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## **General opportunities and problems of point-bar to establish kilns**

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### **Abstract**

Point bar is a typical depositional landform of fluvial process. This physical feature is commonly found in the lower part of the Hooghly river. Point bars are very suitable location for brick kilns. There are many causes for choosing such a fragile landscape to set up this industry. Brick industry is an ancient industry in India. It is a distinctive type of enterprise of point bars and of inland vacant area as well, throughout the country. However, gradually the point-bar kilns are becoming a sick industry. The basic opportunities to set up the point-bar kilns have been highlighted in this article. Besides that, the article is also concerned about the problems coming out of the function of the point-bar kilns along with some probable remedies.

**Keywords:** Brick kiln, point bar, rip-rap, silt, transportation.

### **Introduction**

Use of brick in India as a building material is ancient. During the historical past, bricks were produced only for private purpose. It was a platform of art too (i.e., *Terra Cotta*). Gradually it has become an industry, globally. Now a day's numerous brickfields are found to and fro. Yet, point-bars should be considered as the fittest site for brick kiln establishment, owing to spontaneous supply of silt to the plant. In spite of that, the river-blessed industry has to tolerate the adversities that take place as the side effect of the production process. After a certain period, the kiln authorities are compelled to cope with the damages created by the nearby river. The factors that smile to the industry as well as the factors coming out of the industry have been hold on simultaneously with a few reformative recommendations. Apart from

this, the antiquity of brick and its influence on urbanisation has also been touched in this context.

This essay is based on a field survey done at the point-bar brick kilns along the section of Hooghly River of Hentalkhali-Chakchandul area, under Maheshtala municipality of South 24 Parganas, West Bengal, India.

### **Study area**

The prospects and problems of the site have been traced out, at the time of field survey at point bar kilns, located in between the Hental khali-Chakchandul Road and the Hooghly River at Maheshtala municipality, a suburban of Kolkata. The absolute extension of the area is between 22°31'13"N, 88°11'E and 22°30'N, 88°15'E.

## **Objectives**

### **Objectives of this article is to represent:**

1. Some advantages of point bar for kilns.
2. Some effects of the modus operandi of the kilns, especially increasing risk of river bank erosion.
3. Some reasonable recommendations against the problems.

## **Methodology**

The methodology of this study, may be categorized under three headings as follows-

### **Pre field**

Before the field survey a few pre field works were done. Here valuable and necessary secondary information was collected (as maps, secondary statistical data etc.), questionnaires were formed, according to objective, to study the perception of the target group about the problem. Thereafter a few reconnaissance surveys were performed.

### **Field**

After the preliminary survey, questionnaire survey was conducted at the site and the actual situation has been photographed.

### **Post field**

In this section, data and information, acquired from the site with the help of questionnaires, has been analyzed. Many secondary sources have been consulted to analyse the advantages and disadvantages of the site. In this article, post-analysis facts have been discussed elaborately rather quantifying it.

## **Types and locations of brick kilns**

Flexible norms, rules and regulation has provided the entrepreneurs enough room to set up kilns haphazardly on the point bars or upon the vacant land or annex to a market, where they want, either in a rural or suburban area. This is obviously a favourable opportunity for burgeon of kilns. The West Bengal Government has entitled

the point bar kilns as 'Baluchar' kilns and the others as 'Danga' kilns (Circular No.2739(18)-L. Ref. sub , 2000). Amongst the locations, the point bars are the fittest to establish kilns according to the entrepreneurs.

## **Favourable conditions for construction of point bar brick kilns**

### **1. Plenty of the basic raw material**

The mother raw material of brick production is soil/mud. Soil is ubiquitous but a fixed resource. Therefore, being a weight-gaining industry, kilns were traditionally set up near market areas. The theory of least cost location of industries has approved such logical location (Chatterjee, 2009).

The deposits of a river at its lower course (where point bar is a characteristic landform) i.e., alluvium/silt, may also be treated as the main raw material of bricks. As the river deposits its load at a more or less same rate, at a fixed interval at a site, here prevails some opportunity of apparent renewability of the equivalent raw material. Hence, brickfields can use the natural fluvial system as the source of raw material, very easily, if it is set up on the point bars.

However, soil is a ubiquitous thing, nature and properties of it determine whether it is suitable for brick or not. In this question, fluvial deposit is fit to the want.

### **2. Dual mode of transportation and communication**

Facility of transportation and communication is a crucial influencing factor of any industry. Point bars are such a kind of site where the navigation route and the roadway merge. Therefore, the point bar kilns are able to enjoy the dual mode of transportation and communication. Thus, river acts as a supplier of raw material as well as a route itself (Plate 2). According to the theory of comparative cost advantages waterway is most economical than the other modes (Chatterjee, 2009).

### **3. Collection of raw material without transportation cost**

A large earthen reservoir is dug in the land of the point bar kilns and canals are cut to connect the river with the reservoir. At the time of high tide, lotic water reaches the reservoir automatically and at the time of ebb tide, it returns to the river automatically. So, when the lotic water enters into the reservoir it is trapped to extract its suspended load, which is the basic raw material, through settling process (Plate 3). Therefore, no extra cost for transportation of the basic raw material is needed.

### **4. Opportunity of accumulation of alluvium during dormant period**

The Monsoon is the dormant period of brick industry when production process is postponed. However, in the case of the point bar kilns, situation is a bit different. Tide remains as usual here, as 'Time and tide waits for none'. Moreover, overland flow originated from precipitation joins with the tide. Prolonged heavy shower after a long dry season accelerates soil erosion vividly. The climatic condition of the combined period of pre-monsoon and monsoon is quite fit to the mentioned condition what is favourable to more accumulation of mud from the land mass of the brickfield and its vicinity through solifluction and/or earth flow in the reservoir. Besides it, soil creep is also possible along the wall of the reservoir, canals and the wall of the river channel. Contributions of these typical processes of mass wasting and the tidal activity concurrently accumulate more and more alluvium naturally during this period that is processed when the industry re-opens in the post-monsoon season (Plate 3).

### **5. Characteristics of soil of point-bars**

Another matter is that, though generally the young alluvial soil is too fertile to produce much yield, yet it has less crop-variety than the old

alluvium. Moreover, a dynamic change is seen in the properties of soil along the riverbank. So the nature of the soil found in the catchment region or lower course is quite different from the command region or the upper course of the same river. However, they are similar only at the point of their immaturity. In India, young immature alluvium is generally categorised by the name of 'Khadar'. The point bars where the kilns are founded are under this section. The other category is the old alluvium, which is called as 'Bhangar', colloquially. However, when the properties of the general categories are scanned thoroughly, then sub-orders and further small groups come out. The Khadar region has three types of soil of Great soil groups after the modern USDA classification. These are- (i) Haplaquent, (ii) Ustifluent and (iii) Udifluent, under the sub-orders- (a) Aquent and (b) Fluvent respectively, of the Entisol order. The type of soil of the study area is marked with the name of Hplaquent Halaquent, after the method of the USDA. By nature, this kind of soil has only a little bit of salinized profile (Mukherjee, 1984). It indicates that the deltaic alluvial soil of this region is prone to be salinized, as most of the tidal regimes are devoured with this hazard, globally.

Therefore, it is more reasonable to use such a piece of land in other purpose rather cultivation. To set up kiln is surely one of the rational options.

The brick kilns, situated on the point bars at Achipur, an area under the jurisdiction of Pujali municipality-a suburb of Kolkata, are a suitable evidence in this regards. According to the historical records, Achipur is the earliest ghetto of foreigners in India. Immigrants from China came there and established a sugar mill in 1780s. They used the wastelands and the bars as well for sugar-cane farming for their factory, annex to the mill (Mitra, 1990). Later it shut down and by and by the land use changed. Now Brick industry is the dominant function of the same site.

## **6. Availability of Consumers and Workers**

The flood plains are the most densely populated region of the world. Therefore, available consumers of the product (market) and available workers for kilns of course co-exist here among the local population, especially in such suburban region like the said study area.

It may be inferred in the light of the discussion so far, that, probably, the said factors have made the point- bars attractive site for brick kiln establishment. In reality, a number of kilns have agglomerated there in the study area enjoying the possibilities.

### **Problems of the point-bar kilns**

Very few problems of the point bars that gradually come out of the functions of the kilns, in spite of such potentials.

#### **1. Haunt of Tide**

Regular haunt of tide into the kilns through canals increase the convenience of silt collection; at the same time, the same process is liable to increase the possibility and quantity of soil erosion or bank erosion. Tidal bore increase the vulnerability of erosion.

It has been discussed earlier how soil erosion is accelerated in the monsoon. Though this is gainful in the view of the authority of the kilns, this is undesirable, in the cautious view as the land of the kiln is degrading by the way.

#### **2. III-Effect Of Modus Operandi**

The industry itself has some boomerang activity, which have ill-effects as follows—

##### **I. Hazard of Bank Erosion**

Deposition is dominant at the lower course of river. Point bars are one of the depositional landscapes of the lower course of a river. In the lower course, the river flows across its flood plain. The pattern of the channel becomes sinuous. Shifting of channel is also a common phenomenon,

here. The Hooghly River is the lower course of the Ganges. Thus, this portion is also characterised with the said characteristics. The study area is situated under this section. Therefore, there must be tendency of the channel to become sinuous, nearby the point bar kilns. However, the condition of the study area and its surrounding is a bit different. Because, the riverbank have been bound with concrete (i.e., River jacketing), except the portion beside the brick kilns to maintain the ease of collection of raw material. So, the natural trend of the channel has been hindered partially, because of such activity. Hence, the riverbank by the side of point bar kiln is fragile than the jacketed portion surrounding the kilns. Therefore, the durability of the bank beside the kiln is practically less than the concreted section. Thus, the river is free to flow naturally, where the bank is unprotected. That is why the kilns are suffering from bank erosion problem. The procedure of raw material collection (plate 4) is liable to accelerate the problem. In this way, the problem becomes hazard. The method of raw material collection has been described above.

Actually, inviting the river through canal towards the proximity of the embankment, only for the interest of the brick kiln authorities, is a sure threat to the natural levee. With the simultaneous increase in demand and production, soil collection is on the rise. Side effect of soil collection in collaboration with the said factor (tide) is making the dilemma come complex. The net result of the entire course of action is just increase in soil erosion than re-deposition with fluvial process. That is why the natural supply system of the basic material is gradually failing to fulfil the need of the factories and there remains hardly any chance to fill up the decay created due to incongruous collection of mud from the wall of the embankment. On the other hand, the natural embankment, back swamps, the wastelands even the arable land of the flood plains are becoming the alternative source of material. At present there

are dual source of material for most of the point bar kilns. Therefore, the embankment is decaying gradually. At the same time, vulnerability of the inhabitants of the flood plain is increasing. It is a fact that the flood plains are the most densely populated region of the world. Besides that, spread of soil mining is diminishing the fertile lands.

On behalf of the irrigation and waterways department, Government of West Bengal, it has appealed, not to cut the soil from the embankment as a measure to avert flood. Abiding by such directive, engraving from the levee and its surrounding has been decreased manifold. Point bar is located in between the embankment and the river channel. Therefore, point bars naturally come under the vicinity of the levee and the prohibition is effective on the point bar region. As a result the kiln authorities are forced to depend on the ex situ source and they are importing more soil than that they obtain in situ. Another resultant ill effect is the positive increase of riverbed. A striking fact in this regards is that, brick factory of the riverbed, i.e., the point bar kiln causes choking of discharge at the peak discharge period putting dire pressure on the embankment (Sanyal and Niranjana, 2015). It means rise in wetted perimeter what is a threat to the stability of bank as the soil is very erosive by nature. Simultaneously the upsurge of river is hobbling the navigability of the route. After all imposing such interdict is to spoil this subordinate way of dredging. It is evident the government initiative of dredging is falling short to the desired level. In this way, actually the mentioned directive, on behalf of our government, is telling upon the navigability and bank of the river. However, the customary procedure of soil collection is not safe at all. In this process, slope of the bank becomes steeper by and by because of increase in excavation from there. It is a fact that mining the foot of slope is to increase the chance of slide/topple. Moreover, increase in length of slope increases the degree of soil erosion

over it. According to a research, when the length of slope increases twice, where the average slope is 7%, then rate of erosion over it increases 2.6 times from the former rate (Das & Basu, 2009). Apart from this, soil-mining causes increase in the gradient of the slope and as a result soil erosion increases. Because increase in gradient accelerates the velocity of overland flow (twice increase in gradient results in four times more soil erosion). So to say, the mentioned activities are conjugally raising the vulnerability of the embankment.

In this connection, the traditional ways of arresting the bank erosion practiced here follows—

#### Traditional ways of mitigation

After establishing the brick kiln, the authorities have to face hazard after a certain period as the consequence of their deed done. They are compelled to do with the problems as atonement of their once lucrative modus operandi by commanding the river. Then it is the only way left, to resist against the menace. The authorities apply various steps to prevent bank erosion according to the need of the situation. Dumping sand-filled sags along the loose portion of the bank, use of palisade of bamboo and/or sal stake in the riverbed at the foot of the vulnerable area are some customary steps (Plate 5).

Some exclusive steps- e.g., rip rap with rejected brick scraps, river jacketing, using geo textile are also in practice. Nevertheless, the steps are effective for a while. Ultimately, it becomes impossible to cope with the aggressive river. Therefore, at last the kilns of the point bars are only fit to be abandoned. This is the ultimate destiny of the kilns of the point bars (Plate 6, 7).

#### II. Reduction of Fertility of Soil

'In the brick making process soil texture changes and result in repeated heating of soil which does not permit the rainwater to infiltrate. The resultant effect is lowering down of depth in water level and

emergence of unfertile land which were earlier highly productive and fertile prior to brick kiln industry' (Sanyal and Niranjana, 2015). Impermeable soil profile that hinders the infiltration of rain may also hinder the connection between the river and the ground water. As a result, the environment of the zone of transition between the land and water is suffering.

### **III. Degeneration of Groundwater**

Another thing is that, degeneration of groundwater is favourable to subsidence of landmass, elsewhere. Because down fall of groundwater is another name of removal of support from beneath the ground surface.

### **IV. Problem of Surplus Labourers And Unemployment In Disguise**

The jobbers become out of their job and they are compelled to go to the active kilns, when any active kiln becomes abandoned. Thus, the problem of surplus labourers is created at their destination.

The labourers are engaged in the kilns only during the period from post monsoon to pre monsoon. During the rest of the year, they have to do other works to earn their livelihood. It can be said, analyzing their condition that, the labourers are victim of unemployment in disguise. The surplus labourers make the situation more complex.

The afore said deduction has been done, on the basis of a recent field study, done over ten selected point bar kilns, located in between the Hental khali- Chakchandul Road and the Hooghly River, under Maheshtala Municipality, Kolkata. Here the brick industries are older than approx thirty years and more. Now, four out of the ten kilns have stopped their production and the rest which are active are about to stop their production also. A major cause behind such circumstance is undoubtedly the hazard of riverbank erosion. Because every year the river is extremely harassing the authorities in this issue. Gradually, the

problem is spreading its root at a more depth, raising the anxiety of the residents of the riverside region, whether they are dependent upon the industry or not. The 'Tapan Bricks' has achieved the ultimate phase. The river has engulfed it. It is obviously an alarm to the vicinity.

It has been stated formerly, with the increase in production the need of the raw material grows and the natural source is falling short to fulfil the want. The problem of riverbank erosion is accelerated and is transformed into hazard that ultimately destroys the kiln as a result of this lucrative activity of the kilns and the labourers get out of their job.

From the elaborated discussion, it is clear that, owing to illogical traditional over use of the possibility of raw material collection turns the opportunity into a hazard. Then hazard and opportunity co-exists. Such condition is existing there at the point bars of the study area. Therefore, it would not be a superfluous talk, to say that illogical over use makes such potentials, a Dead Sea Apple.

The deduction of the researcher about the problem has been presented with a flow chart as follows—

Excavation on levee -> Increases the risk of bank erosion -> River Bank erosion starts -> The river engulfs the point bar kiln -> Kiln shuts down -> Laborers of the closed kiln become out of their job -> problem of surplus laborer starts at the destination

This is a unidirectional chin, which shows that illogical overuse of a natural opportunity becomes dangerous for our socio-economic scenario in future. To prevent the harm that may break out in future, some possible sustainable remedies should be found out.

### **Main Findings**

Before searching remedies, it would be better to point the problem out of the detailed discourse because it may help to prescribe better option. The synopses of problems are as follows.

- The problem brakes out of the prolonged lucrative activity on the riverbed.
- The point bar kilns are facing more risk than the other ones located at safe inland position
- River should grasp the kilns of the point bars at a long run.
- In India, this Industry is dependent upon private initiative only.
- Irrespective of its location, all the kilns damage the soil, causing infertility, land degradation as well as ground water degradation.
- Kilns are active agent of riverbank erosion.
- As per government report, this is a marginal industry.
- In most parts of India, this is an unorganized sector of function.
- Now the state of the problem for the brickfields is increasing day by day but the government is indifferent about the matter. Hence, the owners are also disappointed about government aid.
- There is scarcity of labourers at the brick kilns. Moreover, the employers are suffering from unemployment in disguise and the vicious cycle of poverty. So, the situation is providing a good opportunity to convert the sector as the abode of crime.
- Alternative building materials are influencing behind the ruin of the industries. After all, the basic alternative element i.e., fly ash is itself a pollutant.

### **Recommended Remedies**

In such circumstance a few possible ways of remedy may be prescribed as follows-

1. A revised land use map with schematic location of kilns should be published.
2. The brick industry must be taken into account as a small-scale industry.

3. The government must strongly invigilate the activity and rate of production of the kilns.
4. E.I.A. of the kilns should be done.
5. Risk of any location to set up an industry must be assessed before establishing it. This method may be applied, even on the established kilns repeatedly after certain interval, because, this method measures the level of safety of any location. This way the most safe site may be chosen.
6. The government may grant aid for the kiln authorities with cash and kind.
7. Government initiative to establish brick kiln, is a good option, near the dumping ground of dredged alluvium/silt for convenient raw material collection from there. In this way dump-related problems will be manipulated.
8. After all, 'However for the sake of long active life of rivers which are crucial for the very existence of man, reckless practice of soil cutting from banks and bed should be checked' (Das, 2014).

### **Discussion & Conclusion**

In the ancient Indian society brick was a building material as it is now. However, then it was also a platform of *Terra Cotta* art. Only the then privileged and aristocrats were able to construct a brick-made house or monument. There was hardly any brick kiln present just a century ago. Then bricks were produced privately, according to need by the entrepreneur who himself was the owner of the building or estate. Therefore, it was too much expensive then.

With the time, that scenario has changed. The *Terra Cotta* art has been transformed gradually to a commercial industry. Being a compulsory criterion of urbanization, concretisation is an index of development. Now, brick is a major element of concretisation. Brick kilns are the source of it. Now India is the second highest producer of bricks, next to China (Sanyal and Niranjana, 2015).

SATELLITE IMAGERY OF THE STUDY AREA



SOURCE: GOOGLE EARTH

IMAGERY DATE: 25/11/2014

Fig. 1. Location Map of the Study Area.



Plate 2. River as a mode of raw material transportation.





**Plate 3 (a & b). process of silt (raw material) collection (provokes the channel to shift).**



**Plate 4. excavation from the natural levee (embankment).**



**Plate 5 (a & b). Few steps of mitigation**



**Plate 6. the ultimate result**



**Plate 7. An abandoned brick kiln**

There are approximately fifty thousand active brick kilns across India that produce more than 38 million clay bricks per day in an average (Sanyal and Niranjana, 2015). Thus, brick industries have a distinctive contribution behind development of any country. India is one of the prospering nations in the third world. The rate of urbanisation in India is 31.16% (2011).

Depending on this information it can be recognized as the largest private small scale of economics, yet this is considered as a marginal

industry as per Government record, because in most parts of our country this is an unorganised sector of secondary economic function. Therefore, kilns have not been mentioned so far, as a kind of land use in the maps published by any agency- that is why, this industry is deprived of any kind of assistance from the government. On the other hand, norms, rules and regulations about establishing a kiln is too much supple.

De facto, the brick kiln industry is a polluting industry. At the same time the industry is in

distress due to its modus operandi, especially, at the point bar location. But the former fact attracts relatively more to dive into the matter than the later one. The author's endeavour is to wind the concentration of the readers towards the impact of in bed and on bed soil cutting by brickfield. It must be hoped that, proper action in this regards will be applied according to situation as soon as possible to revitalise such an ancient industry. Recently, the problem, that we are discussing, is attracting modern research. This is of course a ray of hope in this purpose.

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