3	36	24	32	23
Total Suspended Solids	mg/L	< 5	48	24	16	14
Total Dissolved Solids	mg/L	224	714	738	820	754
Free Ammonia	mg/L	0.21	0.7	0.76	0.8	0.6
SAR	-	2.7	5.7	6.5	6.9	7.6
Boron	mg/L	BDL	BDL	0.03	BDL	BDL
Nitrates	mg/L	5	22	76	75	77
Total coliform	MPN/100ml	33	540	920	>1600	920
Fecal coliform	MPN/100ml	< 2	74	94	79	49
CPCB water quality criteria class		**B**	**E**	**E**	**E**	**D**

Parameters	Unit	Musi river at			
		Kasan iguda	Before confluence with River Krishna at Wadapally	River Krishna before confluence with River Musi at Wadapally	River Krishna after confluence with River Musi at Wadapally
pH	-	8.2	8.5	8.5	8.5
Electrical conductivity	µS/cm	2200	1537	828	827
Dissolved oxygen	mg/L	4.4	3.7	4.8	5.0
Chemical Oxygen Demand	mg/L	196	38	18	20
BOD 3 at 27°C	mg/L	49	5	3	3
Total Suspended Solids	mg/L	26	< 5	< 5	< 5
Total Dissolved Solids	mg/L	1520	984	522	529
Free Ammonia	mg/L	0.71	0.8	0.02	0.12
SAR	-	18	11	9	9
Boron	mg/L	0.42	0.94	BDL	BDL
Nitrates	mg/L	29	7	12	8
Total coliform	MPN/100ml	46	170	140	220
Fecal coliform	MPN/100ml	08	17	33	33
CPCB water quality criteria class		**D**	**E**	**C**	**B**

Note: Results related to sample as received.
BDL – Below Detectable Limit

Table 5: Musi River water quality data for sampling carried out on 9.7.2019

Parameters	Unit	Musi river at				
		Osman Sagar	Nagole bridge	Pratapsin garam	Pillayipalli	Rudravelly
pH	-	7.92	7.4	7.5	7.6	7.56
Electrical conductivity	µS/cm	468	1328	1415	1522	1749
Dissolved oxygen	mg/L	5.8	Nil	NIL	3.6	4.1
Chemical Oxygen Demand	mg/L	18	165	120	87	76
BOD 3 at 27°C	mg/L	3	26	18	18	19
Total Suspended Solids	mg/L	<5	36	28	28	24
Total Dissolved Solids	mg/L	304	850	891	944	1018
Free Ammonia	mg/L	BDL	0.34	0.43	0.42	0.30
SAR	-	0.9	9.5	3.7	5.6	3.5
Boron	mg/L	BDL	BDL	0.004	0.034	BDL
Nitrates	mg/L	5	22	23	24	25
Total coliform	MPN/100ml	49	920	920	920	540
Fecal coliform	MPN/100ml	08	94	110	79	94
CPCB water quality criteria class		**B**	**E**	**E**	**E**	**D**

Parameters	Unit	Musi river at			
		Kasaniguda	Before confluence with River Krishna at Wadapally	River Krishna before confluence with River Musi at Wadapally	River Krishna after confluence with River Musi at Wadapally
pH	-	7.71	8.59	8.39	8.50
Electrical conductivity	µS/cm	2222	1739	1117	1166
Dissolved oxygen	mg/L	4.0	3.4	4.2	4.6
Chemical Oxygen Demand	mg/L	172	35	19	25
BOD 3 at 27^{O}C	mg/L	43	10	3	4
Total Suspended Solids	mg/L	60	<5	<5	<5
Total Dissolved Solids	mg/L	1680	998	645	662
Free Ammonia	mg/L	0.85	0.75	0.02	0.17
SAR	-	9.1	3.9	2.5	2.7
Boron	mg/L	0.49	BDL	BDL	BDL
Nitrates	mg/L	24	7	5	7
Total coliform	MPN/100ml	170	49	140	140
Fecal coliform	MPN/100ml	17	17	17	23
CPCB water quality criteria class		**D**	**E**	**C**	**D**

Note: Results related to sample as received.
BDL – Below Detectable Limit

Table 6: Musi River water quality data for sampling carried out on 23.7.2019

Parameters	Unit	Musi river at				
		Osman Sagar	Nagole bridge	Pratapsingaram	Pillayipalli	Rudravelly
pH	-	6.13	7.10	7.40	7.50	7.60
Electrical conductivity	µS/cm	540	1599	1611	1660	1662
Dissolved oxygen	mg/L	5.1	Nil	Nil	4.0	4.7
Chemical Oxygen Demand	mg/L	29	210	131	68	74
BOD 3 at 27^{O}C	mg/L	3	42	20	18	20
Total Suspended Solids	mg/L	< 5	46	32	22	34
Total Dissolved Solids	mg/L	346	991	999	1046	1030
Free Ammonia	mg/L	0.19	0.90	0.47	0.49	0.62
SAR	-	2.5	5.2	5.9	6.6	6.3
Boron	mg/L	BDL	BDL	0.04	BDL	BDL
Nitrates	mg/L	12	34	94	80	75
Total coliform	MPN/100ml	33	920	1600	540	920
Fecal coliform	MPN/100ml	05	79	170	94	79
CPCB water quality criteria class		**B**	**E**	**E**	**D**	**D**

Parameters	Unit	Musi river at			
		Kasaniguda	Before confluence with River Krishna at Wadapally	River Krishna before confluence with River Musi at Wadapally	River Krishna after confluence with River Musi at Wadapally
pH	-	8.2	8.4	8.4	8.4
Electrical conductivity	µS/cm	2190	1672	1142	1714
Dissolved oxygen	mg/L	4.8	3.3	5.0	5.3
Chemical Oxygen Demand	mg/L	118	27	14	20
BOD 3 at 27^{O}C	mg/L	24	6	3	4
Total Suspended Solids	mg/L	36	8	< 5	< 5
Total Dissolved Solids	mg/L	1862	1070	708	928
Free Ammonia	mg/L	0.78	0.69	0.02	1.01
SAR	-	11.4	8.7	7.7	5.0
Boron	mg/L	0.64	1.0	BDL	0.3
Nitrates	mg/L	40	11	23	14
Total coliform	MPN/100ml	55	110	94	140
Fecal coliform	MPN/100ml	12	17	17	22
CPCB water quality criteria class		**D**	**E**	**B**	**D**

Table 7: CPCB Water Quality Criteria based on Designated Best Use

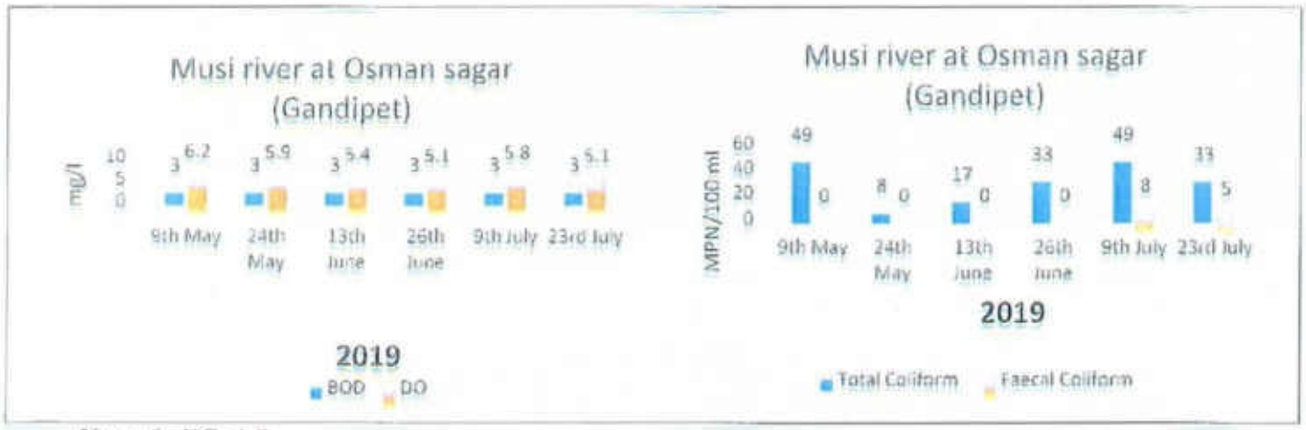
Drinking Water Source without conventional treatment but after disinfection	Class A	➢ Total Coliforms, MPN/100ml - 50 or less ➢ pH - 6.5 and 8.5 ➢ Dissolved Oxygen - 6mg/l or more ➢ Biochemical Oxygen Demand 5 days 20°C -2mg/l or less
Outdoor bathing (Organised)	Class B	➢ Total Coliforms, MPN/100ml - 500 or less ➢ pH - 6.5 and 8.5 Dissolved Oxygen -5mg/l or more ➢ Biochemical Oxygen Demand 5 days 20°C -3mg/l or less
Drinking water source after conventional treatment and disinfection	Class C	➢ Total Coliforms, MPN/100ml - 5000 or less pH - 6 to 9 ➢ Dissolved Oxygen - 4mg/l or more ➢ Biochemical Oxygen Demand 5 days 20°C -3mg/l or less
Propagation of wild life and Fisheries	Class D	➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen - 4mg/l or more ➢ Free Ammonia (as N) 1.2mg/l or less.
Irrigation, Industrial cooling, controlled waste disposal	Class E	➢ pH between 6.0 and 8.5 ➢ Electrical Conductivity at 25oC micro mhos/cm maximum 2250 ➢ Sodium absorption ratio maximum 26 ➢ Boron maximum 2mg/l.

Table 8: Average values of Musi and Krishna River water samples carried out for hygienic survey during 9th May 2019 to 23rd July 2019

S. No	Monitoring locations	pH	EC	DO	COD	BOD	TSS	TDS	Free Ammonia	SAR	Boron	Nitrates	Total Coliform	Feacal Coliform	CPCB Water Quality Criteria
1	Upstream of River Musi at Gandipet (Osmansagar)	7.78	447	5.6	30	3	5	276	0.24	2.7	BDL	7	32	4	B
2	RRiver Musi at Nagole Bridge, RR Dist	7.50	1368	Nil	192	44	68	864	0.72	5.3	BDL	34	635	78	E
3	River Musi at Pratapsingaram,RR Dist	7.55	1412	Nil	133	27	31	884	0.56	5.0	0.10	61	1260	131	E
4	River Musi at Edaipalli,RR dist	7.58	1395	3.4	100	25	19	896	0.52	5.7	0.03	61	1133	84	E
5	River Musi at Rudravelly Bridge	7.55	1468	4.3	88	22	23	895	0.47	5.4	BDL	52	1083	97	D
6	River Musi at Kasaniguda	7.99	2175	4.3	144	34	31	1509	0.82	10.8	0.48	28	52	7	D
7	River Musi before confluence with River Krishna at wadapally	8.50	1454	4	47	8	5	916	0.70	7.0	0.97	8	74	12	D
8	River Krishna before confluence with River Musi at Wadapally	8.46	868	4.5	22	3	5	538	BDL	5.1	BDL	10	121	17	C
9	River Krishna after confluence with River Musi at Wadapally	8.45	1029	5.3	26	3	5	609	0.23	4.7	0.30	10	228	24	C

2.6

Figure 3:



Note: 0=FC<1.8

Figure 4:

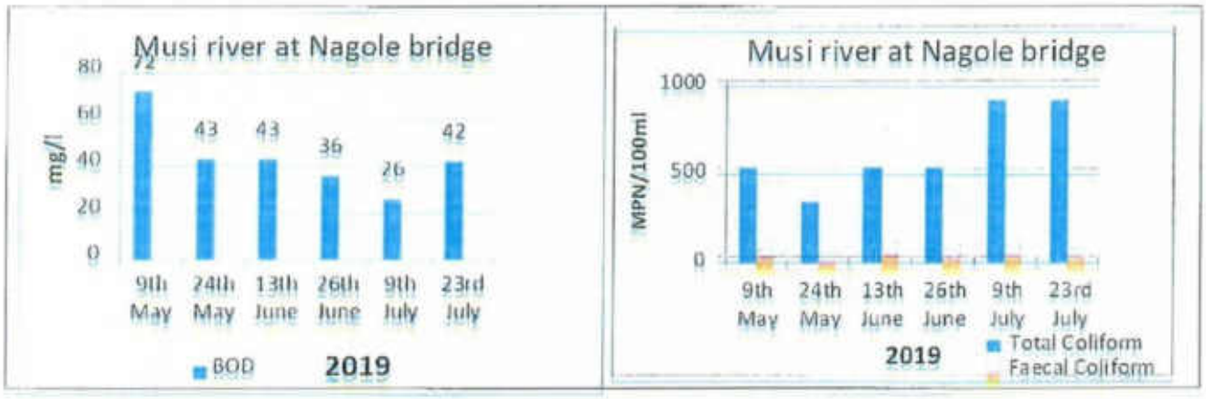
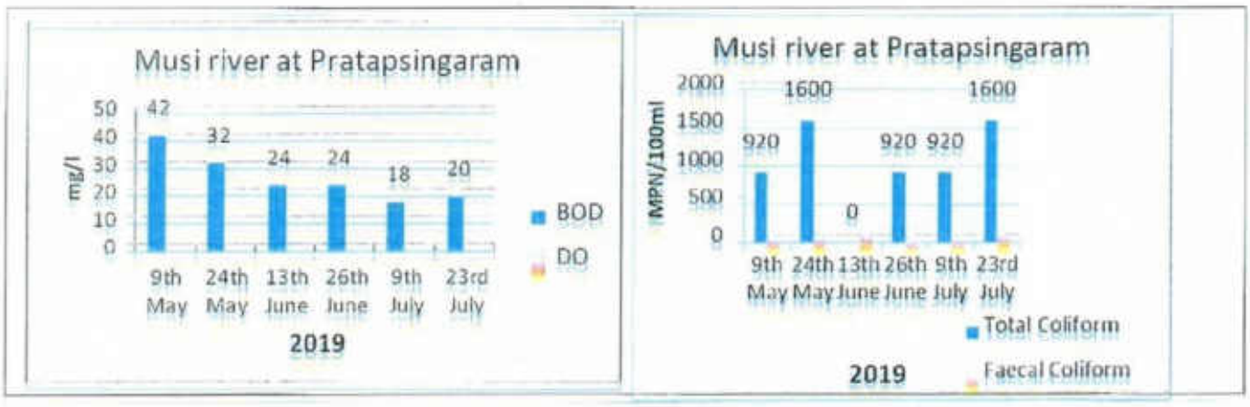


Figure 5:



Note: TC=>1600 on 13th June 2019

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Figure 6:

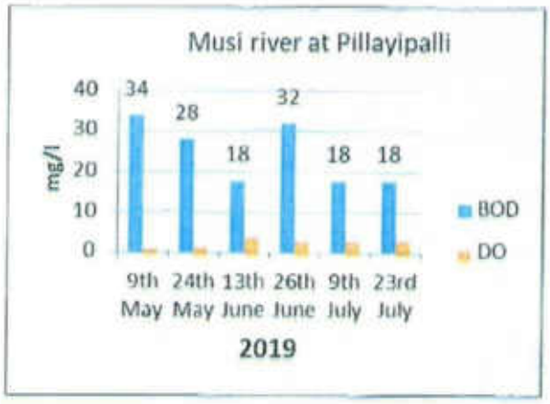
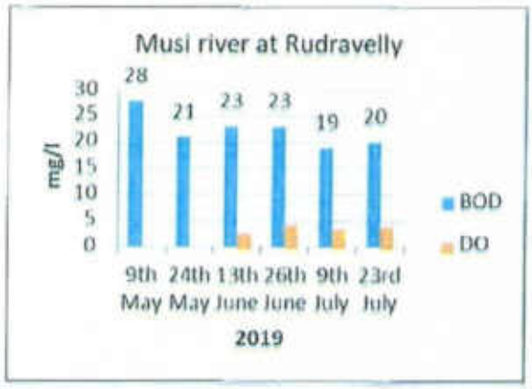


Figure 7:



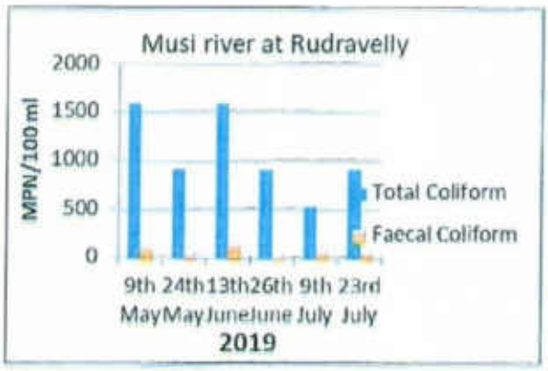
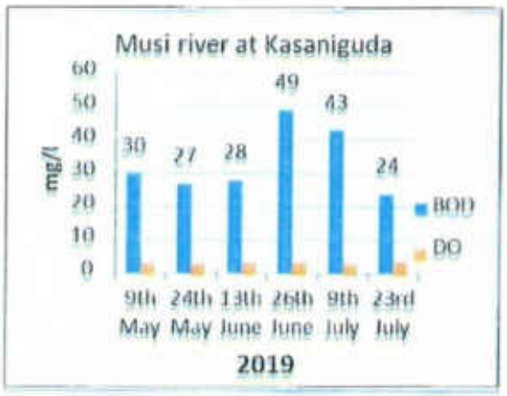


Figure 8:



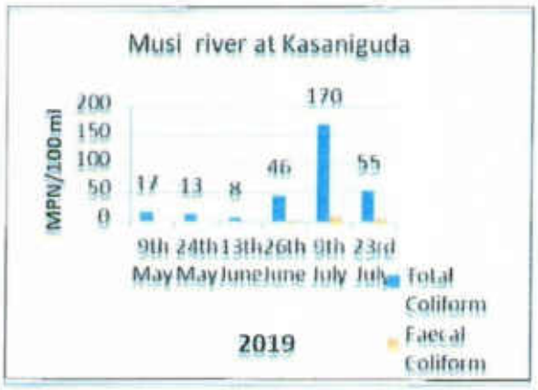


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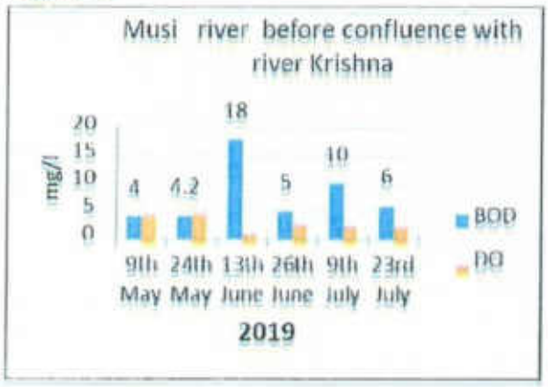
Figure 9:



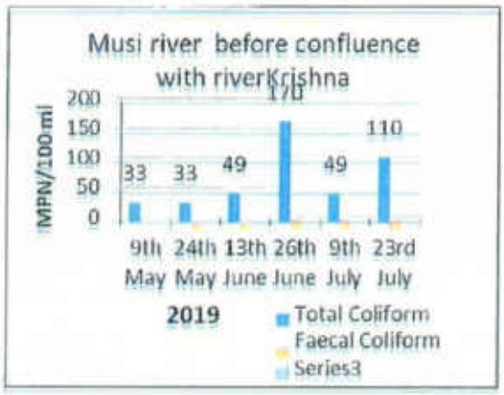


Figure 10:

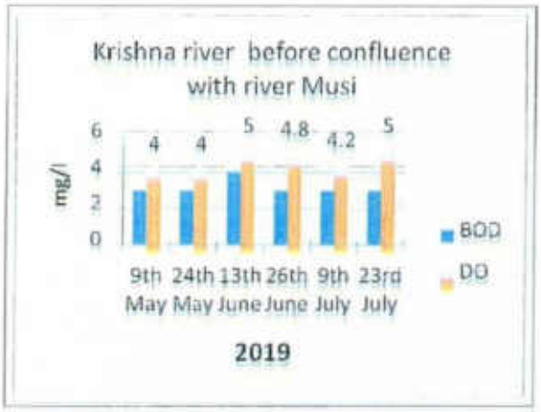
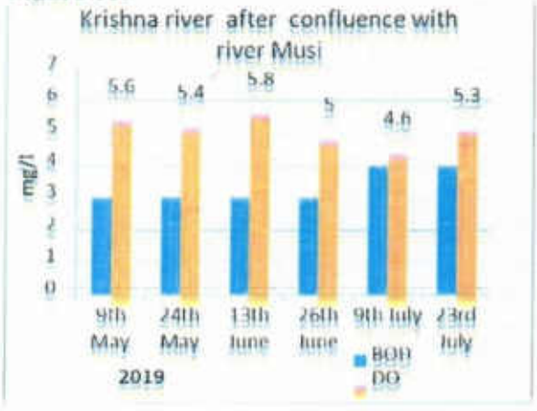


Figure 11:



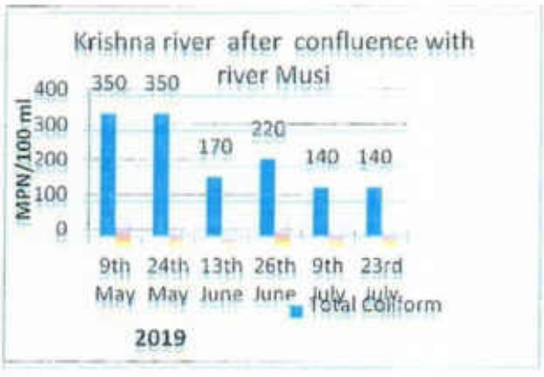


Figure 12:

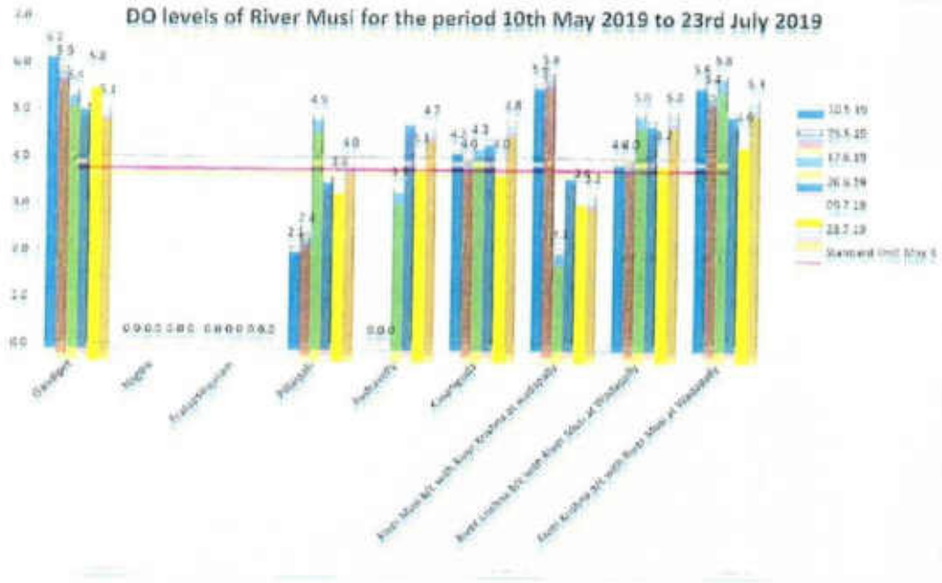
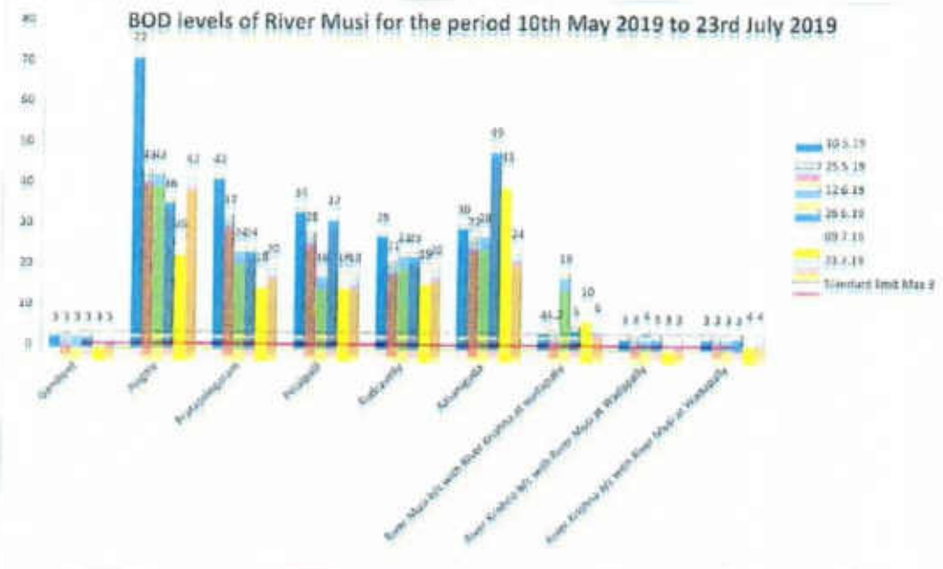


Figure 13:



5) Observations

The analysis results of the collected samples reveal that

The pH was in the range of 7.1- 8.8 at the entire Musi river Stretch from Osman Sagar to Wadapally in all six rounds of monitoring.

Musi river at Osman Sagar (Gandipet) is in the upstream of Musi river and is drinking water source to the Hyderabad city. The analysis result shows that the Dissolved Oxygen was in the range of 5.1 to 6.2 mg/l in all 6 rounds of monitoring. The DO values in the river at this point are in the range of 5.1-6.2mg/l, BOD was 3 mg/l and Total coliform was <50 MPN/100 ml throughout six rounds of monitoring. Based on Designated Best use classification of surface water, Musi river water at this point falls under **B** class.

Musi river at Nagole bridge is about 30 km from Osman Sagar and is near to Industrial area in the Hyderabad city. The DO was found to be nil in all six rounds of monitoring and BOD values are in the range of 26-72 mg/L indicating the water quality has deteriorated completely may be due to entry of untreated sewage into it.from the city. The Total coliform is in the range of 350-920 MPN/100 ml. The Musi river at this point is falling under the category of **E** with respect to BOD and DO based on Designated best use classification of surface water.

Musi river at Pratapasingaram: Further downstream, Musi river sampling was carried out at Pratapsingaram point which is about 14 km from Nagole Bridge. Musi river is surrounded by Agricultural lands especially paddy fields at this location and it was observed that waste water was continuously entering to Musi river from these land along with sewage from the village. The analysis result shows that BOD is in the range of 18-42 mg/l. and DO remained nil throughout all six rounds of monitoring at this point. The Total coliform was more than 1600 MPN/100 ml during mid-June and was in the range of 920- 1600 in the other month.

Musi river at Pillayipalli is about 13 km downstream from Pratapsingaram. Few Textile industries were present near to the Musi River at this point. It was observed that coloured effluent was being

discharged to Musi river during the monitoring. There are Banana and paddy fields adjacent to the river and the waste water from these fields was gaining entry into river Musi. Though the flow was good in the river the water was dark grey in colour. The BOD was in the range of 18-34 mg/l and DO was in the range of 2.1 – 4.9 mg/l and Total coliform was in the range of 540- 1600 MPN/100 ml however it exceeded 1600MPN/100ml two times. All these observations clearly shows that large quantity of untreated sewage is gaining entry into the river along with industrial effluents. The Musi river at this point is falling under the **E** category with respect to BOD and DO based on Designated best use classification of surface water.

Musi river at Rudravelly bridge is about 8 km from Pillayipalli. The BOD was in the range of 19-28 mg/l and DO was in the range of 3.4 - 4.8 mg/l and Total coliform was in the range of 540-1600 MPN/100 ml. The Musi river at this point is falling under the **D** category with respect to BOD and DO based on Designated best use classification of surface water.

Musi river at Kasaniguda is about **80 km from Rudravelly.** Lot of fishing activity was observed during the monitoring. The BOD was in the range of 24-49 mg/l and DO was in the range of 4.0-4.8mg/l and Total coliform was in the range of 8- 170 MPN/100 ml.The Musi river at this point is falling under the **D** category with respect to BOD and DO based on Designated best use classification of surface water.

Musi river at Wadapally, Nalgonda district is about 35 km from Kasaniguda. It is the confluence point of River Musi with River Krishna. Sample was collected at River Musi before confluence with River Krishna, River Krishna before confluence with River Musi and River Krishna after confluence with River Musi. The BOD was in the range of 4- 18 mg/l and DO was in the range of 2.1, 5.8 mg/l. The Total coliform was less than 500 MPN/100 ml in all six rounds of monitoring.

Musi River before confluence with Krishna River falling under the **D** class category. The BOD values showed drastic reduction compared to Kasaniguda and this might be due to the self-

purification capcity of the river flowing between 110 km and also many small streams join Musi in between before reaching Wadapally.

Krishna river before confluence with river Musi shows the BOD values in the range of 3-4 mg/l and DO in the range of 4-5 mg/l. The Total coliform was less than 500 MPN/100 ml in all six rounds of monitoring. Though, the Krishna River water falls under **B** class usually, the short duration (3 months and 6 rounds of monitoring) observations shows that it falls under C category.

Krishna river after confluence with river Musi shows improvement in DO up to 5.8 mg/l may be due to the mixing activity and BOD remains same in the range of 3-4mg/l. The Total coliform was less than 500 MPN/100 ml in all six rounds of monitoring though the location is a religious place and mass bathing activity is observed. Based on the observations, the Krishna river after confluence with River Musi water falls under the **C** category.

6) Inference:

1. The compiled average BOD value throughout the stretch from Gandipet (Osmansagar) i.e., Upstream of river Musi to River Krishna after confluence with river Musi at Wadapally during the period 9th May 2019 to 23rd July 2019 is ranging between 3 to 44 mg/L.
2. The BOD of 3 mg/L which falls under Class-B i.e., out door bathing quality was recorded at upstream of river Musi at Gandipet (Osmansagar), river Krishna before confluence and after confluence with river Musi at Wadapally.
3. Krishna river water quality before confluence with River Musi and after confluence with river Musi at Wadapally falls in Class-C i.e., drinking water source after conventional treatment and disinfection.
4. River Musi at Rudravalli, at Kasaniguda and before confluence with river Krishna at Wadapally falls under Class-D (i.e., Propagation of Wild life and Fisheries) with BOD 22, 34 and 8 mg/L respectively.
5. River Musi at Nagole, Pratapasingaram, Pillaipally falls under Class-E, the BODs observed are 44, 27 and 25 mg/L respectively.
6. Musi river at Pratapasingaram has highest Total coliform of 1250 MPN/100ml followed by Pillaipalli with 1133 MPN/100ml.

7. It is observed that the Total coliform count in Musi stretch from Nagole to Kasaniguda (Monitoring locations at Sl.No.2, 3, 4 & 5) is more when compared to other part of Musi stretch which could be due to discharge of treated and untreated sewage into River Musi.

7) Pictures depicting the sampling points of Musi River stretch from Osman Sagar to Wadapally

Musi River water sampling at Osman Sagar.(Gandipet.)

Musi River water sampling at Nagole

Musi River water sampling at Pratapsingaram

Picture depicting no DO in Musi river at Pratapasingaram point

Water from the agricultural fields entering Musi at Pratapasingaram point

Picture depicting no DO in Musi river at Nagole point

Solid waste dumped around Musi river near the Nagole bridge

Coloured water from Textile indussrtry entering Musi River at Pillayipalli

Musi river at Rudravelly

Fishing activity in Musi river at Kasaniguda

Sampling at River Musi before confluence with River Krishna

Sampling near the confluence of River Krishna and Musi.

Sample collection from Krishna river for Hygienic study at Wadapally

Musi and Krishna confluence point at Wadapally

Sample collection for Microbiological analysis from Krishna river

1. (B.S.Anupama)
Scientist 'C'
CPCB,RD(S),Bengaluru,

2. (Sathyanarayana Rao)
SES
ZL,TSPCB,Warangal

3. (Murali Mohan)
JCES(FAC)
TSPCB,HO, Hyderabad

ANNEXURE - XXI

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CENTRAL POLLUTION CONTROL BOARD

"Parivesh" Bhawan, East Arjun Nagar, Delhi - 110032

Trace Organic Laboratory

Pharmaceutical Compounds Analysis Report

1	Report No. and Issue Date	:	TOL/Antibiotic/2019/26, Dt. 27/09/2019
2	Name of Project	:	Quick Hygienic Survey of River Musi as per Hon'ble NGT Order OA-426/2018
3	Sample Matrix	:	Surface Water
4	Date and time of Sample Collection	:	9.5.19, 24.5.19,13.6.19, 26.6.19, 9.7.19, & 23.7.19
5	Sample Collected by	:	Dr. Suman Kapur & Team , BITS, Pilani, Hyderabad
6	Volume of Sample Collected	:	Not Reported
7	Volume of Sample Extracted	:	Not Reported
8	Extraction Method	:	No Reference Method, but extracted with HLB SPE Cartridge
9	Sample Preservation	:	Not Preserved
10	Sample Condition	:	Dry
11	Date and time of Sample receipt	:	04/09/2019
12	Sample Registration No. and Date	:	TOL/Antibiotic/36/54/19, Dt. 04/09/2019
13	Date of Sample Analysis	:	05/09/2019 to26/09/2019
14	Test Method Reference	:	USEPA Method- 1694
15	Report to be sent to (Name & Address)	:	DH-WQM-I

- All values reported BDL.
- No presence of (21) identified pharmaceuticals

Pl see for ur

28/9/2019

SCE

27/9/19	27/9/19	27.09.2019
V. K. Verma	B. Kumar	Sanjay Kumar
(Analyst)	(Supervisor)	(DH-TOL)

Sample Code	Concentration of Pharmaceuticals (ng/L)																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Cefadroxil	Cefixime	Amoxicillin	Mefemic Acid	Diclofenac	Levofloxacin	Ciprofloxacin	Fluconazole	Metronidazole	Azithromycin	Doxycycline	Ofloxacin	Ampicillin	Chloramphenicol	Norfloxacin	Nalidixic Acid	Spiramycin	Roxithromycin	Lincomycin	Enrofloxacin	Cloxacillin
Detection Limit	40	40	20	40	40	50	50	40	40	10	10	10	15	30	15	15	15	8	8	7	26
1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

27/9/19	27/9/19	Sanjay Kumar 27.09.2019
V. K. Verma	B. Kumar	Sanjay Kumar
(Analyst)	(Supervisor)	(DH-TOL)

Sample Code	Concentration of Pharmaceuticals (ng/L)																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Cefadroxil	Cefixime	Amoxicillin	Mefemic Acid	Diclofenac	Levofloxacin	Ciprofloxacin	Fluconazole	Metronidazole	Azithromycin	Doxycycline	Ofloxacin	Ampicillin	Chloramphenicol	Norfloxacin	Nalidixic Acid	Spiramycin	Roxithromycin	Lincomycin	Enrofloxacin	Cloxacillin
Detection Limit	40	40	20	40	40	50	50	40	40	10	10	10	15	30	15	15	15	8	8	7	26
14	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

V. K. Verma 27/9/19	B. Kumar 27/9/19	Sanjay Kumar 27.09.2019
(Analyst)	(Supervisor)	(DH-TOL)

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Sample Code	Concentration of Pharmaceuticals (ng/L)																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Cefadroxil	Cefixime	Amoxicillin	Mefemic Acid	Diclofenac	Levofloxacin	Ciprofloxacin	Fluconazole	Metronidazole	Azithromycin	Doxycycline	Ofloxacin	Ampicillin	Chloramphenicol	Norfloxacin	Nalidixic Acid	Spiramycin	Roxithromycin	Lincomycin	Enrofloxacin	Cloxacillin
Detection Limit	40	40	20	40	40	50	50	40	40	10	10	10	15	30	15	15	15	8	8	7	26
27	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
35	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
36	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
37	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
38	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
39	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

V. K. Verma	B. Kumar	Sanjay Kumar
(Analyst)	(Supervisor)	(DH-TOL)

Sample Code	Concentration of Pharmaceuticals (ng/L)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Cefadroxil	Cefixime	Amoxicillin	Mefemic Acid	Diclofenac	Levofloxacin	Ciprofloxacin	Fluconazole	Metronidazole	Azithromycin	Doxycycline	Ofloxacin	Ampicillin	Chloramphenicol	Norfloxacin	Nalidixic Acid	Spiramycin	Roxithromycin	Lincomycin	Enrofloxacin	Cloxacillin
Detection Limit	40	40	20	40	40	50	50	40	40	10	10	10	15	30	15	15	15	8	8	7	26
40	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
41	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
42	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
43	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
44	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
45	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
46	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
47	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
48	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
49	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
51	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
52	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

27/9/19	B. Kumar 27/9/19	Sanjay Kumar 27.09.2019
V. K. Verma	B. Kumar	Sanjay Kumar
(Analyst)	(Supervisor)	(DH-TOL)

Sample Code	Concentration of Pharmaceuticals (ng/L)																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Cefadroxil	Cefixime	Amoxicillin	Mefemic Acid	Diclofenac	Levofloxacin	Ciprofloxacin	Fluconazole	Metronidazole	Azithromycin	Doxycycline	Ofloxacin	Ampicillin	Chloramphenicol	Norfloxacin	Nalidixic Acid	Spiramycin	Roxithromycin	Lincomycin	Enrofloxacin	Cloxacillin
Detection Limit	40	40	20	40	40	50	50	40	40	10	10	10	15	30	15	15	15	8	8	7	26
53	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
54	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

***BDL = Below Detection Limit**

Statement:

1. The results relate only to the samples tested.
2. The report shall not be reproduced except in full, without the written approval of the laboratory.

Remarks:

1. Received sample were Diluted to 500 µl in Mobile Phase.
2. Injection Volume 1.0 µl

27/9/19	27/9/19	27.09.2019
V. K. Verma	B. Kumar	Sanjay Kumar
(Analyst)	(Supervisor)	(DH-TOL)

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