POSSIBILITY TO THE PROJECT OF SAND-MINING ON BHARATHAPUZHA

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As a part of Cultural geography and habitat of Nila River valley, a UGC major reseach of Oriental research Center(PG Dept. of Malayalam), SNGS College, Pattambi, Palakkad Dist., during the period 1998-2001 under the Principal Investigator of the project Dr. N.M. Nampoothiri.

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PREFACE

The river Bharathapuzha, which is known as ‘Nila’ is in an advanced stage of death by the indiscriminate method of sand-drawal. Therefore, it is a crying need to protect the river. But, development and pollution control are equally important. Keeping this in view and realizing the necessity of scientific way of sand-drawal, the possibility of a project of ”Cultural Geography and Habitat of Nila River Valley” by me, which has headed by Dr.N.M.Napoothiry.

The technology of project is entirely different by the other open-cast mining principles of metalliferous or non-metalliferous mines, and the system of stripping of sand is fully prepared by me.

I think that it could trivialize a number of problems relating to the rivers much, particularly Bharathapuzha.

The work will enable the students, researchers and practitioners in hydrology, engineering, geology, environmental science and other disciplines concern with rivers.

I hereby expressing thanks to the UGC and the Principal Investingator Dr.N.M.Napoothiry, and the Orinental Reserch Centre, for giving me the valuable chance to evolve the scientific system of sand mining under the Major Reserch Project, conducted during the period 1999-2001.

Chapter I

I-I Introduction

Background of the Study

Recently, the river Bharathapuzha has changed her shape of originality and formed as a grazing land by the indiscriminate method of sand-drawal. Now she is in an advanced stage of death by the cankerous disease. Secondly, any society or samithy organized to protect the river did not take any initiative to do the investigation about it. In this circumstance, with much of inspiration from my friends and relatives, I ventured to accept the task of investigation about the scientific way of sand-drawal on the river-bed.

I-II Objectives of the Study

Conservation of Bharathapuzha is a crying need. But, the development and pollution control are equally important. Keeping this in view and realizing the necessity, I decided to asses the possibility of a scientific method of sand-drawal on the river-bed.

I-III Significance of the Study

Scientific way of sand-drawal on the river-bed, could trivialize a number of problems relating to the rivers much, particularly Bharathapuzha enabling the people of India as a whole to a derived institutions to know about the subject.

I-IV Scope of the Study

As on recordical evidence, an average of 3,88,918.89 mt sediments have been expelled to the sea-ward course in a year, by the cyclic process of the geological work of running water. Secondly, more than hundreds of loads of sand (by lorry service) have been transported from the river-bed in a day by the illegal transaction of human being. Therefore, the value of these products is loosing to the Government. But, it can be made use of by the scientific system of sand stripping on the river-bed. Through the project of sand-mining on the river-bed, the income which is expecting to the Government is not less than Rs. 130,99,88,00 in a year. In addition to these, the technical system of sand-drawal helps to bring back the originality of the river

I-V Methodology

Scientific and social methods of the observation are developed to determine the facts. Primary data are collected by reading the available documentary sources, which gives an idea about the term ‘sand’, its classification, mineral combination, size of individual particles, standards permit to the natural sand and its formulation on the river-bed, etc complete

Secondary data about the physical condition of the river-basin, income of sand by the earlier auctionary system and by the existing permit system, etc available are collected from the various departments and the related organizations.

In the social method, I had done a number of interviews to secure certain information from the subjects, which is known only to himself and cannot be gathered from any other sources and the laboratory study of verbal behavior under given circumstance.

I-VI Data Analysis and Suggestion

In the second step, sorted out the data of facts and grouped them on priority basis. After grouping the facts, the work of editing started and afterwards filled the blanks, occurred on the work. Thus, I exposed the fruit of work with the organic piece of literature. The project idea, which emanated from the study have been suggested the possibility to the ‘Project of sand mining on the river-bed’.

Chaper II

Definition and Classification of Sand

II-I Introduction

Sand is a natural product, available in all the rivers, lakes, oceans and dunes. But, it is very difficult to get the purified sand with specified mineral combination having particular size of individual particles for the particular purposes. Therefore, before studying the industrial potential of a sand-mining on river-bed, one should know about the term ‘sand’, its classification with the size of individual particles, standards permit to the products and the formulation of sediments on the river-bed. Hence, they are dealt in this chapter.

II-II Definition of the term ‘Sand’

Sand is a natural product formalized as a compound of mineral fragments resulting from weathering. It originates in rivers, sea, lakes and dunes. The degree of roundness with grains is varied. It covers the range of these that are angular to perfectly rounded ones. Depending on the number of minerals that are entered into the composition, the sand is distinguished into various kinds - Ref: Sedimentation and Mineral Association of some sedimentary rocks and ores, Mineralogy by A.V. Milosky and O.V. Kononov, the Russians, translated by G.G. Egorovin in 1982.

II-III Classification of Sand

Depending on number of minerals that are entered into the composition of sand, the following kinds of sand are distinguished. They are:

(1) monomineral sands, comprising only one mineral ; (2) oligomictic sands, consisting of two minerals; and (3) polymictic sands with several minerals entering into their composition. The most widespread mineral of sand is quartz. The sand containing feldspar is called orkosic sand. In various quantities of sand can be found to include glaucomite, mica, carbonates and other minerals – Ref: Fragmented Rock, Minerology of the same author's as before.

As an individual explorer, I did not get the laboratory assistance to classify the minerals with its percentage contained in the sand deposits of Bharathapuzha. Therefore, I approached some local persons, who are the experts and working in the field of sand filtration to collect the metals, on other rivers in Kerala. According to them, the sand of Bharathapuzha comes under the group of polymictic. The widespread minerals in the sand deposits are quartz and feldspar.

II-IV Standards Permit to the Natural Sand

Standards permit to the natural sand to contain upto five percent particles measuring 5-10mm, and upto 0.5 percent greater than 10mm and not more than 3 percent of dust like clay and silty particles including upto 0.5 percent clay. The presence of contaminating admixtures in sand is admissible – Ref: Mining rock

for building stone production, open-cast mining unit operations by V.V. Rzheuvsky, the Russian, translated by S.M. Semyonov.

The sand of Bharathapuzha is a natural product. By the opinion of local experts, who analyse the products it comes under the standards permit.

II-V Size of Individual Particles

The Table (No. II-V-I) shows the size of individual particles commonly used in the world. But, I could not compare with the sand of Bharathapuzha, by the non-availability of laboratory assistance. In this circumstance, I approached the local experts, who are sand filtering on the river-beds. According to them, the size of individual particles of sand settled on the river is almost same as specified in the table.

II-VI Formulation of Sediments on the River-bed

Rivers generally have their origin in high lands and during their downward journey towards the sea, they traverse through the vast country and naturally comes across a variety of country rocks along its path of travel. Therefore, the rivers transported the products of their own erosion and also the materials of other masswasting process.

The running water transported these loads by the kinetic energy associated with its flow. The exact magnitude of this energy is however variable by the gradient of valley floor, shape and size of the channels and its discharge.

As soon as velocity of running water decreases, its transporting capacity is proportionately reduced and, as a result, a part of its load is dropped down. The large rock fragments are, therefore, deposited enroute, while the lighter and smaller particles like the sand and silt are transported to a very great distance in keeping with the gradual fall of the power of transportation of the river along its sewardcourse.

Thus, the sediments like coarse grained, medium and fine-grained sand are settled in a particular location by the variable velocity of the river, flowing through that location in a particular time.

II-VII Summary and Conclusion

Sand is a natural product, formalized as a compound of mineral fragments resulting from weathering. Generally, it is available in all the rivers, lakes, oceans and the dunes. But, it is very difficult to get the purified sand with specified mineral combination having particular size of individual particles for the particular purpose.

According to the rivers, the sediments like coarse grained, medium and fine grained sand are settling in a particular location by the variable velocity of running water flowing through that locations.

As per the suggestion of local experts, the sand of Bharathapuzha comes under the group of polymictic sand, the most widespread minerals that entering into the composition is quartz and feldspar with the size of individual particles comes under the standards permit.

Chapter III

Physical Condition of the River-basin

III-I Introduction

Industrial potential of sand mining on a river-bed mainly depends on the availability of sand on its bed. But, the availability of sand on a river-bed depends upon the physical condition of the river-basin. Therefore, the topography, temperature, intensity of wind, configuration of river-system, length and hydraulic gradient, declivity from side extremities, rainfall and water discharge through the river, etc are dealt in this Chapter, with a view to find out the availability of sand on the river-bed.

III-II Topography of River-basin

Physiographically, the area of river-basin is divided into three parts. They are the upper, middle and the lower part. The upper part of the basin is covered by the hilly tract of western ghats. In the middle part, only a few area of plain land is available in Coimbatore District of Tamil Nadu and the vicinity in east and south of Palakkad township in Kerala State. The balance area of the middle part and the entire area of upper region of lower part are covered by the isolated mountains and hillocks, made up of harder, durable and resistancive substance of laterite, bed-rocks and the belt of hard rocks – Ref: Physiographical Division, Plate No: 2, Water Atlas of Kerala, 1995.

Coverage of earth by hills and mountains produced the irregularities on the earth surface. The irregularity of earth made up of sedimentary rocks, facilitate more erosional products.

III-III Temperature

The temperature of Palakkad, recorded in seven years (Table No: III-III-I) indicates he average of 39.4^0 C in March and May periods. From the month of June onwards, it gradually comes down by the heavy monsoon. Again, an increasing trend is seen in September and October periods. But, normally it lowered in November and December periods. Again, it increased in March and May seasons.

The cyclic system of temperature changes and its natural diurnal variations give rise to the fluctuation of temperature in Palakkad District, Facilitate more weathering on earth surface, results to the more quantity of erosional products.

III-IV Intensity of Wind

The river Bharathapuzha flows along the length of Palakkad gap. Secondly, the wind which blows from the bay of Bengal is passing through this gap. Hence, there is a chance to intensify the wind on the river-basin. But, specified data about the intensity of wind on the basin is not available.

Total area of the river-basin in Kerala is 4,400 km2. But, only two observatories, one at Malampuzha and the other at Pattambi are recording the velocity of wind

passing through. The other areas have no observatories to find out the wind action.

The Table No: III-IV-I indicates the more wind action on Malambuzha, but showing merely in Pattambi, because the observatory at Pattambi is located more than 100km far behind from the mouth of Palakkad gap, naturally reduced the velocity of wind. Therefore, the data about these two locations are not enough to justify the wind action on the basinal area. in the circumstance, I decided to go trough the conventional method of investigation.

I approached a number of senior citizens having good knowledge about the subject and also residing at different locations on either side of the river. According to them, intensity of storm in summer was dreadful and taking off the thatched roof of huts are quite natural.

Since there is no such a scientific data to prove the wind velocity on the basinal area, the two aspects such as the wind action on Malampuzha and Pattambi and the knowledge of senior citizens about the intensity of storm in summer are striking that the velocity of air in contact with the earth surface of basinal area is more, produced the weathering by the disintegration of soil particles, facilitate more quantity of erosional products.

III-V Configuration of River-system

Main stream of the river originates from Anamudi Peak, having a height of 2,695 mts above MSL on Anamalai Hill range in southern portion of western ghats. As on Fig: No III-V-I, the pourings from the origination traverse through the upper basin of Aliyar dam and then falls in the main dam constructed on 300 mts above MSL in Tamil Nadu. From the dam, it runs into the north-east direction and confluence with another river called Palar, which originates from another part of the same hill range, then flows west into Kerala through the Palakkad gap (Fig No: III-V-II), having 32 km in width comprised in the western ghats, the originator of the river. The river flows in Kerala along the length of this gap with procuring three major tributaries, which originate from different parts of western ghats. Hence, the river flowing across the originator and runs about 255 km length before joining the Arabian sea at Ponnani in Kerala State.

As on recordical evidence, provided from the Plate No 43 in Water Atlas of Kerala 1995, the river-system dominated on 6,186 km^2 on the earth surface. Out of this, 1,786 km^2 contained in Tamil Nadu and the balance of 4,400 km^2 comprised in Palakkad, Thrissur and Malappuram Districts in Kerala State.

The irregularity of earth surface as described in Chapter No: III-II above, give-birth to the large number of gutters and streams on the landscape. The network of river-system in wide area facilitates more quantity of erosional products.

III-VI Hydraulic Gradient

As a convenience, hydraulic gradient of the river is divided into three parts. They are the upper, middle and the lower. In the upper part, it flows through the hilly tract of western ghats and fall in Aliyar dam, constructed on 300 mts above MSL in Tamil Nadu. In the middle part, it is traveling with average gradient from the dam to the Moolathara regulator in Kerala–Tamil Nadu boarder. From the regulator, it flows in Kerala with variable gradient and falls in the Arabian sea at Ponnani.

As on Fig No: III-VI-I, the river flows 17 km length from the boarder to the South Chittoor with the gradient of 3.47 m/ km in length. Then it flows 27 km distance to the location of Kannadi bridge in west of Palakkad town by reducing its rate of gradient upto 1.22 m/ km. From the location of bridge to the Kalpathipuzha junction in Parli, it flows 18 km distance by increasing the rate of gradient upto 1.61 m/ km. Then it flows 6 km upto the location of Mankara observatory with 1.5 m/ km gradient. Then Mankara to the Cheerakuzhi river junction near Ottapalam, it runs 16 km length by reducing its rate upto 0.75 m/ km. Then it flows 15 km length upto Shoranur, with almost flat in 0.2 /km. Again, it runs the 15 km length to the location of Pattambi by increasing its rate upto 0.67 m/ km. In the last, it flows 41 km length from Pattambi to the sea coast by reducing its rate upto the average of 0.49 m/ km. Hence, the river flows 155 km length in Kerala with variable gradient.

Variation on hydraulic gradient indicates the number of flatness on the river-bed, provides room to accumulate the large quantity of products on these locations.

III-VII Declivity from side Extremities

As on visuality, the earth surface on either side has no more slope towards the river. But, the proximity of tall mountains (Fig No: III-V-II above) on either side of the river length naturally produced the declivity towards the river. But, recordical evidence about the rate of slope is not available. However, the tributaries (as on Fig No: III-VI-I) from the tract of mountain, indicating the phenomena of slopes towards the river.

Availability of erosional products by the declivity of land towards the river on either side of the river length is the peculiarity of Bharathapuzha.

III-VIII Rainfall

The monsoon of India had supplied the periodical rainfall, which fed the rivers of Kerala. But, there is a marked variation on the amount of rainfall to each and every river-basin in Kerala. As on Table No: III-VIII-I, while getting 4500 mm of rainfall on the catchment area of river Kuttiyadi in Kozhikkode, the quantity of rainfall scheduled the river-basin is 2300 mm.

The Table No: III-VIII-II indicates that 63.5% of the total rainfall, which gets in 75 days by the south-west monsoon and 19.17% which gets in 22 days by the north-

east monsoon. Whereas, the periodical summer showers which have been blessed with the balance 17.32% of the total in 21 days time. Hence, the river-basin is blessed with the monsoon and summer showers.

The Table No: III-VIII-III shows some variations on the quantity of rainfall. During the period of 1979-81, the river-basin had blessed with more than the quantity scheduled by the nature. But in 1982-89 it has been lowered upto 1822 mm. Again, the quantity increased upto 2560 mm in 1992.

According to the table, there is no reduction on the quantity of rainfall on the basinal area other than some variations. Therefore, the scheduled quantity of rainfall to the basinal area is expectable in future.

III-IX Water Discharge

As on Fig No: III-V-I above, there are eleven numbers of big dams constructed in different locations on the river-head. The total storing capacity of these dams (Table No: III-IX-I above) is 651.62 mm^3 of water. In addition to these, the two regulators–cum–dams are constructed on the river-bed. The dams are closed immediately after the rainy seasons. Therefore, the water which can be stored by these dams is being blocked and diverted through the irrigation canals by the dams. Besides this, the remaining water on the upper area of the dams is also diverted to the canals. Hence, the entire water on the upper region except the overflows of dams by the particular seasons is being blocked and diverted through the canals, produced the reduction on the flow of the river.

In olden days, frequent floods are quite natural in Bharathapuzha by the continuous long testing and heavier rainfalls in a number of days. According to the statement given by the old timers, the tremendous floods like deluges occurred in 1924 and 1941 are the most important, which had tested in a number of days. But, from 1941 onwards there is no such frequent floods as in olden days by the failure of long lasting heavier rainfall and the blockage of sources by the dams in different location of the same river.

The Table No: III-IX-II about the water discharge through the observatory station at Kumbidi, shows some reduction on the quantity of water discharged from 1982-83 onwards when it compared with the period of 1981-82. But, from 1982-83 to 1989-90 periods there is no reduction other than some variations on the quantity of its flow.

Since the major quantity of its flow is being blocked and diverted by the dams, the river has been flowing with the 5082.9 mm^3 average (Table No: III-VIII-I above) of its annual flow. It has second place in water discharge of kerala rivers.

As on above, the present status of its flow can be expectable in future.

III-X Summary and Conclusion

The irregularity of earth surface, intensity of wind on the basinal area, cyclic system of temperature changes, hydraulic gradient from the river-head, and declivity from the side extremities are reasoning to produce more weathering on the earth surface, results to the more quantity of erosional products on the basinal area. The network of river-system on wide area facilitate the more quantity of sand products on the river-bed. Abundance of rainfall and its periodical supply are helping to maintain the rate of quantity of water discharge through the river.

Sufficiency of erosional products on the basinal area and the quantity of water discharge through the river are ensured the sufficiency of products to the lifetime project on the river-bed.

Physical condition of the river-basin is favourable to breed the sufficient quantity of sand products on the river-bed. But the lack of frequent floods as in olden days, active work of soil conservation on the basinal area, indiscriminate method of sand-drawal and the system of taking more quantity that it produced on the river-bed are reasoning to the exhaustion of reserves on the river-bed leading to the destruction of river.

Chapter IV

Availability of Sand

IV-I Introduction

Almost all sources of the river have been blocked by constructing eleven numbers of big dams in different locations on the river-head. Hence, the erosional products from the upper regions have been blocked by these dams and the products from the area in lower region of dams are used to settle in the river-bed. Therefore, the availability of sand on Bharathapuzha is divided into two heads, viz. the availability of sand in the dams in river-head and the availability of products on the river-bed in lower region of the dams.

Generally, the administration of dams comes under the Public Work Department of the State. Hence, the project in dam sites should be under the authority concerned of the dams. Therefore, the area of investigation is limited on the area in lower region of the dams.

It is very difficult to find out the availability of sand on the river-bed because it is a replenishing product by the geological work of running water. Therefore, it is necessary to find out the quantity of products settling on the river-bed and the quantity transported from the river-bed in a year. But, recordical evidence about these two aspects are not available, so that the quantity of products had been taken by the earlier auctioning system, the quantity has been taken by the existing permit system, quantity of products has been transported by the illegal

transaction, etc in a year and the quantity expecting from the sediments expelled to the sea-ward course in a year by the geological work of running water are dealt in this chapter with a view to get the availability of products on the river-bed.

IV-II Quantity of Sand taken by the earlier Auctioning System

More than fifty centres such as the Grama Panchayaths and Municipalities were authorized to bid the sand of their own locations. But, recordical evidence about the actual amount of auctioning or the quantity of products taken from the river are not available by the shortage in period of auctioning system and the limitation on getting details to the individual explorer.

As on Table No: IV-II-I, the average amount of sand auctioned by the four centres (available) in lower part of the river is Rs.1,34,282.55 in a year. But, the auctioning amount of these four centres is not sufficient to find out the actual quantity of product taken from the river-bed because, the centres on the middle and upper regions have no chance to bid the products for more amount by the shortage in accumulation of products. Therefore, the considerable amount is only the fifty percent of that centres in the lower part it comes to the amount, such as Rs. 1,34,282.55 into 50/100 = Rs. 67,141.27/centre. Hence, the total amount of auctioning by the fifty centres might be:

Rs. 67,141.27 X 50 = Rs. 33,57,063.50

or say Rs. 33,57, 064/ - in a year

During the period of auctioning, the bidders sold the products at the average rate of Rs.100/- per one load. Hence, the quantity of products to the worth of

Rs. 33, 57, 064/100= 33, 570.64 or say 33, 571.40 or say 33, 571/ load.

As a result of rapacity, the bidders exploited the products minimum 10 times more than the auctioned. That is Rs. 33, 571 X 10 = Rs. 3, 35, 710/ load.

As on above, I came to the conclusion that a minimum of 3, 35, 710 load sand might be taken from the river-bed in a year by the earlier auctioning system.

IV-III Sand taken by Permit System

Recordical evidence about the quantity of sand taken by the permit system is not available by the discontinuity on supply of permits. Therefore, I had done a direct investigation on the locations from wherever the sand products had been taken by the permits. As on information by the local people, only ten centres in the lower part of the river is authorized to supply the permits for taking sand.

The Table No: IV-III-I indicates that an average of 132 permits (with 5 tons average in a load per one permit) are supplied by each centre in a day. But, the allowed period of such drawal on a river-bed is from 1st November to 30th June of every year. Therefore, it comes to around 200 working days in a year. Secondly, the centres are not able to issue the permits in calendar days of the year by the

occational orders of the government to suspend it. Hence, the number of working days to the issuance of permit is automatically reduced to the average of hundred days in a year. Therefore, the imaginable quantity of sand transported by the permit system is 132 loads X 10 centres X 100 days. That is 1,32,000 loads in a year.

IV-IV Illegal Transaction

During the period of auctioning system, more than 50 centres were authorized to bid the sand of their own locations. Hence, almost all the locations on the river-system were used for the sand-drawal. But, in the period of permit system only, the 10 centres in the lower part of the river is authorized to the supply of permit. Secondly, the authorized centers are not able to supply the permits more than 100 days in a year. Hence, the non-availability of sand by the lack of permits on one side and the increasing demand on products and the rapacity of human being, etc on other side are induced to the illegal transaction.

Recordical evidence about the quantity of sand transported by the illegal transaction is not available. But, the paper reports (Table No: IV-IV-I) showing the illegal transaction of sand products from the river-bed. In this connection, I had done a random survey along the main stream and its tributaries. As on information by the local people, more than 300 loads of sand products have been transported from the river in a day. That is (365 days into 300 loads)=1,09,500 loads in a year.

IV-V Quantity expecting from the sediments expelled to the seaward course

As on Table No: IV-V-I, an average of 3,88,918.89 mt sediments including 23,076.67 coarse grained sand, 35,176.87 mt of medium sand and 3,30,655.35 mt of fine grain sand have been expelled to the sea-ward course in a year by the geological work of running water.

Available period of data is only about 1981-82 to 1989-90. Secondly, the quantity of sediments expelling to the sea-ward course can be reduced by the active work of soil conservation on the basinal area. But, there is no reduction other than some variations on its quantity expelling to the sea-ward course in a year. Secondly, there is no chance to reduce more than 50% of the quantity of sediments expelling to the sea-ward course in a year by the physical condition of the basinal area. Therefore, 50% of the quantity can be expected from the sediments expelling to the sea-ward course in a year by the technical system of sand-drawal. That is:

3,88,918.89 X 50/100

= 1,94,459 mt

or

1,94,459/ 5 ton by lorry service

= 38,892 loads in a year

IV-VI Summary and Conclusion

As on available data, an average of 3,35,710 loads of sand had taken in a year by the auctioning system ..I.

By the permit system it has been reduced upto 1,32,000 loads in a year ..II.

Due to lack of sand by the non-availability of permits, an average of 1,09,500 loads of sand have been transported in a year through the illegal transaction..III.

The quantity of sand transported by the permits and illegal transaction is II+III.

1,32,000 + 1,09,500 = 2,41,500 loads in a year.. IV.

Therefore, considerable quantity of sand transported from the river-bed by the human being is IV.

Average of I and IV = 3,35,710 + 2,41,500 / 2 = 2,88,605

Loads in a year ..V.

Expecting quantity of sand from the sediments expelled to the sea-ward course in a year is 38,892 loads in a year ..VI.

Availability of sand on the river-bed is dependant upon the quantity of sand transported from the river-bed by the human being and the quantity expecting

from the sediments expelled to the sea-ward course by the geological work of running water. They are:

V+VI = 2,88,605 + 38,892 = 3,27,497 loads in a year.

As on above, I came to the conclusion that the available quantity of sand on the river-bed is 3,27,497 loads (average) in a year

Chapter V

Marketing Facilities

V-I Introduction

Marketing facility of sand products depends upon the growth of construction activities. But, the growth rate is depended upon the developments on that area. Therefore, they are dealt in this chapter with a view to find out the marketing facility of sand product.

V-II Industrial Developments

Palakkad is a leading industrial centre of Kerala State. As on records, the District Industries Centre, Palakkad, there are 48 large and medium industries in Palakkad District. In addition to these, the Table No: V-II-I about the growth rate of SSI units shows that there are 6,525 small scale industrial units registered within the period of 1992-93 and its number has been increased.

V-III Growth of Institutional Buildings

Table No: V-III-I about the institutional buildings related to the commercial, educational, health and the social infrastructure, etc indicates the density of buildings in Palakkad District. In addition to these, the number of buildings such as the buildings for Police Force, Forest Department, Judicial and Financial Departments and the buildings for domestic and recreational purposes are

balanced to be recorded. Hence, the density of institutional buildings is increased in day by day.

V-IV Growth of Buildings in Rural Area

The availability of land with less cost rate, pollution free atmosphere, conversion of joint family system to the nuclear family life and the influence of Gulf money, etc results to the growth of buildings in rural area. The data of buildings (Table No: V-IV-I) available from the seven Panchayaths in a cluster, shows the density of buildings in rural area.

V-V Summary and Conclusion

Industrial growth and its pertinent developments, growth of population an their concentration on industrial area results to the growth of buildings in town and Municipalities. The availability of land with less cost rate, pollution free atmosphere, conversion of joint family system to the nuclear family life and the influence of Gulf money, etc results to the growth of buildings in rural area. The rate in growth of buildings indicates the marketing facility of sand products in Palakkad District. As on above, the facility of sand products on basinal area is imaginable.

Chapter VI

Technology of Mining

VI-I Introduction

Generally, the deposits which are taken once will not be replenished in life time. Secondly, the entire quantity of deposits are taking by the mechanized mining principles. But, in the case of sand-mining on a river-bed, the deposits are yearly settling products of erosion formed by the cyclic process of the geological work of running water. Secondly, it is purely a conventional method of stripping the products by the physical labours. Hence, the system of mining is entirely different from the other open-cast mining principles of metalliferous or non- metalliferous mines

The entire complex of technology is sub-divided into the inter-related technological unit operations. They are:- (1) Preparation of site to replenish the products, (2) System of mining works, such as (a) Classification of area by the qualitative, quantitative and volumetrical basis of products settled in a particular location at the time of intervals, (b) Identification of sites from wherever the products can be taken, should be taken and should not be taken in a particular time, (c) Determination of quantity that can be taken, should be taken and should not be taken from the sites in a particular time, and (3) Stripping the scheduled quantity of products from the listed sites and so on. Therefore, the elements of technology are dealt in this chapter by the hereditary and inborn knowledge of mining works.

VI-II Preparation of Site

Generally, the preparation of site (site is also considered as an area engaged in the mining of deposits) is not necessary for the project of sand-mining on a river-bed, because the river-beds are completely filled with the sand products. Secondly, the products are replenished by the cyclic process of the geological work of running water. But, in the case of Bharathapuzha, the flatness of river-bed formed by the sandy layers on the rocky beds are removed in many places (Photo No: VI-II-A) by the indiscriminate method of sand-drawal. Like that, the channels and sand-heaps (Photo No: VI-II-B) are formed in some other locations, especially in the upper and middle part of the river length. Therefore, the gradient of river-bed may be increased than it was recorded in olden days.

The increasing gradient by the removal of sandy layers and the exposal of rock-bed in the river base, formation of channels and the sand-heaps and the vegetations formed on the river base are not allowing the lower density of products to be settled on that locations. So, they are expelling to the sea-ward course. Therefore, preparation of site to replenish the products in such a location is an additional work in technology of sand mining on the river-bed. It will help to secure the maximum quantity of sand products from the sediments, expelling to the sea-ward course by the geological work of running water.

VI-III Classification of Area

Sedimentation of a river depends upon the gradient of its valley floor, shape and size of channel and the rate of quantity of water flowing through it. Therefore, variations on the quantity and quality of products settling on a river-bed is quite natural. So, the periodical classification of area is the foremost item in the system of sand-drawal on the river-bed. It consist in qualitative, quantitative and volumetrical basis of analyzing the products settled in a particular location at the time of intervals.

A thorough investigation with the laboratory assistance is necessary to prepare the data based tables for justifying the facts. But, I could not do it by the limitation as an individual explorer and the public nuisance on the river-bed. So, the methodized models of figure and tables are used to justify the facts.

For the convenience of study, the length of river-bed is divided into a number of parts. Each part is called as segment with its local name of that area, like Chittoor, Kannadi in Palakkad, Parli, Mankarai, Ottapalam, Shoranur, Pattambi, Thrithala, Kuttipuram, etc in Bharathapuzha. The Fig No: VI-III-I (Example of, classification of area) shows that A – B is the length of segment, where the products are seen on the river-bed within the boundary of A and B. A1, A2, A3, A4 are the number of locations or the sites on the segment, where the particular

products are settled. But, sometimes, the same quality of product is available on the entire area of segment, especially on the lower part of the river length. In such conditions, the entire area of the segments is considered as a single site. The Table No: VI-III-A (example of areawise classification of products) expressed the idea about the quality, dimension and quantity of products settled in a particular location on the river-bed. It shows that A1, A2, A3, A4 are the number of sites in segments, where the particular products, such as coarse grained sand (C), medium sand (M) and fine grained sand (F) are settled with its dimension of area and the quantity along with the voluminal measurements of the layers of deposits, settled on the particular sites. Like this, divide the length of main stream and its tributaries in a number of segments like A – B, B – C, C – D and so on and classifying the area of particular products settled on that locations at the time of intervals. It will help to find out the status quo of products, settled on the river-bed and its tributaries.

VI-IV Identification of Site

The indiscriminate method of sand-drawal is reasoning to expose the rocky layer of river base in many places. Secondly, these types of excavation some times will be destroying the durability of bridges and other valuable articles on the river-bed. Therefore, identification of sites to take the particular products from the classified area is the next important task of sand-mining on the river-bed. It will help to bring back the originality of river.

Table No: VI-IV-A (example of, identification of sites) expressed the idea of sites from wherever the products can be taken, should be taken and should not be taken from the sites in a particular time. According to the table, the sites A1, A5, A8 and A10 are showing the sufficiency of particular products in those areas. At the same time, the sites A2, A4 and A9 are indicating the excess quantity of particular product on those locations. Whereas the sites A6 and A7 are showing the insufficiency of products and the site number A3 shows the obstacles by the valuable article, such as the bridge on that location. Hence, the table giving a clear picture about the availability of products on the segment. Like that, identify the sites on classified area of products settled on river-bed at the time of intervals.

VI-V Determination of Quantity

As a reason mentioned in chapter No: VI-III above, the rate of quantity of products settling on the river-bed is always variable. Secondly, the excess quantity of sand-drawal sometimes reasoning to increase the gradient of the river-bed. Therefore, determination of quantity that can be taken, should be taken and should not be taken from the identified site is the unavoidable task of sand-mining on the river-bed. It will help to maintain the gradient of river-bed by keeping the status of resource on it.

Table No: VI-V-A (Example of, determination of quantity) expressed the idea about the quantity of products that can be taken, should be taken and should not be taken from the sites in particular time.

The table shows that 0.5m and 0.4m thickness of course grained sand deposits can be taken from the sites A1 and A8. The 0.45m thickness of medium grain sand can be taken from the site No: A10 and 0.4m thickness of fine grain sand can be taken from the site no: A5 on the segment. Like that, 0.5m thickness of coarse grained sand should be taken from the site No: A9 and 0.6m depth of medium sand should be taken from the site No: A2 and 0.6m depth of fine grain should be taken from the site No: A4 on the segment. But, the product should not be taken from the site No: A3 by the bridge on that location and site numbers A6 and A7 by the insufficiency of products on these sites. Thus, the table showing the picture about the thickness of products admissible to cut from the particular sites in a particular time. Like that, determine the thickness of deposits that can be taken, should be taken and should not be taken from the sites on the identified locations at the time of intervals.

VI-VI Strip of Products

After the determination of quantity, the next important task of sand-mining on a river-bed is stripping the scheduled quantity of products from the listed sites.

Taking the scheduled quantity of products from the listed sites, in voluminal measurement, by the physical labours, with the assistance of a technical person. The simple instruments like the spade and shovel may be used to strip the product. Removing products from the site by the head load of physical labours, those who inhabits the place adjacent to the river (Riparians).

VI-VII Auxiliary Operations

Blasting works to remove the products is not needed. The inter-related technological unit operations to the transportation and reprocess in factories are not necessary. The power supply, ventilations and the de-watering are not needed. Therefore, the machineries and more technical labours are not needed.

VI-VIII Summary and Conclusion

The entire complex of technology is sub-divided into the inter-related technological unit operations, such as (1) Preparation of sites to replenish the products, (2) classification of area by the qualitative, quantitative and volumetrical basis of products settled in a particular location at the time of intervals, (3) Identification of sites from wherever the products can be taken, should be taken and should not be taken from the sites in a particular time, (4) determination of quality that can be taken, should be taken and should not be taken from the sites in a particular time and (5) Stripping the scheduled quantity of products from the listed sites is the technology of the project on the river-bed.

In short, schedule of sites with the quality and quantity of sand products available at the time of intervals and taking the scheduled quantity from the listed sites by the conventional method of physical labour is the technology of sand-mining on the river-bed.

Peculiarity of the project is that , the auxiliary operations, such as the blasting works to remove the overburden of deposits, the inter-related technological unit operations to the transportation and reprocesses in factories, etc are not needed. It is very simple and easy to handling. Hence, it is entirely different from the other mining principles of metalliferous or nonmetalliferous mines.

Chapter VII

Economical Assesment

VII-I Introduction

Before starting a project, it is necessary to find out the profit and loss by this. Therefore, the income which had lost by the earlier auctioning system of sand, income by the existing permit system of sand-drawal, cost of sand which had been loosing by the illegal transaction of sand from the river-bed and expecting income as on proposed project of sand mining are dealt in this chapter with a view to find out the economic benefits through the project.

VII-II Income by the earlier Auctioning System

As on Chapter No: V-II above, the income by the earlier auctioning system of sand was Rs. 33,57,064/-.

During that period, the bidders had exploited the large quantity of sand to the worth of 10 times more of the auctioned amount. Therefore, the worth of sand taken by the bidders was Rs. 33,57,064 X 10 = Rs.3,35,70,640/-. Hence, the income which had lost by the sand auctioning was:

Rs.3,35,70,640 –

Rs. 33,57,064

Rs.3,02,13,576/- in a year.

VII-III Income through Permit System

As on Chapter No. IV-II above, the total number of permits (at the rate of one load/ permit, having an average of five tons in a load) issued in a year is 1,32,000 permits which is equel to 1,32,000 loads in a year.

The value of 1,32,000 loads of sand at the rate of Rs.400/ load is

1,32,000 X 400 = Rs. 5,28,00,000/-.

VII-IV Value of sand loosing by illegal transaction

As on Chapter No.IV-IV above, the total quantity of sand transported by the illegal transaction is 1,09,500 loads the cost of 1,09,500 at the rate of Rs.400/ load is 1,09,500 X 400 = Rs.4,38,00,000/-. The value of sand being lost by illegal transaction is:

Rs. 4,38,00,000/- in a year.

VIII-V Expected Income on proposed project

As on Chapter No.IV-VI above, the availability of sand expecting to the project of sand mining on the river-bed is 3,27,497 loads in a year. Expecting income at the rate of Rs.400/ load is 3,27,497 X 400 =

Rs. 13,09,98,800/- in a year.

VII-VI Other Benefits

Blasting works are not needed. Inter-related technological unit operations and re-process in factories are not needed. Use of technical labours is not necessary. Therefore, it has no more expenditure like other mining works.

VII-VII Summary and Conclusion

I. An average of Rs. 3,02,13,576/- had lost in a year by the earlier auctioning system.
II. At the time of getting Rs. 5,28,00,000/- through the permit system an average of Rs. 4,38,00,000/- is being lost in a year by the illegal transaction of sand from the river-bed.
III. Expecting income on proposed project is Rs. 13,09,98,800/- in a year.
IV. At the time of loosing Rs. 4,38,00,000/- by malpractice, an amount of Rs. 13,09,98,800/- is expecting by the project, makes the difference – 13,09,98,800 + 4,38,00,000/- = Rs. 17,47,98,800/- ina year.
V. As far as the production cost is concerned, it has no more expenditure like other mining work. Therefore, it is benefitial.

Chapter VIII

Environmental Assessment

In the case of sand mining on a river-bed, the blasting works or other process to the removal of over burden of deposits are not needed. The inter-related technological unit operations to the transportation and re-process in factories are not necessary. Therefore, it is free from pollution. The existing channels, sand-heaps, mud-flats and vegetations, etc on the river-bed will be removed by the scientific way of sand-drawal. Therefore, the river-bed becomes flatish. Secondly, the river will be free from over siltation, which may be a reason to the regional hydrodynamics.

As on above, the project of sand mining on the river-bed is necessary to maintain the chastity of river.

Chapter IX

Overall Summary and Conclusion

IX-I Introduction

In order to find out the industrial potential of sand mining on Bharathapuzha, a detailed survey was conducted. The findings which emerged from the analysis of data collection are summerised as follows:

IX-II-I Physical condition of River-basin

The irregularity of earth surface by the isolated mounatin and hillocks, intensity of wind, cyclic system of temperature changes, hydraulic gradient from the river-head, diclivity from side extrimities towards the river are seeing as favourable to produce the sufficient quantity of erosional products on the earth surface. The net work of river system in wide area prodiced the large quantity of erosional products on the river-bed. It will enabled to the lifetime project of sand mining on the river-bed. grace of monsoons with 2300 mm rainfall and its periodical supply of heavy and long lasting rains are providing facilities to replenish the products on river-bed. Hence, the physical condition of the river-basin is favourable.

IX-II-II Availability of Sand

I. Quantity of sand exploited by the bidders in earlier auctioning period was an average of 3,35,710 loads in a year.

II. Quantity of sand taken by the permit is an average of 1,32,000 loads in a year

III. Quantity of sand transported by the illegal transaction is 1,09,500 loads (average in a year)

IV. Quantity of sand transported from the river-bed during the period of permit system is:

II + III = 1,32,000 + 1,09,500 = 2,41,500 loads.

V. Hence, considerable quantity of sand transported by the auctioning system and the existing permit system is

I + IV / 2 = 3,35,710 + 2,41,500 / 2 = 2,88,605 loads (average) in a year.

VI. Expecting quantity from the sediments expelled to the sea is 38,892 loads in a year.

As on above, the availability of sand on the river-bed is:

V + VI = 2,88,605 + 38,892 = 3,27,497 loads in a year.

IX-II-III Marketing Facilities

Now, the Palakkad District is a leading industrial centre in Kerala. The industrial growth and its pertinant developments are showing the favorable condition of marketing facilities.

IX-II-IV Technology of Mining

Schedule of sites with the quality and quantity of sand products available at the time of intervals and taking the scheduled quanity from the listed sites, by the

conventional method of physical labour is the technology of sand mining on the river-bed

IX-II-V Economical Assessment

The income expected from the project is Rs. 13,09,98,800/- in a year. Secondly, the production cost is very less when it is compared with the other mining works. Therefore, it is profitable.

IX-II-VI Environmental Assessment

The blasting or other process to the removal of over-burden or to take the products are not needed. The inter-related technological unit operations to the transportations and re-process in factories are not needed. Therefore, it is free from pollution. The existing channels and sand-heaps, mud-flats and the vegetations, etc on the river-bed will be removed by the scientific and systematic way of sand taking. Secondly, the river is free from over-siltation, which may be a reason to the regional hydrdynamics and the microseismic activites on the basinal area.

Chapter X

Suggestion

A detailed investigation, alongwith a number of parameters are required to justify the facts. But, I could not do it by the limitation on the individual explorer. Even then, the findings which emerged from the analysis of data collection supports the possibility to the system of sand mining on the river-bed because the process of winning minerals by the scientific and systematic way to the development of nation is called or named as “Mining”. Secondly, procedural rules are quite natural in the project of mining works. Therefore, I hereby suggest the possibility of a project of sand-mining on the river-bed.

Chapter XI

Recommendation

In order to the effective development of project,some major recommendations are suggested. They are: (1) the project of sand mining on a river-bed should be devided into two heads; (a) mining of sand products on the dam sites should be under the authority concerned of that dams by providing separate wing of sand mining, (b) the project on river-bed including the area of regulator–cum–dams and the reservoirs, known as check dams may be under a simple authority, like the Mining and Geology or the River Management with the stringent penal code; (2) marginal profit of the project should be utilized to the river itself, to bring back its originality; and (3) the authority concerned of the project is responsible to look after the chastity of river.

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