ESTIMATION AND SPATIAL TEMPORAL VARIATION OF SGD IN COASTAL REGION OF TAMILNADU

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Abstract - Coastal hydro geologists and oceanographers now recognize the potentially significant contribution that submarine groundwater discharge (SGD) could make to the coastal ocean. SGD may be both volumetrically and chemically important to coastal water and chemical budgets. Our review reveals a critical lack of data from coastal zones of almost all parts of the world, especially in South America, Africa and parts of Asia, making a comprehensive compilation incomplete. SGD should be paid more attention with regard to water and dissolved material budgets at the local and global scales.

Key Words: **submarine groundwater discharge (SGD), coastal zone, submarine groundwater recharge (SGR)**

1. INTRODUCTION

In coastal areas, a significant amount of groundwater enters coastal waters via direct discharge also called submarine groundwater discharge (SGD), through beaches and the adjacent near shore environment. This groundwater discharge is of significant concern because of its impact to the coastal ecosystem. The enormity of SGD can be understood using tracer techniques, including the use of naturally occurring isotopes which can provide a convenient way of assessing the SGD due to its ability to integrate the water fluxes over various spatial and temporal scales.

1.1 SGD Role on ground water quality

This chapter describes three of the most commonly used methods to either calculate or measure flow of water between sea water and the ground-water domain.

The first method involves measurement of water levels in a network of wells in combination with measurement of the stage of the surface-water body to calculate gradients and then water flow.

The second method involves the use of portable piezometers (wells) or hydraulic potential manometers to measure gradient. In the third method, seepage meters are used to measure directly flow across the sediment-water interface at the bottom of the sub surface-water body.

1.2 Less study in India

These methods are generally adopted only for coastal area in the sense of costler activity only because of the foreign countries make assurance in the wear and seas area in which the probable methods will launch up the taking and landing up connection and research may further realized with prefect accurance.

1.3 Dynamic coastal at Poompuhar to Nagappattinam

The present study area covers from vanagiri near poompuhar to nagore (From longitude 79o 51'26.604'' E to 79o 51'03.654'' E) poompuhar to nagore (from latitude 11o 08' 23.94'' to 10o 49'26.892'') nagapattinam city about 40 km.shows the collected sample locations. The present study area covers many industries, agriculture area, prawn culture area, most famous tourism place of POOMBUHAR and nuclear power plant. The sample location were recorded in terms of degree – minute second (Latitudinal and Longitudinal position) using handheld Global Positioning System (GPS) (Model: GARMIN GPS-12) unit. Each location is separated by a distance of 3 to 15kms only approximately.

2. Objectives

Prepare a baseline data on the subsurface ground water discharge (SGD) in poombukar to nagappatinam coast and their variability with tidal cycle.

Estimate the variation of SGD with regard to

2.1 Natural setup

1. Undisturbed
2. Disturbed

2.2 Manmade influence

2.3 Agriculture & Irrigation

In some coastal areas, and especially in small islands, agricultural production makes an extremely important contribution to the local economy or to national agricultural production. In countries such as Egypt and Bangladesh, the river deltas, with their fertile alluvial soils, play a major role in the agriculture sector. Whatever the situation, there are a number of reasons for giving agriculture particular attention in integrated coastal resource management planning.

Agriculture has major positive, but also potentially negative, effects on the coastal environment. Sustainable agricultural policies are therefore needed to minimize the negative impacts of inland agriculture on coastal areas;

Fig -1: Agriculture in Chinnangudi

2.4 Prawn culture

The practice of prawn farming is widespread in coastal Bangladesh due to favorable biophysical resources. However, export-oriented prawn farming is particularly vulnerable to climate change in coastal Bangladesh. This study identified different climatic variables, including salinity, coastal flooding, cyclone, sea-level rise, water temperature, drought, and rainfall have profound effects on prawn farming in the Bagerhat area of southwest Bangladesh. Although the prospects for prawn–carp polyculture and integrated prawn–fish–rice farming are positive in Gopalganj, a number of challenges were identified for the expansion of prawn culture.

2.5 Jetty & Port

The approach channel to some ports situated on sandy coasts is guided and protected across the beach by parallel jetties, made solid up to a little above low water of neap tides, on which open timber-work is erected, provided with a planked platform at the top raised above the highest tides. The channel between the jetties was originally maintained by tidal scour from low-lying areas close to the coast, and subsequently by the current from sluicing basins; but it is now often considerably deepened by sand-pump dredging.

Fig -2: Jetty in Manikkapangu

3. Methodology

3.1 Seepage meters

Seepage flux between the groundwater and the overlying surface water can be measured directly by covering an area of sediment with an open-bottomed container and then measuring the time and change of water volume in a bag connected to the container .Two of these devices, known as seepage meters can be made by cutting 15-cm-long, end sections from a 0.208 m3 (55 gallon) metal drum. Seepage meters can detect flux as low as 0.001 cm3/m2 s (about 0.1 mm/day) if the bag is left connected for a day or longer

Fig -3: Seepage meter

3.2 Collection of interstitial water from study area

Location selected based on natural & arthopogeni activity.

Table -1: Collection of interstitial water

LOCATION	LATITUDE	LONGITUDE	SPECIAL FEATURE
Vanagiri	11.125090	79.85805	Prawn culture
Chinangudi	11.09328167	79.85733500	Agriculture

Manika pangu	11.06013	79.85591	Navigation
Karaika	10.91795	79.85350	Port
Vadaku vanjore	10.85073	79.85306567	Jetty
Nagore	10.82413617	79.851015	Navigation & religious activities

3.3 Study area map

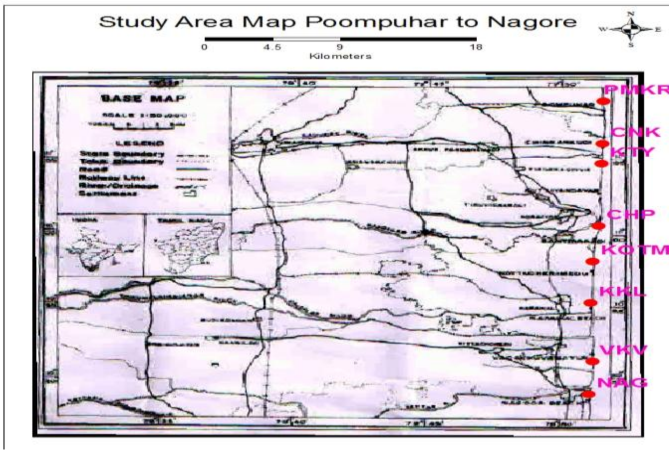


Fig -4: Study Area Map

3.4 Salinity

Salinity is the measure of all the salts dissolved in water. Salinity is usually measured in parts per thousand (ppt or ppm). The average ocean salinity is 35ppt and the average pond water salinity is 0.5ppm or less. This means that in every kilogram (1000 grams) of seawater, 35 grams are salt.,

3.5 Conductivity

Conductivity measures the water's ability to conduct electricity. It is the opposite of resistance. Pure, distilled water is a poor conductor of electricity. When salts and other inorganic chemicals dissolve in water, they break into tiny, electrically charged particles called ions. Ions increase the water's ability to conduct electricity.

3.6 Total dissolved solid

Total dissolved solids are the amount of organic and inorganic dissolved substances like minerals, metals and salts that may be found in water. It includes everything present in water other than pure H_2O and suspended solids. TDS can be from natural sources like dissolved rock, or from man-made chemicals such as volatile organic chemicals (VOCs). In general, the total dissolved solids concentration is the sum of the cation (positively charged) and anion (negatively charged) ions in the water.

3.7 Chemical oxygen demand

Chemical Oxygen Demand or COD is a measurement of the oxygen required to oxidize soluble and particulate organic matter in water.

A common method for Chemical Oxygen Demand analysis is MThe method involves using a strong oxidizing chemical, potassium dichromate Cr2O72-, to oxidize the organic matter in solution to carbon dioxide and water under acidic conditions. Often, the test also involves a silver compound to encourage oxidation of certain organic compounds and mercury to reduce the interference from oxidation of chloride ions. The sample is then digested for approximately 2 hours at 150°C. The amount of oxygen required is calculated from the quantity of chemical oxidant consumed.

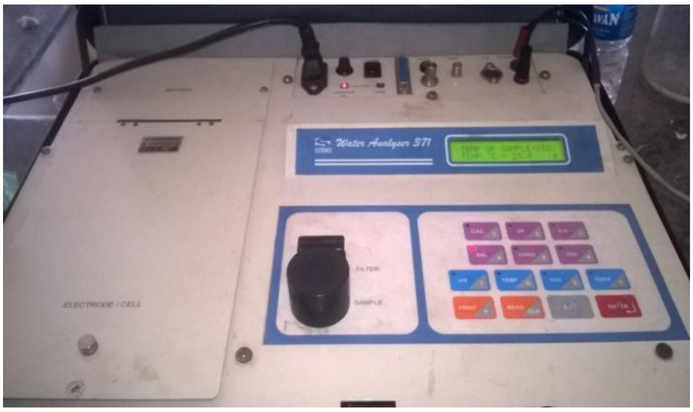


Fig.- 5: Water Analyzer 371 (SAL, COND, TDS - Water quality test)

Fig.- 6: Water Analyzer by using ISE (pH, Cl test)

4 RESULT & ANALYSIS

4.1 Variation of SGD quantity along the coast of the study area

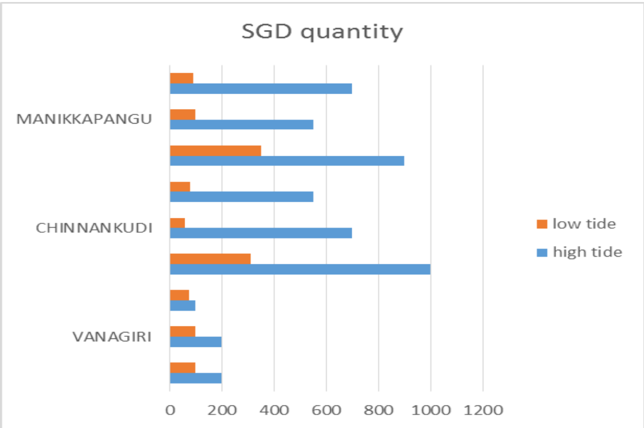


Fig -4.2: SGD quantity

4.2 Effect of lunar phase on SGD quantity

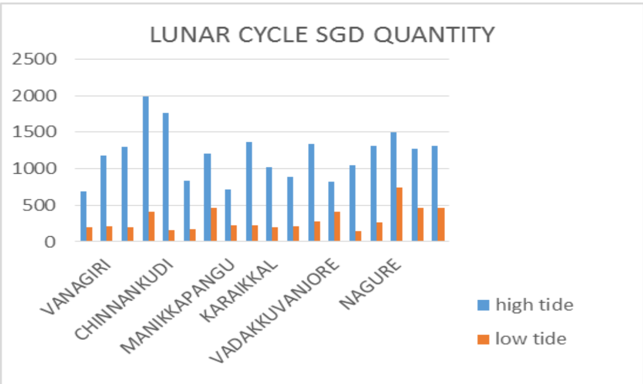


Fig -4.2: Lunar cycle SGD quantity

4.3 Variation of water quality vanagiri :

Table - 1 Variation of water quality

SAMPLE	FM	NM	FM	FM	NM
	DO	DO	DO	PH	PH
LOW TIDE	3.2	3.1	3.2	8.56	8.22
HIGH TIDE	3.1	3.2	3.1	8.47	8.47
PRAWN CULTURE 1	3.3	3.1	3.2	9.38	7.46
PRAWN CULTURE 2	3.2	3.1	3	8.23	8
PRAWN CULTURE ON PROCESS	3.3	3.3	3.4	8.22	7
CONSTRUCTION	3	3.2	3.2	8.12	8
POND	3.2	3.1	3.2	9	8
HAND PUMP	3.2	3.2	3.1	8.34	8

4.4 Chinnangudi:

The study of relationship between the subsurface water and sea water with some of the deviations and came to know about the variations in water level. pH,Cl,sal,ect..

Table 2 - Chinnangudi

SAMPLE	FM	NM	FM	FM	NM	FM
	DO	DO	DO	PH	PH	PH
LOW TIDE	3.2	3.1	3.2	8.56	8.22	8.23
HIGH TIDE	3.3	3.2	3.3	7.98	8.47	8.37
GROUN WATER	3.1	3.2	3.2	9.32	7.5	8
HAND PUMP	3.2	3.2	3.1	9.04	7	8.1

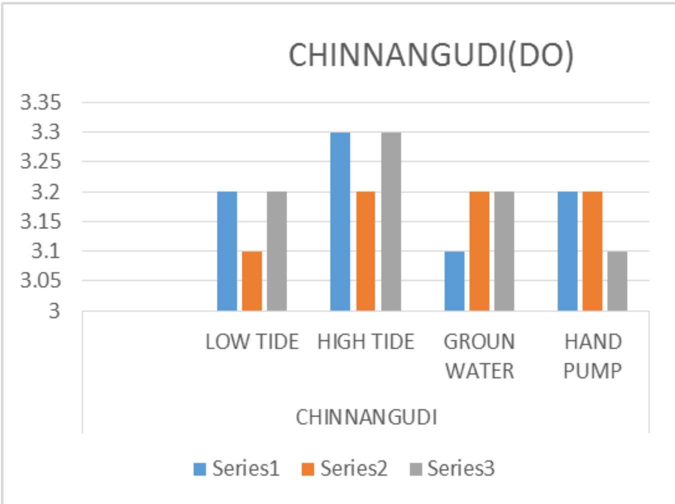
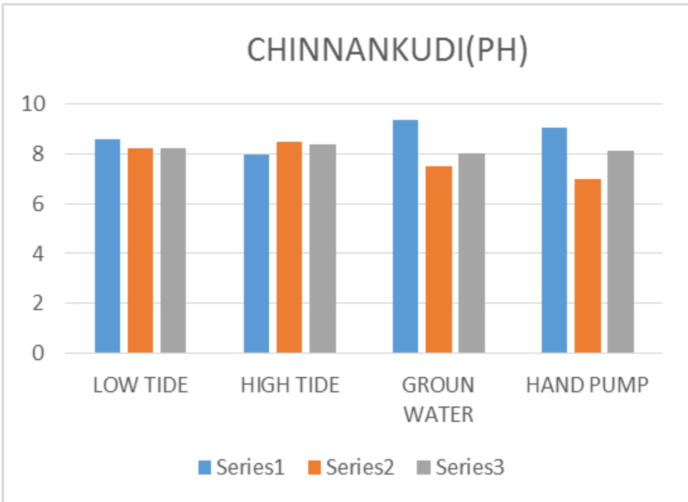


Fig -4.3: Chinnankudi(DO)



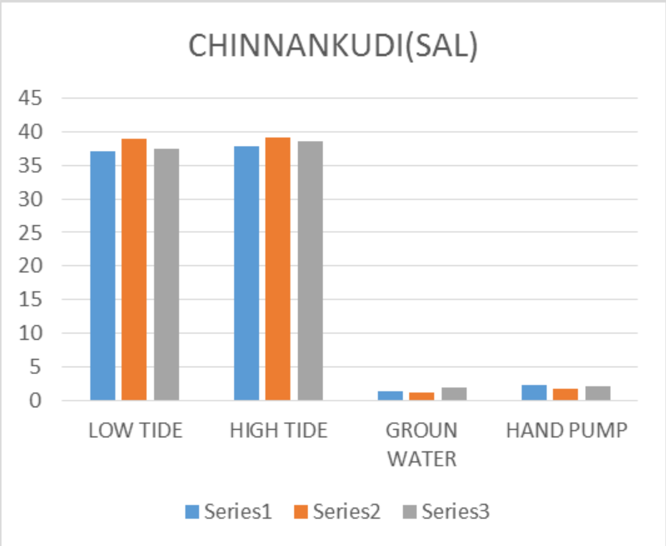


Fig -4.5: Chinnankudi(SAL)

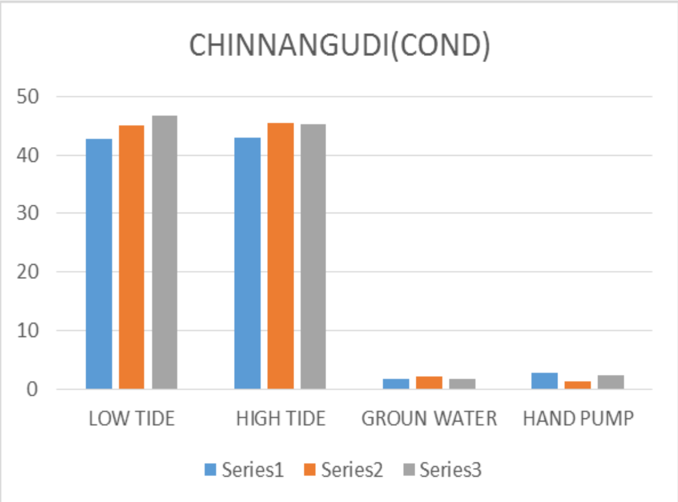


Fig -4.6: Chinnankudi(COND)

5. CONCLUSION

The project deals with the study of relationship between the subsurface water and sea water with some of the deviations and came to know about the variations in water level. pH,Cl,sal,ect.. value can be changed according to the full moon and new moon alternative progression which results in high modification under its calculation and tide height may be increased in new moon when comparison with full moon. The quality accomplished changes according to sunrise and sunset as well as moonrise and moonset from pumpuhar to nagapattinam six different seazone are estimated and plotted according to the valves.

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