

STUDY OF SOME SELECTED HEAVY METALS IN WATERS OF SEA VIEW AT CLIFTON KARACHI AND AT PASNI GAWADER (A CASE STUDY)

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ABSTRACT: The motive of systematic indagation and investigation was to report the grade and the dispersal confirmation of heavy metals in the shoreline's aqua pura acquiring incessant acquittal of native and industrialized and manufacturing contagion and wastages through the Sea View Point Karachi and Point J.T Pasni Gawader. The areas were focused on the scenario of further expansion as an international maritime by the state. An atomic absorption spectrophotometer technique was used, comparing the intensities of the samples. The outcomes of the indagation specify that the averaged quantities of every metal (Cu, Fe, Mn, Ni, Pb&Zn) which were considerably greater than the standardized figures. Besides, the magnitudes of heavy metal effluent in the aquatic trials were in subsequent downswing direction $Zn > Mn > Fe > Cu > Ni > Pb$. Relating to the additional metallic element, the Zinc ratio was remarkably great and its foremost cradle of affluence could be the local and industrialized acquittal of wastage as well as freight activity. The outcomes of indagation and research consequently recommend that integrating prompt curative steps can tackle effluence and assist in attaining sustainable development socially and economically.

Keywords: Heavy Metals, Atomic Absorption Spectrophotometer and Environmental Pollution

1. INTRODUCTION

Pakistan is positioned near the entrance of the Persian Gulf. It finds nearer to India, Oman and Iran and the inland central Asia-pacific states and territories. Pakistan is accordingly come up with a righteous fortune to advantage from the geographical and strategic state. Nonetheless, increments in the coastline and seaboard territories and dilapidation of the ocean and maritime wherewithal of the country are rising as significant conservation intimidations requiring instantaneous effort.

Pakistan exhibits shoreline nearly 990 kilometers alongside a littoral precinct of 240,000 square kilometers in the north of Bahr-el-Arab, which can be scouted and advanced into newfangled harbors, tourists' resorts, manufacturing sites, and industries. It covers two separate distinctive divisions, the acquiescent verge of Sindh, which spans over 370 kilometers and another dynamic verge of the Balochistan coastline which elongates over 760 kilometers. Pakistan engrosses a highly significant place on the dynamic trade and commercial and routes of supplying oil resources from the Persian Gulf to the locality of Pakistan are also accessible from the Red-Sea. This topographical place offers a fortune to Pakistan for leading the decisive elongations and imperative routes athwart the Bahr-el-

Arab.

There are effluents viable and non-viable mediums in the coastline region of Pakistan. The viable mediums include mangrove forestry alongside Sindh and Balochistan Coast with Indus Delta harboring the 6th largest mangrove forests of the entire world. These merchandises and amenities are both traded and marketed, for instance, fish, lobsters, crawfish, crustaceans and non-trading, for instance, mangroves for their pharmaceutical purposes and their roles as nursing places for adolescents fish and bulwarks beside storm surges. These goods and chattels and amenities have an enormously significant considerable and tactical value for a long duration.

The coastal and marine areas of Pakistan produce about 596,980 metric tons of marine fish and 25,000 metric tons of shrimp while it exports about 131,000 metric tons of fish worth Rs. 7.272 billion. There are other Port Qasim, Gwadar and some small Jetty. Port Qasim is Pakistan's second busiest port, handling about 35% of the nation's cargo (17 million tons per annum). It is located in an old channel of the Indus

River at a distance of 35 kilometers east of Karachi city center. The study area of Karachi as shown in Figure-1

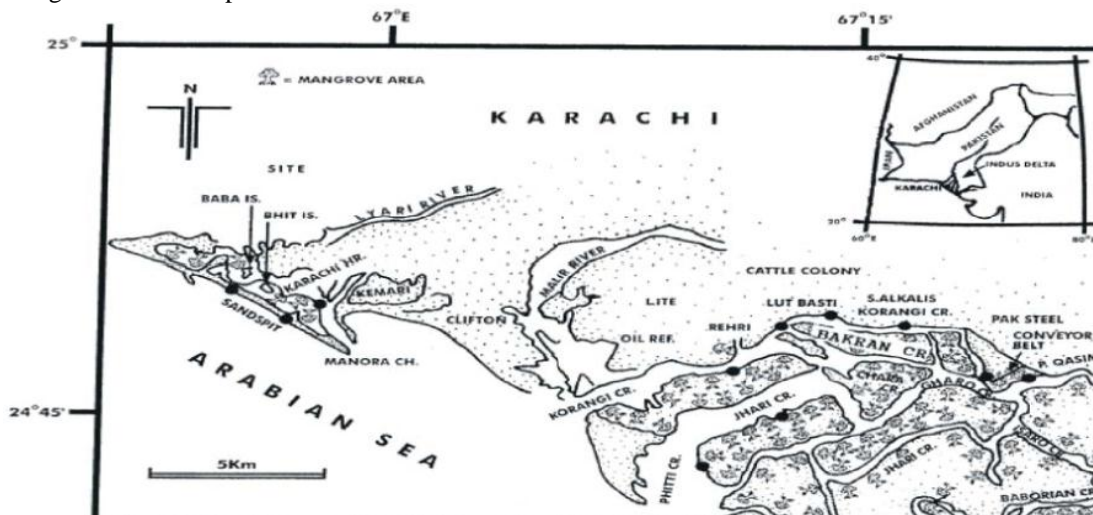


Figure- 1. Map showing study area (Sea Viewpoint Clifton)

A huge quantity of conservation concerns in the coastline state of Pakistan has been rising, which exhibits an uninterrupted stance on the community's health status near the littoral regions. The underprivileged public health and deprived supply of water for consuming and dumping of unrefined dung and dumping of local domestic debris and unaddressed clearance of industrial and manufacturing wastes and trashes producing contagion, affluence and threats to community health. By means of various anthropogenic actions such as domestic refuse, industrial, manufacturing processes and waste materials, develop pollution because of heavy metal releases into the environs. Smelting, mining, and the associated actions are one of the significant origins by means of which florae, topsoil and exterior layers H₂O are contaminated. Acid mine drainage and heavy metallic effluence are too essential trepidations where discarded materials comprising metal surplus in sulphides from excavating action have been put in storage or unrestrained.

Escalating intensities of pollutants near to littoral regions of

Pakistan, which are considerably tied to amplify the measurements of trade and business by means of the shipment business via the Karachi Port which is sternly polluting the mangrove afforests and oceanic lifecycle in the region. The shoreline advancements accomplishments encompassing synthetic amendments of the coastline surroundings have correspondingly speeded the influences of effluence leading to the corrosion of coastline conservation quality, diminution of coastal chattels, hazards to public health and loss of biodiversity. Pakistan is exploring the probability and practicability of emerging an "energy-corridor" for shipping oil lubricants and merchandise to China as well Central Union via Pakistan. "PR China" is currently tied up for the edifice of an unfathomable set-up port in Gwadar. Pakistan is making strategies to advance it as a trade and also as the energy-corridor with China & Central-Asia. All these accomplishments will exercise undesirable bearing on the brittle maritime ecological system. The Coastal Area of Gwadar as shown in Figure-2.

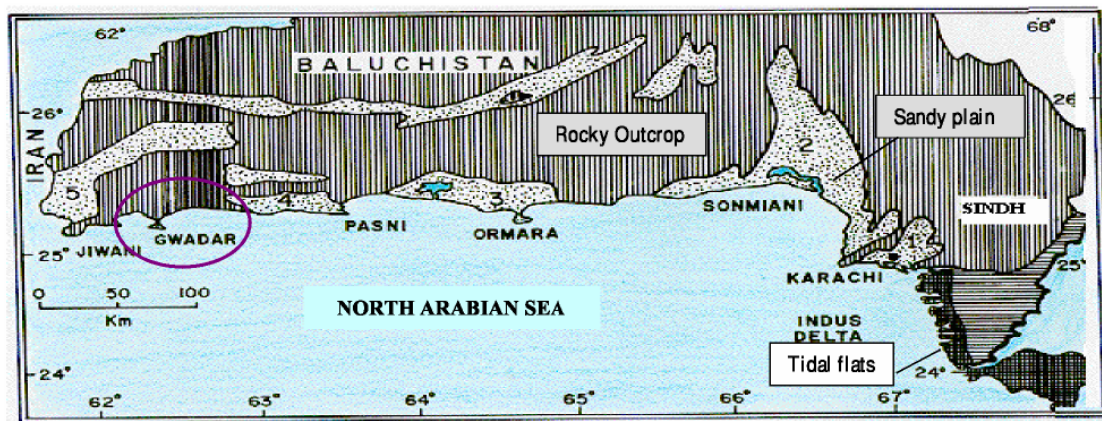


Figure-2. Map of Pakistan coast showing the study area.

The occurrence of metals in excess of natural loads is a problem of serious concern [1]. This is attributed to the rapid population increase, industrial development, urbanization, and agricultural practices [2]. Some of these metals are extremely dangerous to human health, such as Cd accumulation is associated with hypertension, osteomalacia and itai-itai disease [3-4]. Lead poisoning has been associated with permanent brain damage, behavioural disorders and impaired hearing [3, 5]. Toxic and essential metals enter the aquatic environment through natural and artificial processes that involve weathering of rocks and soil, dissolution of aerosol particles in the atmosphere, oil spillage, sewage effluents, auto-emissions, dredging activities, and industrial effluents [6]. With increased diversification in industrialization and extensive use of metal-based fertilizers, such as phosphate and ammonia fertilizers in Pasni, the concentration of metal pollutants in the fresh-water reservoirs is expected to rise through natural run-offs [7]. A high percentage of acid leachable metals, such as Fe, Mn, Zn, Pb, Cu and Ni, have been reported for some lakes in Nigeria [8]. After entering the water, metals may precipitate, get adsorbed on a solid surface, remain soluble or suspended in water, or are taken-up by fauna and flora, eventually accumulating in marine organisms that are consumed by human beings [6,8-9]. The

presence of metal pollutants in fresh and marine waters has been found to disturb the delicate balance of the aquatic ecosystem, including the concentration of some metals in the body tissues of fish [10-12].

In the innate nautical ecologies, ores (metals) exist, usually in nanogram to microgram points. Nevertheless, a few of the metal ores take place at smaller quantities in exterior H₂O are exist in large amounts in the conforming deposits and remains, and fishes in the oceanic environs [10, 2, 12]. For that reason, it is obligatory to comprehend the bio-magnification echelons of a few metallic ores in the dregs and flora and fauna in the nautical ecosphere.

Pollution in the aquatic medium due to anthropogenic doings at this time has come about as wide-reaching ecological distress [13]. Numerous investigators have stated that noxious effluence from municipalities, boroughs and fields emancipation of non-refined burghs, civic and effluence of commercial and manufacturing units, extravagant nutrients and oil lubricants and spills, progressively intimidates survives and non-survives resources in the watercourses, coastline and aquatic environs [14-18]. Henceforth, surveillance of nautical shoreline surroundings is vital to comprehend the basis, dissemination, providence, and stance of oceanic noxious waste in order to structure a practicable managing

stratagem [19].

Effluence in ores (metals) is contemplated as one of perilous and noxious waste in the biosphere due to their poisonousness, dilgence, and a threat to anthropoids, nautical existence and damage for a long duration to the environs [20-21]. Usually, the heavy metals are contemplated as xenobiotic chemicals for the reason of not producing a constructive part in physiological processes and are very detrimental though existing in negligible magnitudes. Toxic metallic compounds include cadmium, beryllium, aluminum, uranium, mercury, lead, bismuth, barium, antimony, arsenic, etc. Furthermore, these metallic ores for instance, like manganese, zinc, iron, and copper are vital trace micro-nutrients. Nonetheless, in the ether, topsoil and aquatic part above the admissible restrictions, these metallic ores can develop a threat to all entities.

The Harbor zone of Karachi is now contemplated to be the very profoundly defiled nautical place because of accepting an unremitting liberation of local garbage and manufacturing left-over. The leftover is then additionally complemented with oil slicks from cargo merchant shipping vessels and tank ships of oil in the regions. It has been accounted that because of the emergence of various several noxious wastes such as heavy metallic ores in the shoreline aqua, besides the diminution of Anomia ephippium/pearl oyster occur, but also fishes and shrimps which were copious in the Manora Channel/Karachi Harbour transmigrated to the subterranean aquatic part [22-23]. On the other hand, despite the fact of huge effluence echelons in the Karachi Harbour area and it is, however, being used for showering by foreigners, sightseers, and the native visitors too.

Due to chemicals and heavy metallic ores such as cadmium, nickel, zinc, lead, copper, etc. coastline get contaminated and polluted are speeded up drastically for the last few decennaries [24-26]. Erstwhile examinations disclosed that non-diffused, point or single sources of pollution and non-point sources of pollution or diffuse pollution have produced influences on coastal aquatic excellence [28]. In the mid-nineties, the conservational and ecological estimate of Karachi coastline zones specifies heavily loaded biotic effluences and the incidence of heavy metallic ores [29- 30]. Entirely the exoneration of unprocessed native and commercial effluences is not only influencing the public health but also developing conservational and financial cons [31]. As boating, tourism & fishing is being influenced relentlessly for that time has arrived now to take an essential step with the intention of preventing immense maritime annihilations and damage of aquatic biological diversity. Because of the absence of systematic inspection, a great number of coastline regions turn out to be destitute and instigating a severe threat to aquatic life (mangrove afforests, seafaring food network, etc.). By applying new conventions and bigger ecological affairs, averting aquatic effluence alongside Karachi Coast is disparagingly indispensable with interest in providing assured protection, protective healthiness, environs and to attain social and economic sustainable development.

The motive of the current investigation was to evaluate and assess the extents and latitudinal dispersal of metals (Cu, Fe, Mn, Ni, Pb & Zn) in Sea View Point Clifton and adjoining coastal areas, Point J.T Pasni District Gawader. The outcomes of research may perhaps assist to protect and

managing the seafaring biota accepting unaddressed oceanic wastage.

2. EXPERIMENTAL

The samples were collected from Sea View Point Clifton and adjoining coastal areas, Point J.T Pasni District Gawader in the season of September-October, 2016.

Water Sampling and Preservation: Seawater samples were collected on September-October, 2018 from (i) pollution receiving body namely Sea View Point, Clifton (ii) the non-polluted Point J.T Pasni District Gawader. The specimen collection spots are specified in Figure -1&2 In this study, Sea View Point, Clifton, Khi and adjacent coastline regions were chosen as it is partially confined and opened cove layering a region of around 5 K.m is the receiver of Lyari-River. This river act as a free and clear dung cesspit, accepting exceedingly contaminated leftovers of *industrialized and native sources* while the other spot of *Bosnia* was chosen for the determination of minor contaminated as related to Khi.

For inspecting oceanic water excellence, exterior seawater samples were picked together in a hygienic plastic container (2.5 Liter) in the course of non-considerably coarse aquatic situations dominant in primary summertime monsoon phases from September-October. For assessment of metallic ores, 500ml from every water sample was conserved by the addition of a little amount of HNO₃ with a standardized practical approach put down in A.P.H.A accordingly [33].

Sample Consumption and Metals' Assessments: 100ml of every seawater sample was vaporized virtually to aridity at temperature of 65-70°C on the highly warm plate underneath the unpolluted air-fuming cover. Lastly, the seawater testers were watered to produce dilutions and reduce concentration around 25ml using 2% nitric oxides [32]. With intention of evaluating the ranks of affluence by heavy metallic ores alongside the Khi coastline, the noxious metals such as Cu, Fe, Mn, Ni, Pb, Zn and Cr in the seawater trials were evaluated by AAS (atomic absorption spectrophotometer-Hitachi-Model-Z-8000) after incorporation of acidic contents using the approaches narrated in APHA [33]. Resulting facts and figures are accounted for in mg/L (ppm).

3. RESULTS AND DISCUSSION

Since the last decennium, contamination in maritime water sediments due to chemicals has been documented as a threat in shoreline seawaters. In Puget-Sound, broiling points of poisonous substances have been displayed to modify and lessen the benthic and seabed, to impede within organic cells and biological activities, leading to developing infections in fishes [34]. Additional antagonistic trade and industrial impacts of cons-minated deposits contain postponing or levitating the expenses of safeguarding shoveling of direction-finding watercourses due to the probable hazards of re-storing lethal substances into the seawater level or the requirement to discover dumping spots for the deposits.

In the assortments of seabed entities that live in affected bays or shoreline areas develop great decline due to effluence by heavy metallic ores and can spread adversative influences via the food cable, aves, mammals, and Echinodermata and that feed on effluent aquatic life. Organic lives possibly accrue pollutants from aquatic medium, dregs, or foodstuff in their tissues. It perhaps

consequences in magnitudes of the contagion to many of the times greater than those found in the environs. The gradation of bio-accrual potential relies on the ranks of disclosure and the tools by which the organism exorcises repositories or metabolically degradation of the contaminant. The contamination of marine sediments *becomes* an important political *issue* when ports are dredged and contaminated dredged materials have to be dumped at someplace, and it becomes a human health issue when fisheries are affected due to contaminated or diseased fish.

The middling degrees of heavy metallic ores in the marine water samples assembled in the duration of September-October 2018 from station Sea View Point of Clifton at Karachi Coastal areas and Point J. T Pasni Gwadar and the data shown in Table-1 and Figure-3. It may be prominent that considerably greater degrees of all illustrated metals i.e., Cu(0.093ppm), Fe(0.107ppm), Mn(0.183ppm), Ni(0.027ppm), Pb(0.024ppm) and Zn(0.548ppm) are present in Sea View Point of Clifton at Karachi. Greater degrees of metallic components in the Port and adjacent zones may be accredited to the unprocessed native and manufacturing left-over drained form River of Layari. The contemporary state further exacerbates because of fishing-trawler and shipment doings (such as refurbishing, refueling, lubricating and ships' tarpaulin), oil slicks from consignment(Cargo) oilers and barges.

The comparative resulting analysis of heavy metallic ores evidently specifies that metallic substances in the Sea View Point of Clifton at Karachi are considerably higher as compared to Point J. T Pasni Gawader and consequently may disparagingly produce influences on the aquatic biota. Greater quantities of Cu&Zn in the seawater testers probably because of the incursion of leftovers and remains

from industries and manufacturing units such as electrically powered equipment, electro-plating, fabric, and glass. Nevertheless, increased quantities of Mn and Ni in the yachting marina indebted to the influx of unprocessed emissions from automotive batteries, electro-plating, car canvas, and dyeing and glass manufacturing units[35]. Even though W.H.O or U.S.E.P.A has not set specific strategies yet for the liberation of heavy metallic ores and elements in the sea. Australian & Swedish recommendations [36], have been applied in this investigation for evolutionary purposes.

It is worthy enough to state here that relatively increased quantities of heavy metallic components in the maritime and harbor waters were specified by quite a lot of scientists in the world [20-37]. A huge number of scholars also endeavored to assess accrue of heavy metallic components in the water of the coastline region in khi, Pakistan [35, 38, 39]. As revealed in Table#1, the dispersal arrangement of metallic ores in coastline seawater of Khi has a resilient connotation with effluence (mostly municipal dung and industrialized emission of dung) supplemented by rivers of Layari into the marine water. It has also noticed that the ranks of accumulation of metallic ores/elements in shoreline seawaters declined progressively as the detachment of the specimen assembling site from Layari-River fallout and showed increments as in the instance of point J.T Pasni, Gawade. Resulting outcomes displaying the distinctly higher degree of Zn in all the testers as related to additional evaluated metallic ores and components and its cradles perhaps maybe the local and manufacturing leftover along with the shipment proceedings and operations.

Table-1. Heavy Metals Concentration (ppm) in Samples Collected from Coastal areas of Karachi and Gwadar.

S.NO.	Name of sites	Cu	Fe	Mn	Ni	Pb	Zn
1	Sea View Point Clifton	0.093	0.107	0.183	0.027	0.024	0.548
2	Point J.T Pasni Gawader	0.025	0.038	0.065	0.03	0.008	0.488

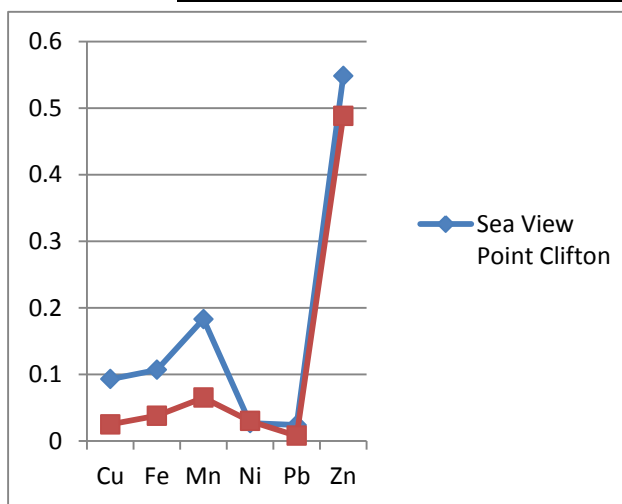


Figure-3. Heavy Metals Concentration (ppm) in Samples Collected from Coastal areas of Karachi and Gwader

It is noteworthy to state here that oceanic deposits are commonly the cutoffs and evaluation criteria for trace elements as metallic ores in marine biome destined to adjourned specks and sink instigating numerous conservational complications. Currently, pollution of aquatic residues turns out to be an essential ecological concern as when anchorages are scoured the coastline seawater becomes contaminated, triggering anthropological health threats via consumption of polluted or unhealthy fish. Additionally, the polluted scoured constituents when discarded on the terrestrial instigate enormous conservational complications. Consequently, it is recommended through this entire investigation and indagation of the constitutional and governmental sectors and entrepreneurs and manufacturers to assimilate swift curative with intention of combating the contagion, to guard the health and to attain social and economic sustainability in shoreline zones of Khi.

4. CONCLUSION

The degradation of water quality poses a serious impact on the environment, social and economic sectors. Virtuous ecological excellence and eminence are indispensable to supporting littoral and nautical bio networks, commercially and frivolous echinoderms, and financial progression in shoreline populations. The health of coastline and aquatic biomes is influenced by seawater and residue class. The contemporary fallouts specify that the coastal shallow brines off Khi seashore are contaminated by unrefined by dumping of industrial left-overs and domestic left-over water into the Khi. The noxious metallic examinations have specified a coarse assessment of the airborne magnitude of the contaminated region in the Khi. The unremitting effluence accounts besides the coastline region of Khi will have antagonistic influences in expressions of (i) increments in poisonousness echelons of aquatic food web; (ii) significant pressure on aquatic echinoderms' vicinities and mangroves;(iii) erosion of cargo-ships as well nautical receptacles; and (iv) substantial hostile influences on the health of showering travelers and occupants of Ihaba & Shit isles, marine boatyard and Manora station. The environs and the pecuniary status of oceanic and shoreline seawaters are interconnected at the distinctive, public, government, provincial, domestic, national and international ranks. Governmental administrative organizations and secluded manufacturing unit in conglomerate should implement technologies to avert and lessen the influences of effluence. Moreover, the findings also, designate the underprivileged water excellence in expressions of heavy metallic ores alongside Khi's shoreline areas due to unremitting liberations of unprocessed local and industrial left-over, installation of distinctive particulate, marina port accomplishments, the discarding of vessel left-over and additional coastal activities. The escalated metallic effluence points in naval bionetwork will have an adversative influence on nautical entities and intensifications in the harmfulness of the surroundings through the food network, leads the deterioration of consignment boats and nautical pots; and a substantial unpleasant influence on the healthiness of coastal populations.

6. RECOMMENDATIONS

- To guard and sustain critical stocks of coastal resources from harmful effects of industrial and urban contaminants and the oil.
- Ensure the treatment of industrial wastes by enforcement of existing and appropriate new environmental legislation.
- Ensure use of low lead oils product, furnace oil, petrol, and diesel.
- Enforce strict environment controls at oil refineries and oil terminals and bunkering points to check oil spillage.
- Protect coastal resources, coastal structures (i.e. ports, harbors, seawater, intake of coastal power plants and industries etc.), beaches and amenities from accidental oil spills.
- To improve existing environmental legislation to cover all aspects of pollution control management.
- Promote research to conserve mangrove forest and associated ecosystems.
- Develop sea farming in a region where agriculture is not possible.

- Strict policy implementation should be placed in different industrial effluents to avoid the contamination of the water of the river.
- There should be collaboration among the organization who involve in pollution control and rehabilitation of river and riversides, to avoid repetition of efforts.
- There should be affordable waste management strategy for every society.

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