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Jamshedpur River Water Contentment Of Heavy Metal Effects On Human Population

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Abstract

The Subanaleka and Kharkai rivers are the life line of Jamshedpur. These water rivers are the heritage, cultural and religious value of the neighboring people of Jamshedpur. The total flow of both rivers is heavily influenced by human activities, urban and industrial waste water, especially in Jamshedpur. High risks are charged for many parameters. Cyanide lead and iron levels are very high. Some heavy metals are important biological agents, but the bio-toxic effects of many heavy metals in human biochemistry have received much attention. Therefore, it is necessary to have a good understanding of the elements that make them dangerous and the related processes such as oxidation. It is also important to understand the source of pollution, which is the essence of life, the washing process, chemical changes and its patterns in the environment. Evidence suggests that these metals are released into the environment by natural and anthropogenic means, particularly mining and industrial activities and vehicle emissions. They enter the soil, mix with waterways and end up in rivers or are washed away by rivers, causing water and soil pollution. Intoxication and toxicity in ecosystems often result from exchange and coordination mechanisms. When ingested, they produce stable bio-toxic substances that degrade their structure and affect their biological activity. This article reviews some heavy metals and their effects and biotoxic effects on humans.

Keywords: Human Health, Heavy Metal, Wastewater, Water pollution Toxicity.

INTRODUCTION

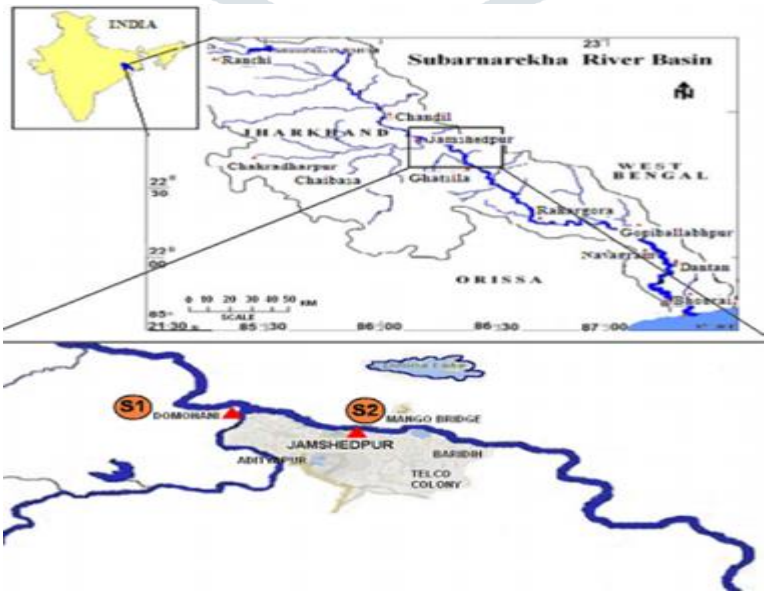

fig. 1. map of subarnrekha river

Jamshedpur is the largest city in Jharkhand. In addition to many small businesses and homes, there are five major steel industries. It is located in the middle of the Subarnarekha valley, at the angle formed by

the Kharkai and Subarnarekha rivers. The Subarnareka River is an intertidal river that flows through the states of Jharkhand, West Bengal and Odisha and empties into the Bay of Bengal. The factory in Jamshedpur receives its municipal and industrial water from the Subarnareka River and discharges its waste water into the river. Waste water from coke ovens and products, cobalt batteries, blast furnaces, sinter plants, power plants, steel mills, lime and dolomite plants, foundries, refractory materials, metal refining and electroplating plants; There are large amounts of cyanide, thiocyanate, ammonia, phenolic compounds, TSS, organic and organic acids. Iron content is part of the environment. Their presence is considered special because once they enter the environment, they are very difficult to remove. Iron is one of the most important chemicals encountered in many workplaces and environments. Due to the prevalence of exposure to toxic substances, the effects of toxic substances on human health are now a major concern. With the increasing use of metals in industry and daily life, the problem of environmental pollution caused by toxic metals has become very serious.

Fig.2 River Subarnarekha at Do muhani

SOURCES AND EMISSIONS

Chemicals are often affected in the environment by industrial wastewater, organic waste, waste incineration, transportation and electri city generation. Depending on whether they are gaseous or granular, they can be carried by the wind kilometers away from their source. Metal pollution is eventually washed out of the air into the ground or into the water. Therefore, air is also a way of polluting the environment. Metal-containing waste water is an important source of metal pollution in the hydrosphere. Another form of decentralization is the transfer of wastewater from water sources contaminated with mining and smelting wastes. Base metals in wastewater are shown in Table 1.

Table 1: **Toxic** Metal in Industrial Effluents

Metal	**Manufacturing Industries**
Arsenic	Phosphate and Fertilizer, Metal Hardening , Paints And Textile
cadmium	Phosphate Fertilizer, Electronics, Pigments And Paints
chromium	Metal Plating , Tanning, Rubber And Photography
copper	Plating, Rayon And Electrical
Lead	Paints, Battery
Nickel	Electroplating , Iron Steel
Zinc	Galvanizing, Plating Iron And Steel
Mercury	Chlor-Alkali, Scientific Instruments , Chemicals

TOXIC EFFECTS

In general, the toxicity of metal ions effects to animals is due to the chemical interaction of the ions with cell systems, enzymes, and membrane systems. The target body for specific iron toxicity is usually the organism that produces the most iron. This usually depends on the metal's exposure and chemical composition, e.g. valence state, volatility, lipid solubility etc. The purpose of the body and the medical consequences of prolonged iron exposure are shown in Table 2.In addition to the toxicity of iron, today we are concerned with the potential carcinogenicity of iron compounds. Some metals, such as chromium and nickel, have been associated with cancer in exposed persons. Iron has been shown to cause severe and chronic pain in humans and other laboratory animals. The effects of various metals are briefly described below.

Table 2: Clinical Aspects of Chronic Toxicities

Metal	Target Organs	Primary Sources	Clinical effects
Arsenic	Pulmonary Nervous System, Skin	Industrial Dusts, Medicinal Uses Of Polluted Water	Perforation of Nasal Septum, Respiratory Cancer, Peripheral Neuropathy: Dermatomes, Skin, Cancer
Cadmium	Renal, Skeletal Pulmonary	Industrial Dust And Fumes And Polluted Water And Food	Proteinuria, Glucosuria, Osteomalacia, Aminoaciduria, Emphysemia
Chromium	Pulmonary	Industrial Dust And Fumes And Polluted Food	Ulcer, Perforation of Nasal Septum, Respiratory Cancer
Manganese	Nervous System	Industrial Dust And Fumes	Central And Peripheral Neuropathies
Lead	Nervous System, Hematopoietic System, Renal	Industrial Dust And Fumes And Polluted Food	Encephalopathy, Peripheral Neuropathy, Central Nervous Disorders, Anemia.
Tin	Nervous Pulmonary System	Medicinal Uses, Industrial Dusts	Central Nervous System Disorders, Visual Defects And EEG Changes, Pneumoconiosis.
Nickel	Pulmonary, Skin	Industrial Dust, Aerosols	Cancer, Dramatis
Mercury	Nervous System, Renal	Industrial Dust And Fumes And Polluted Water And Food	Proteinuria

1 Arsenic:

Soluble inorganic arsenic may have direct biological effects human and animals. Consuming large amounts can cause gastrointestinal symptoms such as severe vomiting, blockage of blood vessels and nerves, damage to the nervous system and eventual death. While not fatal, these high doses can reduce the number of blood cells in the blood, make red blood cells, enlarge the liver, dry the skin, cause tingling and loss of sensation in the limbs, and cause brain damage. Prolonged exposure to inorganic arsenic in drinking water in Taiwan led to black foot disease, severe damage to blood vessels in the lower extremities, and eventually gangrene. The relationship between arsenic exposure and other health effects is unclear. Strongest evidence for high blood pressure, heart disease and other circulatory diseases. Evidence on diabetes and reproductive health is weak; most vulnerable to stroke, long-term neurological effects, and cancers of areas other than the lung, bladder, kidney, and skin. And other skin changes such as hyperkeratosis and pigmentation changes. These effects have been demonstrated in various studies using different research methods. Correlation-response and risk factors were assessed for each endpoint. Its effects have been most thoroughly studied in Taiwan, but population studies in other countries have also provided plenty of evidence. It has been reported that drinking water with an arsenic concentration of 50 µg/L increases the risk of lung and bladder cancer and arsenic-related skin cancer. Occupational exposure to arsenic (by inhalation only) has caused cancer. Correlation-response and high risk were observed. An increased risk was observed at prevalence ≥ 0. 75 (mg/m3) × years (eg 15 years exposure to studio air at a concentration of 50 µg/m3).

Human Health Effects Lead is a heavy metal even at very low levels of human exposure. Effects in humans can be acute or chronic, depending on dose and exposure. Due to its toxicity, it targets all the targets of many organs of the body, causing nerves, heart, kidneys, intestines, blood and reproduction. People's exposure to lead is usually detected through blood tests. Lead stored in bones can manifest later in a person's life as remobilisation from lead exposure. The result is often from breathing dust, lead-contaminated air, and eating food, water, and dust. Inhalation is an important route of exposure for people near the site, including in places with lead pollution, countries that still use lead oil, where lead waste is incinerated, and where lead is recovered. Besides consuming lead in food and drink, the main source of exposure is lead paint. House dust containing lead paint can be inhaled by adults and children and ingested by children with pica.

2 Cadmium:

Human health effects excess of cadmium is through inhalation and consumption, although the main health effects documented in the research studies that dietary (kidney and bone damage) and absorption through smoking and work (lung damage). Diet accounts for 90% of all exposures in nonsmokers. Cadmium in the enviro nment is toxic to plants, animals and many organisms. Cadmium does not transform into less toxic products in the environment, causing it to bioaccumulate in the kidneys and liver of vertebrates and invertebrates. Cadmium enters the environment from many anthropogenic sources.

Wastewater is the main source of cadmium pollution in the environment, and industrial waste gas emissions and the use of large quantities of fertilizers cause pollution. Plants such as rice and tobacco grown in

contaminated soil absorb cadmium and expose humans to dietary (and inhaled) cadmium. However, human exposure can also occur when soil containing cadmium is degraded and dust is inhaled. Eating a diet rich in meat (especially liver and kidney) or seafood will lead to a high intake of cadmium. 72 Cadmium is not essential for biological activity in humans. The main human organ affected by cadmium exposure, both in the general population and in the workplace, is the kidney. Smokers and people with low iron levels are thought to be particularly at risk. The second main effect is bone damage, either as a secondary response to kidney damage or as a direct effect of cadmium on bone.

3 Mercury:

The main effects of mercury on human health and the environment affect human health Mercury toxicity depends on whether it contains elemental mercury, inorganic mercury or organic mercury compounds (especially methylmercury and alkylmercury compounds such as ethyl methyl salts and di methyl mercury). Therefore, exposure to different forms of mercury varies and affects toxicity testing. In the case of methyl mercury, the main source of human exposure to methyl mercury, particularly seafood and fish, is diet. About 80% of inhaled mercury vapor remains in the lung tissue and continues to cross the blood-brain barrier, causing neurological effects. Ingestion of mercury content does not necessarily result in inhalation, but death has been reported. Inhalation of mercury vapor has been shown to cause symptoms such as tremors, mood swings, insomnia, memory loss, neuromuscular changes, and headaches, as well as effects on the kidneys and thyroid. Acute liver injury can be fatal, but its main effects are neurotoxicity and nephrotoxicity. The main route of human exposure to inorganic mercury is through food, but for some populations, skin whitening creams, soaps, and products used in medical and/or cultural practices can result in significant exposure to both inorganic and essential mercury. Methylmercury is a well-known and potent neurotoxin that can affect the human brain. It easily crosses the placenta and blood-brain barriers, so anything exposed during pregnancy is a major concern. The International Agency for Research on Cancer considers methylmercury to be a possible carcinogen.

4 Copper:

Copper is a naturally occurring metal found in soil at an average concentration of about 50 parts per million (ppm). It is found in all animals and plants and is an important part of food for humans and animals. The main sources of environmental copper emissions include copper mining, smelting and refining, industries that produce copper products such as steel, pipes and plates, and the burning of fossil fuels. Most of the water pipes will be made of copper, while the bathroom equipment will be made of copper and copper containing copper. The main source of copper in drinking water is copper that seeps into acidic water from pipes and bathroom fixtures. Blue-green spots left in the bathroom are a sign of copper in the water. Other copper releases to the environment include agriculture for the control of plant diseases and water treatment to remove algae. Health Effects Absorption/ Metabolism Oral absorption of copper has been investigated and the percentage of absorption has been found to be 24-60%. Factors influencing absorption include competition with other metals, such as copper in foods and iron and zinc in foods. There are no studies examining copper absorption. Absorption through the skin is also unclear, but some research suggests it's too low. Useful copper is part of many enzymes necessary for the metabolic activity of the body. The recommended daily amount of copper (RDA) for adults is 0.9 milligrams (mg). Average copper intake for Americans. The usual dietary intake is 1 to 1.6 mg per day. The maximum safe dose for long-term (chronic therapy) is 10 mg/day. Copper-rich foods include shellfish, offal, nuts, beans, and cocoa. The effects of copper deficiency include anemia, low white blood cell count, osteoporosis in infants and children, and connective tissue disorders that lead to bone problems. Short Term (Specific) Side Effects of excessive copper intake can cause gastrointestinal disturbances with symptoms such as nausea, vomiting and abdominal pain. At sufficiently high doses hepatotoxicity occurs and causes death. Over exposure to copper can damage red blood cells, possibly leading to anemia. Long-Term (Chronic) Effects Mammals have good mechanisms to conserve copper stores in the body and therefore often prevent them from eating too much. However, prolonged exposure to high enough levels of copper can damage the liver and kidneys. Wilson's disease is a genetic disease in which copper accumulates in the liver. Symptoms of hepatotoxicity (jaundice, swelling and pain) are not usually seen until puberty. Carcinogenicity (possibility to cause cancer) Although some studies of workers exposed to copper show an increased risk of cancer, they are also exposed to other carcinogens in the workplace. Animal studies show no increased risk of cancer. Copper is currently classified by the EPA as a Class D carcinogen (insufficient evidence for classification) and has not yet been evaluated for exposure to new cancer-causing agents are Growth. There are no reports of growth in individuals with high copper levels. Some studies in animals receiving high doses of copper have observed developmental disorders such as delayed growth and development, delayed bone formation, and reduced pup size and body weight.

5 Nickel:

Nickel is a compound found in low concentrations in the environment. People use nickel for many different applications. The most common applications of nickel are metal products and other metal products. It can be found in metal products such as jewelry. Normal foods contain small amounts of nickel. Chocolate and fat are known to be too much. When people eat more vegetables from contaminated soil, the nickel increase. Plants are known to store nickel, so an increase in nickel from vegetables can be significant. Smokers absorb more nickel from the lungs. Finally, nickel can be found in hand sanitizers. People can be exposed

to nickel by breathing, drinking, eating or smoking. Nickel exposure can also occur through skin contact with nickel-contaminated soil or water. A small amount of nickel is required, but can be harmful to human health when it consumed in large quantities. Effects of excessive nickel intake include. Increased risk of lung, nose, throat and prostate cancers Pain and dizziness effects nickel gas exposure Respiratory failure, pulmonary embolism, birth defects, asthma and chronic lung disease, allergies such as rash (from jewelry only), heart disease. Nickel fumes can irritate the lungs and cause pneumonia. Exposure to nickel and its compounds can cause a dermatitis known as "nickel itch" in sensitive individuals. The first symptom is itching, which usually occurs within 7 days before the rash appears. The initial rash is erythematous or follicular, followed by skin ulceration. Nickel sensitivity, once acquired, seems to last forever.

6 Tin:

Scientists use many tests to protect the public from the dangers of chemicals and to find ways to treat the injured. One way to tell if a drug is harmful to the body is to determine how the body absorbs, uses, and releases the drug. Animal testing is required for some drugs. Animal testing can also help identify health problems such as cancer or fertility. Without laboratory animals, scientists lose an important source of information they need to make informed decisions to protect public health. Scientists have a responsibility to treat research animals with care and compassion. Because current laws protect the welfare of research animals, researchers must follow strict animal care guidelines. Inorganic tin compounds are generally not harmful as they quickly enter and leave your body after you inhale or eat them. However, people who ingested unhealthy foods in large quantities developed stomach ulcers, diabetes, and liver and kidney problems in studies. Studies of inorganic tin in animals have shown effects similar to those seen in humans. There is no evidence that inorganic tin compounds affect reproduction, birth defects, or cause genetic changes. It is not known whether inorganic tin compounds cause cancer. Some organic tin compounds have been shown to be harmful to humans by inhalation (inhalation), oral administration (consumption), or skin contact (particularly through the skin), although serious effects may be due to the particular organic tin compound. Skin and eye irritation, respiratory problems, gastrointestinal disturbances, and neurological problems have been reported in humans with short-term exposure to large amounts of certain organotin compounds. Some neurological problems persist for years after poisoning has occurred. Deaths have been reported following high doses.

7 lead:

Most of the studies seen for a link between lead and cancer have focused on workers exposed to high levels of occupational (occupational) lead. The study found that people with high levels of lead in the workplace had blood le ad levels several times higher than the general population average. Many studies have seen for a link between workplace lead exposure (mainly battery manufacturing workers and smelters) are effected lung cancer. Some of these studies show a small risk of cancer. However, most of these studies are limited in that they do not include other factors that may affect cancer risk, such as smoking or exposure to arsenic or other heavy metals, which often occur with lead in the workplace. Some studies of blood lead effect in the general population have also found a small risk of lung cancer in people with higher lead levels . Several studies found in the same case also studies of breast cancer risk. Most studies have shown that the more lead, the higher the risk of cancer. While these results do not appear to be affected by smoking or arsenic exposure, studies do not include other factors that may affect cancer risk. Studies have also examined links between lead exposure in the workplace and other cancers, including cancers of the brain, kidney, bladder, colon, and rectum. The results of these studies have been mixed. Some studies found a link, others did not. The link between lead exposure and cancer is a matter of concern, and more research is needed to determine the link between lead and many cancers.

Conclusion:

Conclusively, based on experimental studies, the advances of toxicology has improved our knowledge about human exposure to toxic elements (metals and metalloids) and their health effects, such as developmental retardation, several types of cancer, kidney damage, endocrine disruption, immunological, neurological effects and other disorders. The ongoing research works throw more light onto new insights and biochemical and molecular mechanisms involved in the development of pathological conditions in human. Pollution has been a major cause in the decline of the water quality of the Subarnarekha River and this pollution is caused by effluent discharge and anthropogenic activities such as mining activities. Many important industries are located on the banks of the riverand they have been a major source of the pollution. To bring about sustainability of the river environment, certain remedial measures need to be taken. Certain pollution control acts such as the Water Prevention and Control of Pollution Act of 1974 (Bhatia et. al., 1994) deals with the building of wastewater treatment plants. Such measures would lead to a fall in the TDS discharged into the river as well as lowering of the BOD and problems such as euthrophication will reduce. Cleaning up of contaminated riverine sediments may also be a good answer (Kraft, 2006; JUSCO ,WSP ,2006). This cleanup act usually faces resistance from industries and municipalities due to the high cost associated with waster water treatment (Kraft,2006). However it should be kept in mind that good quality water is a basic necessity for sustaining a healthy life in all aspects. Awareness has increased with more and more private public partnerships (PPP) working to provide clean and safe water to the people who are directly dependent on the river for their living (JUSCO, 2011). Capital Investments and Asset ownerships are owned by both the public and private enterprises (JUSCO, 2011). However, a lot more needs to be done in the case of the Subarnarekha River.

4. RESULTS AND DISCUSSION:

fig. no. 3 cancer patient

From the above studies we found most of the disease of cancer is related to these havey metals found in river water because a big population of Jamshedpur lives in the east singhbhum area they are effected these disease because in these area there is no pure water supply and there is not any water treatment plant. People are drinking drilling water and well water and the river water direct supply by nulls. So for these problems company only solution is to built a water treatment plant in east singhbhum, and the related sites of river subernrekha.

The quality of water is a vital subject for mankind due to the fact that it's miles at once connected with human lifestyles. it's miles a matter of history that faecal pollutants of ingesting water precipitated water borne diseases which worn out whole populace of towns. At present, the threat of water-borne diseases and epidemics still looms massive at the horizons of growing nations. Polluted water is the perpetrator in all such instances. The physical verification and experimental results of water samples from January 2011 to January 2012 indicate that the Subarnarekha River is quite polluted in Jamshedpur. The fine of water isn't always suitable for home, business and agricultural uses. The polluted water is the supply of water borne diseases in the locality of Jamshedpur. humans are tormented by dysentery, diarrhoea, typhoid and paratyphoid fever, cholera, jaundice, polio, ulcer, skin illnesses and many others. the polluted water is likewise harming agricultural crops, aquatic life, animal life and business devices.

The water pollution in Subarnarekha River is because of:

1. Industrial waste water
2. Municipal sewage
3. Domestic sewage and waste water
4. Agricultural waste and waste water
5. Some other occasional and seasonal factors like Cremation, statues immersion, human excreta and urine, animal excreta etc.

The test of quality of water at unique web sites of the river, suggest that the economic waste and waste waters containing dangerous chemical compounds are causing most important pollution. Industries placed in and around Jamshedpur are discharging their untreated waste water without delay into those rivers, destroying the first-class of water, M/s. Tata metal and related organizations are on the pinnacle of the listing of water and air polluters. An average survey of the outcomes of parameters studied and feasible measures for controlling water pollutants are discussed underneath: Subarnarekha River gets the waste water from Tata steel thru Sun sun gharia drain (website online – 1) and Garam nala (website – 2). high values had been acquired for a number of parameters at website – 1 PH - five.60 to 7.zero Alkalinity - 60.zero to a hundred and forty.0 mg/l overall hardness - forty nine.5 t0 131.four mg/l Cyanides - 0.67 to at least one. eighty mg/l Phenols - 4.zero to eight.2 mg/l Iron content - three.22 to a few.42 mg/l Mercury content - as much as 0.02 mg/l Chromium (VI) - Up to 1.03 mg/l precise conductance = as much as 828.zero μ – mhos/cm, Low DO. excessive BOD, COD, TSS, TDS and faecal coli paperwork were received. The river water at this web page is exceptionally acidic. consequently, the monetary cost of the water for ingesting and washing functions is lost. additionally, aquatic life could no longer live on in this extraordinarily acidic water. The cyanide content material may be very excessive. free cyanide (as CN or HCN) is toxic. It interacts with ferric haem moiety of cytochrome oxidase and blocks respiratory. Phenolic compounds are also very high. simple phenolic compounds often are biocidal. lower kinds of existence, usually, are more seriously affected than better bureaucracy and aquatic paperwork more so than terrestrial or avian. diploma of toxicity varies significantly with the specific compound. Phenols impart such an objectionable taste and odour to water and food that poisonous exposure seldom happens. even though that is fortunate, it creates the economic hassle of removal of the characteristic medicinal taste of phenols in water or the disposal of phenol tainted fish. Iron content material is also very excessive. As a ways as it's miles regarded, human beings suffer no harmful impact from consuming water wealthy in iron content but it's miles mistaken for processing food, beverages, laundry operations etc. If this water will be used for boiler, then it will cause a stated blockading of the pipes collectively with rusting of the iron pipes. The boiler can also get chocked because of the presence of iron as crimson mud. The high attention of Cr (VI) has following unsafe consequences.

1. It affects the biochemical reactions of lower as well as higher plants.
2. It causes skin disorder and liver damage.

3. It is oncogenic (carcinogenic).

The chromium concentration in urine provides information about the current exposure to water soluble chromium (VI) and about the body burden of chromium. Mercury content is also high. Methyl mercury is highly toxic. It causes irreversible nerve and brain damage. Methyl mercury poisoning also leads to segregation of chromosomes, chromosome breakage in cells and inhibited cell division. The BOD and DO factors indicate a self-purification ratio of 2 . 44 and the required degree of treatment is 73.6%. This is a very high value which indicates that total processes of treatments are required. The self-purification ratio of such rivers is 3. Site – 1 receives effluents from power house No.4 in the form of fly ash slurry and from coke-ovens and coke-oven by-product plants. The effluents from power House No. 4 are presently taken into Ash pits for removal of fly ash, before discharging the water into Sunsungharia drain. This is not adequate measure. A pond should be created after constructing suitable bunds for ponding of fly ash. Clear water from the pond may then be allowed to flow into Subarnarekha River. Coke oven and Byproduct plants effluent which carries harmful phenols, thiocyanates, cyanides etc. should be treated in a biological oxidation plant (pond) before discharging the effluent into the Sunsungharia drain and then into the river. The coke oven batteries may be charged by a new method.

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