CENTRAL GROUND WATER BOARD

DEPARTMENT OF WATER RESOURCES,

RIVER DEVELOPMENT AND GANGA REJUVENATION,

MINISTRY OF JAL SHAKTI

GOVERNMENT OF INDIA

INCEPTION REPORT

THE EFFECTS OF INDUSTRIALIZATION ON THE GROUND WATER QUALITY IN AND AROUND KANJIKODE INDUSTRIAL AREA, PUDUSSERY PANCHAYATH, PALAKKAD

(NAQUIM-2.0)

AAP: 2023-24

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Scientist-D (Hydrogeology)

Introduction

Kanjikode is an industrial town located 13 km east of Palakkad on Salem- Kochi NH Study area is 123 sq. km covering parts of Survey of India topotheets 58 B/9, B/13 and B/14. Kanjikode is a growing suburb of Palakkad. The town is in the gram panchayat of Pudusseri, Malampuzha block of Palakkad district, Kerala state. Pudussery GP is bounded by parts of Malampuzha block to north, west, Chittoor block to south and Coimbatore district of Tamil Nadu to the east. It is the second largest industrial area in Kerala. As many as 42 iron-smelting factories along with many other industrial units (textiles, machine parts etc.) are operating from the park. Korayar is one of the tributaries of river Kalpathipuzha, which in turn is a main tributary of the Bharathapuzha River, flows beside the Industrial area. Some of the deep wells in Palakkad district in Chitoor taluk and a few wells in Kanjikode and Muthalamada area also reported to contain fluoride concentration greater than 1 mg/l (Geogenic). As per SuoMotu *"The health Hazards created by Pollution of water from Bharathapuzha River as per news item in the Hindu"* dated 15.01.2016, Green Tribunal stated that the major polluting sources of River Bharathapuzha and its tributaries. Railway Stations and few industries in Kanjikode area situated on the bank of the river. The untreated sewage is discharged into the river from these sources.

The industrial area is located in the Palaghat gap area of the Western Ghats and is almost flat terrain with local undulations and gentle slope. Northern limit of the area is comprised of Western Ghat ranges. Central and southern parts are free of major hills. The high relief northern part is well drained by streams originating from the mountains. Drainage density here is on higher side compared to the rest of the study area. Tributaries of Bharathapuzha drains the central part of the area.

The study area forms part of the Precambrian gneissic terrain of South India and are composed mainly of hornblende biotite gneiss and biotite gneiss. Hornblende content in the gneiss found vary and at places it is purely biotite gneiss. A major outcrop of garnetiferous biotite gneiss that show laterite development is seen in the central part of the area. The gneisses are well foliated and the dominant trend of folication is NE- SW to E-W and the dip is sub vertical, which at places dip towards south at high angles. Three sets of joints/fractures trending viz. N 30-210, N 130-310, and E-W are seen. The E-W trending tensional fractures thought to be potential conduits for ground water movement. The fractures form sets and also control the course of the two streams Koraiyar and Varattar in the area.

Groundwater is extensively developed through dug wells and deep bore wells. The study area can be divided into four hydrogeological units viz.

Unit I- forms a fringe of the northern hilly part with a width of 2-3 km and marked by numerous ephemeral streams. This is a discharge zone and ground water is present in the weathered zone of hornblende biotite gneiss, biotite gneiss and in top soil. Pre monsoon water levels of dug wells tapping phreatic aquifer ranges from 4 to 7 mbgl except in few places where it is as deep as 11 mbgl.

Unit II- forms an elongated ENE- WSW band of highly fractured and weathered hornblende- biotite gneiss with numerous quarts and feldspar veins mainly around Kanjikode

town. The water levels of dug wells varies from 4 to 8 during pre monsoon and 2 to 6 m bgl during post monsoon.

Unit III- an approximately 3 km long band composed of amphibolites and ultramafics seen in and around Panampalli and Sathyanathapallom villages. Dug wells tapping the thich weathered zone over hornblende botite gneiss and biotite gneiss have pre monsoon water levels of 4 to 10 mbgl and post monsoon levels of 1.5 to 7 mbgl. There are number of large diameter dug wells in the area.

Unit IV- this is the major unit of the area and is composed of weathered and fractured biotite gneiss and migmatites, which yield ground water. The water levels ranges from 5 to 12 during pre monsoon and from 3 to 8 mbgl during post monsoon.

Ground water occurring in Unit I is found to be of good quality with EC values ranging from 200 to 300 µs/cm at 25^0c. Poor quality ground water with EC ore than 1000 µs/cm at 25^0c is found in unit II. Moderate to good quality ground water occurs in Units III and IV with EC values more than 3000 µs/cm at 25^0c.

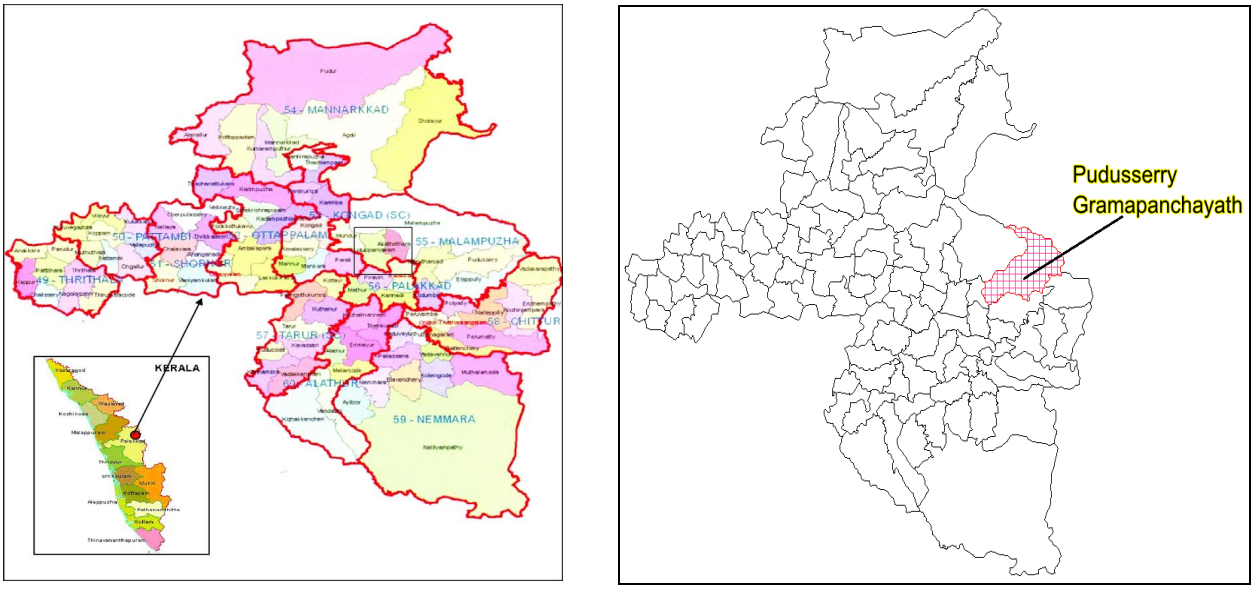
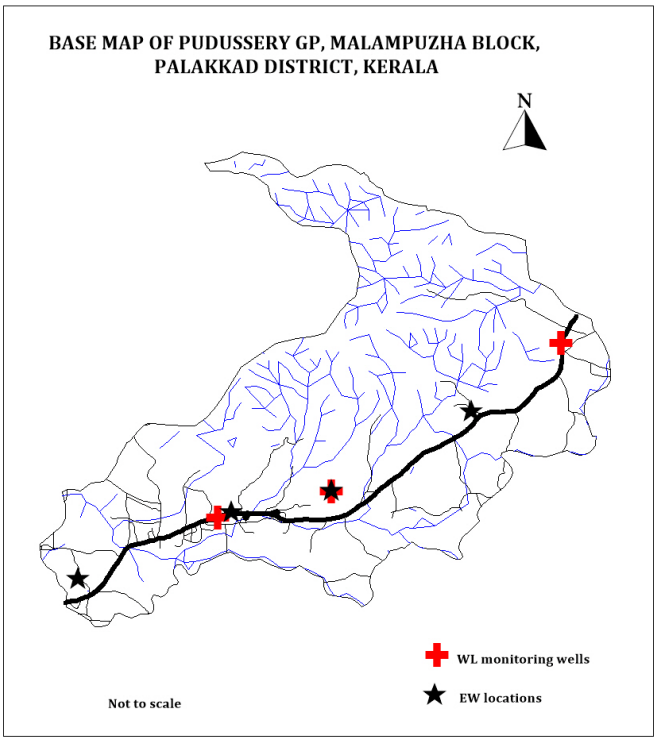


Figure 1: Proposed study area for Industrial pollution



Base map of Pudussery GP, Malampuzha block, Palakkad district

Priority Types

- Ground Water Quality: the effects of industrialization on the ground water quality in and around Kanjikode industrial area, Pudussery panchayath, Palakkad
- Aquifer Dispositions
- Aquifer-wise ground water Water Levels
- Delineation of Recharge Areas
- Estimation/Refinement of parameters used for resource assessment
- Assessment of ground water resources
- Location, Discharge and water quality of the springs, vulnerability of the springs
- Ground Water Quality Management Interventions including demarcation of safer aquifers
- Impact of Mining or Industrial activities and vulnerability of the aquifers
- Artificial Recharge Plan and other measures
- Identification of potential aquifers for drinking water supply
- A plan for drinking water source sustainability

Previous Studies

The compilation of Hydrogeological condition in Palakkad district was carried out by Sh. John Kurian (1981) and subsequent reappraisal surveys by him during 1981- 82. Reappraisal survey in parts of Palakkad district was carried out by Dr. K. Md. Najeeb (1990- 91). Ground water exploration was carried out during first and second phases of SIDA project during 1973- 78 and 1983- 88 respectively. Drilling activities were carried out by CGWB during 1978- 2017.

The report on "ground water resources and development potential of Palakkad district" was published in 1997. Dr. E. Shaji carried out reappraisal hydrogeological survey during 2002- 03. Piezometer construction has been done during 2005- 06. District ground water management plan in farmers' distress hotspot district Palakkad was published in 2006. Studies on conjunctive use of surface and ground water in command area of Malampuzha and Walayar irrigation projects Palakkd district was done by SVNS Rao (1996). Mirco level pollution studies in the Kanjikode Industrial area, Palakkad district was carried out by Dr. K. P. Jaikiran and Smt. Bindu J. Viju (2002). Detailed Mapping of hard rock aquifer system and aquifer management plan in Chittur and Malampuzha block of Palakkad district was carried out as part of the National Aquifer Mapping Programme of the Board during the XII Plan. This activity envisages delineation and characterization of aquifer zones and formulation of strategies for sustainable development of ground water in the area. Dynamic Ground Water Resources of Kerala as in 2009, 2011 as per 1997 Methodology and in 2017, 2020 and 2022 as per 2015 Methodology.

The Stage of Ground Water Extraction as on March 2022 in Malampuzha block is 94.35 % thus the block being categorized as Critical.

Objectives of the Present Study

- ✓ Demarcation of Contaminated Zones
    - Zonation of the area
    - Aquifer identification for poor quality
- ✓ Identification of Fresh GW sources for Drinking Water Supply
- ✓ drinking water source sustainability
    - Recharge area identification & measures for sources sustainability
    - If required identification of alternate source for water supply
- ✓ Tracing source of contamination
- ✓ Suggesting regulatory measures for prevention of contamination

Existing Data

	EW/OW	VES/ TEM	WL Monitoring Wells	Water Quality
Pudussery GP	4 EW + 2 OW	5	3	1

Data-Gap Analysis

	EW/OW	VES/TEM	Monitoring Wells	Water Quality
Pudussery GP	6	50	30	70

Deliverables

- ✓ Map and suggested interventions with -
    - Demarcation of Poor Quality affected area (As per drinking water specification)
    - Demarcation of fresh water aquifers for drinking water supply
    - Location for gw withdrawal wells & their optimum discharge
    - Recharge area demarcation and structure designs
    - Sources of contamination and plume movement, if any
    - Location of alternate source water supply
    - Extent of meeting demand - supply gap
- ✓ Regulation mechanism for prevention from contamination

New Data Generation Plan

Month	Activity
May-2023	Pre-monsoon field work, key well establishment, water sample collection(for basic analysis, heavy metals)
June-2023	Field data Collection, Sample Survey, geophysical studies
July-2023	Data compilation and analysis : Preparation of Thematic maps, cross sections, Aquifer disposition etc
August-2023	Data validation and interpretation: Tabulation and correlation of hydrogeological and geophysical data of existing wells.
September-2023	Analysis and interpretation of chemical and geophysical data
October-2023	Analysis and interpretation of chemical and geophysical data and Mid-term review
November-2023	Post-Monsoon field data collection
December-2023	Data Analysis and Draft Report Preparation: Field work for verification and ground truthing. Chemical Analysis of the post monsoon water samples (collected from selected wells for confirmation of issues)
January-2024	Preparation of groundwater management plans for source sustainability and Report preparation
February-2024	Field checks and Finalization of Report
March-2024	Sharing of the report.

Composition of the Team

Team Member	Name & Designation	Responsibility
Team leader	Sh. Sreenath, Sc-D (HG)	-Planning, Supervision and Execution of the Project

		- Work distribution and monitoring of activities of other team members - Preparation of the inception report. - Timely Delivery of the envisaged Outputs - Finalization of the management plan - Presentations at different forums, sharing of the outputs. - Preparation of the draft report as per the approved Quality Standards and its Final Submission. - Other members of the team will assist the team lead.
Team Member	Sh. Arun Kumar A V (AHG)	- Field Data Collection - Sample collection for quality studies - Secondary Data collection -Entering data in database (WIMS) -Integration of data, preparation of thematic maps, preparation cross sections etc. -Consultation with allied experts like agriculture, irrigation etc. - Preparation of GIS maps and Management Plan
Team Member	Sh. Pankaj Bakshe, Sc-B (Chemist)	- Sample collection for quality studies - Analysis of samples. - Integration with existing data -Validation and interpretation of data - Entering data in database (WIMS) -Preparation of Tables, graphs and maps for reports - Assisting the Team Lead in preparing the reports
Team Member	Sh. V S T Gopinath, Sc. C (GP)	- Field Geophysical Surveys - Interpretation of field data - Entering data in database (WIMS) - Integration with existing geophysical and lithology data - Preparation of inferred lithologs, fresh- saline interface. - Suggesting potential sites for construction of water

		wells/artificial recharge - Preparation of Tables, graphs and maps for reports - Assisting the Team Lead in preparing the Report

Team-Member wise Monthly Target

Sh Sreenath, Sc-D (HG) & Team Lead	**Apri**l – Data Gap Analysis and Preparation of Inception Report
	May - Field Data Collection
	June - Field Data Collection
	July- Data Analysis and Interpretation
	August- Data Analysis and Interpretation
	September -Data Analysis and Interpretation
	October – Preparation for Midterm Work-Shop for NLEC
	November - Field Data Collection and preparation of Management Plan
	December -Sample Surveys and User Feedback
	January – Preparation of Draft Report
	February–Field Truthning of Management Plan
	March - Sharing of the reports with CHQ, SGWCC and DM/DC
Sh. Arun Kumar A. V. (AHG)	**May** - Field Data Collection and other ongoing field activities.
	June - Field Data Collection
	July–Data entery in WIMS
	August- Dataentery in WIMS and other ongoing field activities.
	September -Data Analysis and Interpretation
	October – Preparation for Midterm Work-Shop for NLEC
	November - Field Data Collection and preparation of Management Plan and other ongoing field activities.
	December -Sample Surveys and User Feedback and Data entery in WIMS
	January – Preparation of Draft Report and other ongoing field activities.
	February – Field Truthning of Management Plan and other ongoing field activities.
	March - Sharing of the reports with CHQ, SGWCC and DM/DC and other ongoing field activities.
Dr. VST Gopinath, Sc-C(GP)	**May** - Field Data Collection and other ongoing field activities.
	June – Field Geophysical Data Collection
	July–Data Interpretaion and selection of sites suitable for drilling and Data entry in WIMS.
	August- Data entry in WIMS and other ongoing field activities.
	September -Data Analysis and Interpretation
	October – Field Data Collection and Preparation for Midterm Work-Shop for NLEC

	November – Data Analysis, Preparation of Management Plan and other ongoing field activities.
	December -Data entery in WIMS
	January – Preparation of Draft Report and other ongoing field activities.
	February – Field Truthning of Management Plan and other ongoing field activities.
	March - Sharing of the reports with CHQ, SGWCC and DM/DC and other ongoing field activities.
Sh. Pankaj Bakshe, Sc-B (Chemist)	**May** - Field Sample Data Collection and other ongoing field activities.
	June - Field sample Collection and analysis.
	July–Field sample Collection and analysis. and Data entery in WIMS.
	August- Dataentery in WIMS and other ongoing field activities.
	September -Data Analysis and Interpretation
	October – Preparation for Midterm Work-Shop for NLEC
	November - Field Data Collection and preparation of Management Plan and other ongoing field activities.
	December -Data entery in WIMS
	January – Preparation of Draft Report and other ongoing field activities.
	February – Preparation of Draft Report and other ongoing field activities.
	March - Sharing of the reports with CHQ, SGWCC and DM/DC and other ongoing field activities.

Activity wise action plan

Sl No	Activity	May,23	June,23	July,23	Aug,23	Sep,23	Oct,23	Nov,23	Dec,23	Jan,24	Feb,24	Mar,24
1	Base Map Preparation											
2	Preparation of Inception Report											
3	Exploration (construction of EW/OW/Pz, Pumping Test)											
4	Pre Monsoon Field Survey (Hydrogeological, WQ Data)											
5	Geophysical Data Collection											
6	Data entry in WIMS											
7	Visit to local offices for data collection											
8	Progress reporting in MIS											
9	Sample Surveys & User Feedback											
10	Data Analysis and Interpretation (Pre Monsoon Collected Data)											
11	Identification of alternate sources of drinking											

	water											
12	Workshop and Mid Term Review by NLEC											
13	Post Monsoon Field Survey (Hydrogeological, WQ Data, Geophysical Data, HM Data Collection)											
14	Data Analysis and Interpretation (Post Monsoon Collected Data)											
15	Draft Report Preparation											
16	Field truthing of Management Plan											
17	Modification and Submission of Final Report											
18	Preparation of Maps with Management Plan											
19	Sharing the Report with CHQ, SGWCC and DM											