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A Profile of Industrial Pollution in Kolkata Municipal Corporation Area: The Case of Tanneries

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Abstract

The city of Kolkata has quite a huge concentration of industries within its jurisdiction which have been categorized as Green, Orange and Red by the Pollution Control Board. While the industries under the Green category are found to be least polluting, the Red category units inflict broad spectrum environmental degradation. Though majority of the leather processing units have shifted to the Calcutta Leather Complex at Bantala but still quite a few illegal grossly polluting tanneries continues to operate in various municipal wards of the city especially in east part. Here an attempt has been made to show the impact of tanneries which have been identified as a Red category industry on the workers of these units as well as on the local residents of the area.

Key words: *environmental degradation, tanning, raw hides, hazardous wastes and red category industries.*

Introduction

Tanning is an ancient craft in India and has been practiced for many centuries as an industrial operation at the village level. With the progress of time, however, it has acquired the status of a mature industry playing an important role in the country's economy. The city of Kolkata (erstwhile Calcutta) has about 8,832 industrial units which have been categorized as *Green, Orange* and *Red* by the Pollution Control Board (PCB). There are about 1,651 Red category units operating under Kolkata Municipal Corporation (KMC). These units are the most polluting industries responsible for air, water, noise and solid waste pollution. The Red category industries are further sub-divided into *Special Red Category* and *Ordinary Red Category*. Among the Special Red Category industries the leather processing units, popularly known as *Tanneries* deserve special mention.

Statement of the Problem

There are innumerable tanneries operating mainly in the eastern part of the area under Kolkata Municipal Corporation. The wastes generated from these tanneries are in the form of chromium rich waste water disposed in local water bodies and sewerages contributing to surface water pollution. The leather scraps from the tanneries are disposed on open grounds and vats which cause solid waste pollution in the area. Gases like hydrogen sulphide and ammonia are emitted from these units which are responsible for air pollution. The chemicals used here cause the dissemination of foul smell leading to unhealthy condition induced by odour. Thus it is quite evident that these

units contribute heavily to degradation of the environment and at the same time these are also susceptible to outbreak of fire hazard frequently which has posed as a threat on the lives of workers engaged in these units. The safety measures provided to the workers are inadequate for which they succumb to industrial accidents. Though these tanneries are continuously been monitored by West Bengal Pollution Control Board (WBPCB) but still they continue to contaminate the water and air.

Area under study

A huge concentration of tanneries under the Special Red Category is found in various wards under KMC. Though majority of the tanneries have already shifted to Calcutta Leather Complex (CLC) at Bantala of the adjacent district still a large number of them continue to operate illegally in various wards of the city especially in municipal wards 57, 59 and 66 under Borough VII which deserves special mention in this respect. The tanneries here are located either in the form of industrial units, factories or within households as domestic units. Ward no.107 under Borough XII is noteworthy since it has tanneries under Green and Orange category. Tanneries certified as 'least polluting' are found to be heavily concentrated in municipal wards 33, 58, 108 and 127.

Objectives of the Study

The study has been initiated to fulfill the following objectives:

- To study the environmental impact of tanneries
- To assess the impact of these units upon the health of the workers
- To identify the causes of outbreak of fire in these units
- To find out the frequency of industrial accidents in these units
- To gather information on the safety measures provided to the workers
- To assess the impact of tannery induced pollution on the residents of the area concerned.

Data Base and Methodology

This work is a combination of primary and secondary data. Information was generated on working condition of the labourers as well as their safety measures inclusive of ventilation, electrical wiring and use of gloves with boots. Most of the secondary data were collected from West Bengal Pollution Control Board (WBPCB) and Kolkata Municipal Corporation (KMC). Besides, primary data were also collected.

Apart from computation of the available secondary data and their cartographic representation, questionnaires were framed for the target groups of tannery workers and the local residents for generation of primary data. Purposive method of sampling was followed with a sample size of 60 factory workers and 90 local residents representing no less than six different municipal wards. Field investigation for ground truth verification was conducted inside the tanneries along with the disposal sites too.

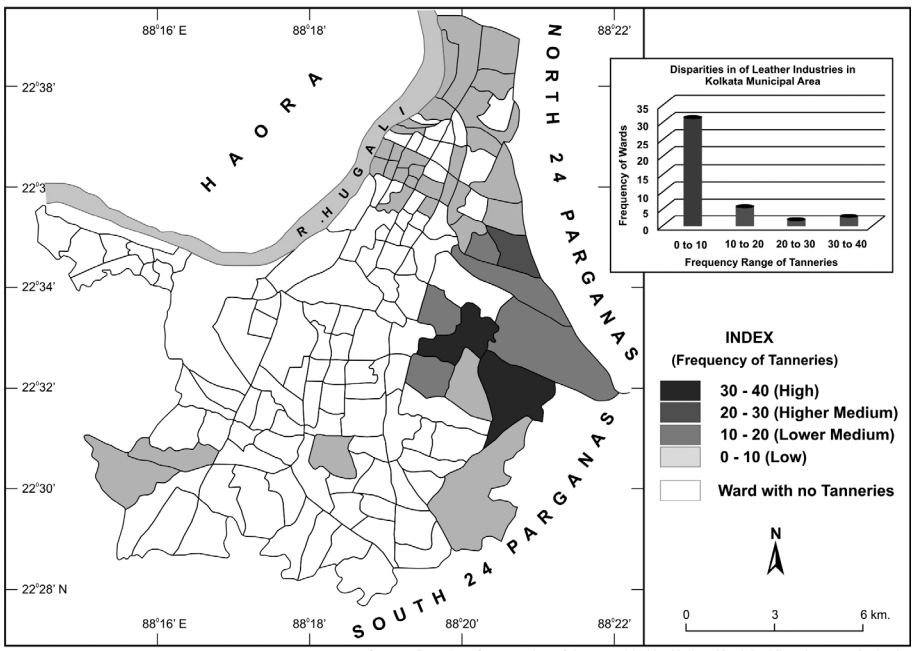
A Brief Overview of the Tanneries in different Wards of the City

A *Tannery* is a place where raw hides are converted into finished and semi-finished leather goods like bags, belts, shoes, watch bands, gloves etc. The word *Tanning* is derived from Latin word '*Tannare*'

derived from '*Tannum*' meaning 'bark of oak'. Tanning is the process of treating skins of animals to produce leather which is more durable and less susceptible to decomposition.

A huge concentration of tanneries is found in Tangra of East Kolkata that traditionally houses a large number of tanneries owned by people of the Chinese origin (Fig.1). The area has about 350 tanneries combining both the legal and illegal ones. The Chinese of Kolkata have gradually turned this part of the city into an important destination for sourcing finished and semi-finished leather. Finished leather goods are exported to European countries like Switzerland, Belgium, Spain, Denmark, Sweden etc. and also to some Asian countries like China. The study conducted in the Tangra-Tiljala and Topsia area has revealed that the tanneries here are grossly polluting units and they have contributed to environmental damage (Fig.2). The tanneries are mainly responsible for water, solid waste and odour pollution. The raw materials used here include raw skin and hides, formic acid, sulphuric acid and various colouring pigments. The solid wastes generated are disposed on open grounds in the adjacent area of the factories while the waste water containing acids and chemicals are disposed to open drains. This toxic water contaminates soil as well. The people in the adjacent areas suffer from obnoxious odour pollution. Majority of the wastes generated in the tanneries are not recycled. These units are also prone to fire hazards and industrial accidents. These tanneries have exerted a tremendous impact upon the environmental components of the area with serious health impact on the workers and local residents.

WARD-WISE FREQUENCY OF TANNERIES, 2008



Source: Based on Computation of data provided by KolkataMunicipal Development Authority

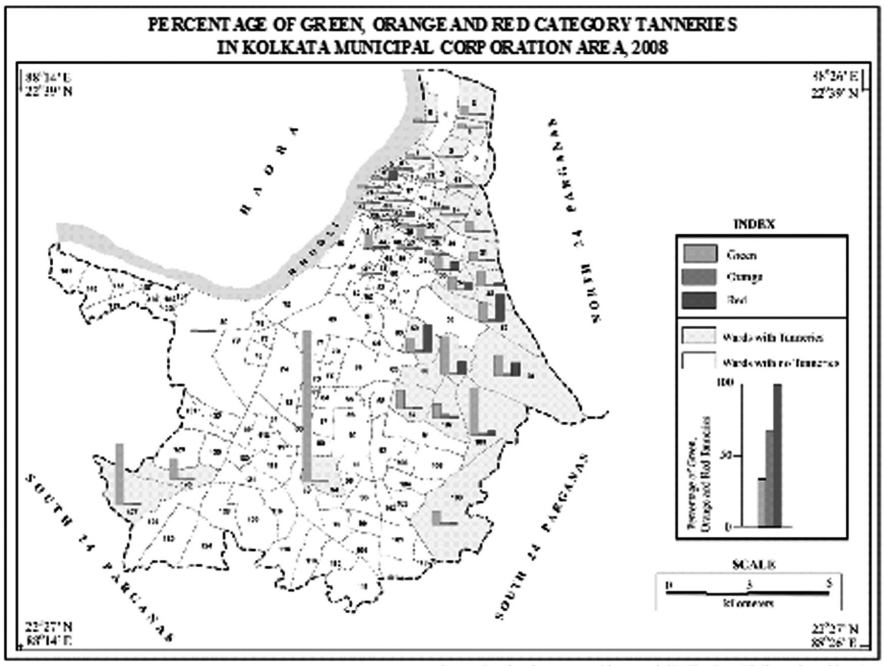


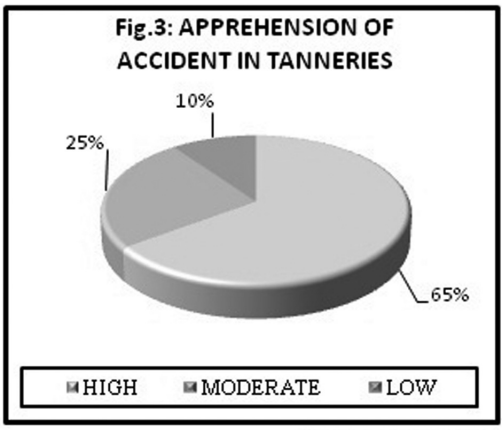
Fig.2

Economic and Demographic Profile of the Workers in the Tanneries

The survey conducted in the tanneries has revealed that 90 per cent of the workers are male while only 10 per cent are female. Among the male workers 60 per cent were found to be unskilled workers with wage of about Rs.50-80 per day while the skilled manual workers get wage of Rs.80-120 per day. However, there are disparities in wages between male and female workers. The female workers are employed at much lower wage in the tanneries. About 80 per cent of the male workers were found to be illiterate while 90 percent of the female workers were found to be illiterate. In case of male workers only one per cent was found to be educated up to graduation level while none of the female workers was found to be at par with that level.

Problems of the Workers

The tanneries are prone to fire hazard which has now emerged as one of the threats to the lives of the workers. Frequently there is an outbreak of fire which is largely due to inflammable raw materials used here and inadequacy of fire fighting equipments and safety measures installed in these units. The apprehension of accidents is much higher in these illegal tanneries which often result in burn, amputation of body parts and even fatal accidents (Fig.3). The survey conducted on the workers has also revealed that they are prone to a number of diseases such as skin infection, lung disorder, eye irritation and breathing discomfort (Fig.4). The skin diseases are probably the most common ailment among the workers since they have to treat the raw hides with chemicals and the use of formic acid along with chromium is



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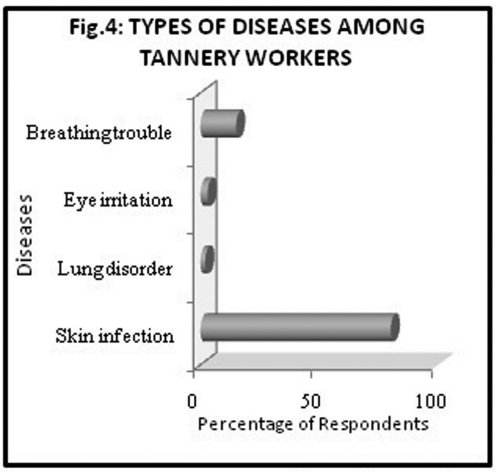
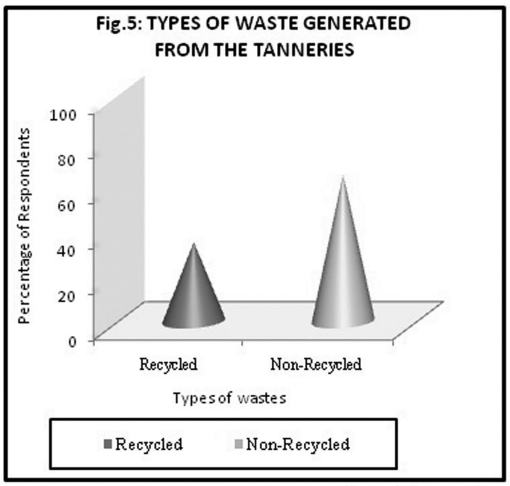


Source: Primary data

a regular practice for them. The workers are not given adequate safety equipment like nose masks, gloves and boots. One of the problems which deserve special mention is that the unskilled workers are never provided with adequate safety measures which pose a serious threat upon their lives. The factory workers also suffer from ill ventilation in the units which is reflected in their respiratory diseases. None of the workers enjoy facilities of life insurance.

Problems of the Local Residents

According to the local people of the area they mostly suffer from the problem of solid waste pollution coupled with emission of gases. The solid wastes like leather scraps and untreated raw hides and skins are dumped along the roadside, streets, open grounds and vats. These discarded solid wastes emit foul odour that further add to their inconvenience. The tanneries mainly dispose their wastes without recycling it (Fig.5). The acid and chromium rich water are released into open drains and local water bodies. In certain parts of Tangra, the solid wastes in the form of garbage are collected from the factories by KMC. But there have always been those inside and outside of Government who believed that voluntary compliance of industry is not sufficient to safeguard the public health for the reason that industry's financial interests often prevent it from doing what would be socially responsible (Markowitz, 2012). In order to solve the problem of pollution caused by waste generated from the tanneries, the local residents have complained several times to local civic authorities but many a times their attempts were in vain.



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Pollutants from the Tanneries

All the three categories of wastes- solid, liquid and gases are emitted from the tanneries in the form of: Waste water, Solid wastes and Gaseous emissions.

- *Waste water:* Water is used as the carrier for chemicals to render cleaning of raw hides and skins. The water after completion of the process is drained out in the same quantity as it was used in the process. This waste water is polluted in terms of biological oxygen demand (BOD), chemical oxygen demand (COD) and concentration of suspended solids, sulphide and chromium.
- *Solid waste:* The major solid wastes generated consist of wet trimmings, dry trimmings, wet shaving, buffing etc. During handling of raw skin which is contaminated with blood, hair, dirt and certain type of bacteria is removed and dumped. The main problem with the waste is their high chromium content.
- *Gaseous emissions:* In tanneries air emissions are produced from the stacks of boilers and generators and during the processing of leather. Though in some tanneries emissions are well from within the limits and pose no serious environmental threat. But hydrogen sulphide and ammonia gases which are emitted during different processes are responsible for health hazard of the workers.

Environmental Impact of Waste Generation and Disposal

Among all the industrial wastes, tannery effluents are ranked as the highest pollutants (Shen, 1999). One ton of hide or skin generally leads to the production of 20-80 m^3 of turbid and foul smelling waste water having chromium levels of 100-400 mg/l, sulphide levels of 200-800 mg/l along with high levels of fat and other solid wastes as well as notable pathogen contamination. About 40 heavy metals and acids are used for processing raw hides (UNIDO, 2005). According to Imamul Haq (1998), various chemicals are used during the soaking, tanning and post tanning processes. The main chemicals used include sodium sulphide, chromium sulphate, ammonium sulphide, ammonium chloride etc. Four metals lead, arsenic, mercury and cadmium are among the ten chemicals most commonly found at hazardous-waste sites (Hill, 2004). The direct discharge of these wastes tends to contaminate the ground and surface water with dangerously high concentration of cadmium, chromium, arsenic and lead. Pesticides are often added for hide conservation during transportation. The remnants of pesticides and effluents containing harmful chemicals are indiscriminately disposed in water and soil without treatment or recycling.

Most of the Indian rivers and other sources of fresh water are polluted by industrial wastes or effluents (Khullar, 2009). With solid wastes representing up to 70 per cent of the wet weight of the original hides, the tanning process comes at a considerable strain on water treatment installations. Tanning of hides is carried out with chromium sulphate at pH 3.5-4.0. After tanning the solution is discharged in drains. In the conventional chrome tanning process 20-40 per cent of the chromium used is discharged in water as hazardous substances. The waste water with a low pH is corrosive to water carrying systems and can lead to metal dissolving in the water.

Destination of Tanneries--*The Calcutta Leather Complex (CLC)*

The Government of West Bengal conceived the Calcutta Leather Complex project in the early 90s of the last century. It was planned as an integrated complex, housing all activities relating to the leather industry in a modern and environment-friendly manner. When the Hon'ble Supreme Court of India directed the tanneries of Calcutta be located beyond the city limits so as to reduce pollution in the residential areas, the creation of the Leather Complex became imperative.

During 1997-2003 the State Government acquired a 445 hectare plot at a cost of Rs.18 crore with an initial project cost of Rs.158 crore to develop the infrastructure of CLC at *Bantala*. The CLC was finally inaugurated on June 30, 2005. Over 400 old tanneries were allotted land in this new complex. A number of new tanneries have come up here. All processed and domestic waste water from the tanneries are treated in a Common Effluent Treatment Plant (CETP). The treated effluent is then discharged into the Karaidanga Storm water flow. The chromium bearing effluent is separately treated and chromium is recovered for reuse in the process. The *land use pattern* in CLC is as follows:

- Tanneries: 202 acres
- Leather goods units/ footwear units/ manufacturing units: 72.57 acres
- Raw material Mart, Chemical units, By-Product Units: 61.30 acres
- Public Utility Area viz. Hospital, Housing, School etc.: 67.17 acres
- Special Economic Zone (SEZ): 110 acres
- IT Park: 130 acres.

A total of 438 relocating tanneries have received lease hold land at the Calcutta Leather Complex and 138 new tanneries have purchased land directly from the BOT party at market rate. Out of these, 365 relocating and 98 new tanneries have received NOC for *Consent to Establish* from WBPCB. Out of the 365 relocating tanneries, 222 relocating tanneries have received NOC for *Consent to Operate*. 71 out of 98 new tanneries have also received NOC for Consent to Operate.

Industrial Pollution Control Measures adopted by the Pollution Control Board

The rapid industrial expansion in West Bengal has given rise to significant pressure on the environment. The industrial units have now become major point sources of pollution. One of the major mandates of the West Bengal Pollution Control Board (WBPCB), therefore, is to reduce industrial emission or effluent generation, and to control the quality of the same within safe

limits. Under the provisions of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981, any industry, operation or process or an extension and addition thereto, which is likely to discharge sewerage or trade effluent into the environment or likely to emit any air pollution into the atmosphere will have to obtain consent from the State Pollution Control Board. There are different types of consent issued under the provisions of the Water Act and the Air Act:

- *Consent for Establishment*: All the industries and activities needing consent must obtain Consent for Establishment before actual commencement of work for establishing the industry / activity.
- *Consent for Operation*: This consent, which is valid for certain duration of time, needs to be taken before actual commencement of production. The Consent for Operation is renewed after a certain period of time.

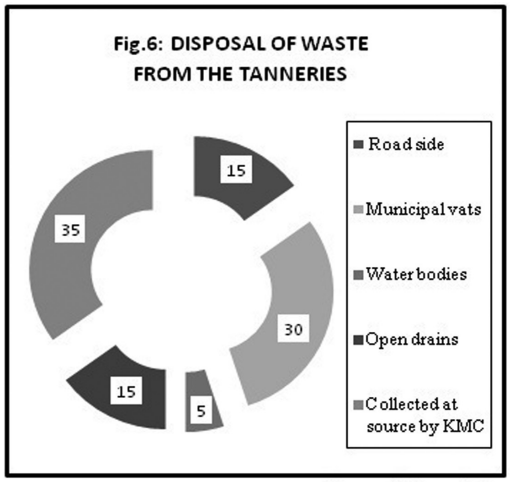
Industrial Categorization and Policy for Site Selection

According to the Pollution Control Board the Red category units have maximum pollution potential, the Orange category units have moderate pollution potential and the Green units have the least pollution potential. Further, considering the degree of pollution among the Red units, these are classified into 'Special Red' and 'Ordinary Red' categories. In addition, a few units under the Green category with no pollution potential are classified as 'Exempted' category units.

The WBPCB ensures that compliance to environmental standards is attained through negotiated agreements and technical guidance. Under the current sitting policy of the Board, the Red industries are not permitted in Kolkata Metropolitan Area (KMA) areas, and Orange industries are not permitted in Kolkata Municipal Corporation (KMC) and Howrah Municipal Corporation (HMC) areas, except the industrial estates of KMC and HMC. This policy does not permit a few water-intensive and highly polluting industrial units having high water consumption within 10-km radius of the Calcutta Leather Complex at Bantala.

Major Findings

From the study conducted on the residents of the area it was found that 70 per cent of them live in the area for more than five years. They suffer from various symptoms of pollution. They have complained a number of times to the local civic authorities and to various Non-Governmental Organizations (NGO) regarding their problems without any result. The local residents have been satisfied with the performance of NGOs to some extent. According to the local people, they are most dissatisfied with the problem of solid



Source: Primary data

waste which is disposed along the streets and in open vats (Fig.6). The non-recycled chromium rich water is drained out in open drains and in nearby water bodies. In certain parts of Tangra the solid waste is cleared by Kolkata Municipal Corporation from open vats or sometimes the wastes are collected directly from the factories. The residents of the area were of the opinion that chances of child labour in hazardous tanneries are quite high. The NGOs and KMC have taken steps for clearance of hazardous waste from the area with effective results in some parts of the area.

The study conducted on the workers has revealed that they too suffer from health hazards from the wastes generated and during the processing of raw hides and skins. The acid and the chemical used in the factories often lead to skin problems and corrosion of the skin. The acid used here sometimes cause skin burning. Inadequacy of the safety measures especially concerning use of the gloves has aggravated the problem. The tanneries in the area are prone to fire hazards as well. The area has witnessed some of the worse outbreaks of fire in recent years; since the tanneries use inflammable raw materials and availability of fire fighting equipments are also inadequate. Fire hazards have sometimes proved to be worse, threatening the lives of the workers. Apart from inadequacy of the fire fighting equipments the other problem is regarding the maintenance of equipments. Often the fire extinguishers are not properly maintained and thus become outdated. The problem of outdated machineries has also cropped up in recent years. This has resulted in decrease in output as well as the occurrence of industrial accidents.

Suggested Remedial Measures

Based on field investigation and pollution related data available, some remedial measures have been suggested which could improve the condition of the tanneries-

i) The tanneries should develop an environment management system to control the intensity of pollution.
ii) The workers should be trained to avoid occupational hazards and must be provided with adequate safety measures like gloves, nose masks, boots, aprons etc. Gaseous masks are the most important safety measure in order to prevent inhalation of fumes which must be given to unskilled workers as well.
iii) Proper arrangement should be made regarding disposal of wastes. Indiscriminate disposal of non-recycled waste must be avoided.
iv) Measures need to be taken immediately for reuse of chromium discharged in the tanning effluent.
v) Labours should come under Life Insurance Policy and Mediclaim.
vi) All tanneries should come under the purview of Environmental Impact Assessment (EIA) followed by necessary action.

Conclusion

The municipal wards of 65, 66, 67 and 108 have quite dense urban residential agglomeration where the location of illegal tanneries has posed a threat on the health of the residents. Apart from the Tiljala and Topsia, a part of Dhapa area is also noted for illegal tanneries and a number of other polluting units like rubber, plastic and chemicals. The tanneries have contributed largely to the area's pollution

and environmental degradation. Attempts have been made for creating awareness among workers to control pollution. A number of steps have been initiated by the Governmental authorities regarding up gradation of environment in the area and also for protection of workers against health hazards. Thus what is required in these areas is the development of sound Industrial Ecology (IE) which will provide a foundation for sustainable industrialization. A corollary objective of IE is the repair of past environmental damage and restoration of ecosystems (Wang et.al, 2004).

Acknowledgement

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