

Environmental Effects of Irregular Extracting of Gravel from River Beds

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Abstract: -Extracting gravel from river beds causes steep slopes and waterfalls and can remove up stream sources of gravel, sand and river sides. With these slopes local fishes become unable to lay eggs or turbulent flows remove their sperms. This paper studies the problems due to gravel extracting from river beds and changing ecosystem. Extracted gravel and sand are washed and processed by the factories near the river and transported to the consuming centers. Washed gravel and sand suspend fine sediments like clay and slit in the river. These fine sediments settle in the river and make impermeable layers in the bed and prevent seepage of surface water to groundwater and increase the dangers of flooding and damaging to the adjacent regions of the river and destroy the environment.

Key-words:-Extract, gravel, Snad, Environment, river, Fish

1 Introduction

River gavel and sand are the best-known building materials because the dissoluble and frail fragments of the gravel and sand are removed by the water flow and the stable ones remain. Therefore, it has been ages that the building experts and profiteers have given such a great consideration that they have established factories nearby the rivers to extract and exploit plenty of gravel and sand that consequently have been led into serious harms including: annihilating the river fishes and their births, growth and movement in the river path, increasing the canal width, increasing or decreasing the river depth, diminishing canal stability, destroying meanders, increasing sediment and its transition, increasing banks' erosion and canal bed, decreasing coastal aquatics. Most of the gravel extracting is taken place in the river tributaries with low depth and holds industrial uses such as: paving roads, making concrete, filling up cavities and, etc. When the scale of extracting gets more than the river sediments, lots of troubles occur for both the river and the aquatics.

2 The Environmental Effects of Extracting Gravel and Sand from the River Beds

Extracting the sediments directly affects the physical parameters of the river as the following:

- Canal geometry
- Bed depth
- The compounds of lower layers and their stability
- The speed and disturbance of the flow
- The roughness of surfaces
- The amount and transition of the sediments
- The discharge and temperature of the river

Changes in such characteristics influence marine plants and all aquatics' birth and growth. For instance; extracting the gravel can be resulted in decreasing population, replacing one kind to another one, changing age and, etc. The harmful effects as the result of extracting river materials on the living creatures are taken place in two procedures:

1-changing type of flow caused by change of the bed shape

2-increasing the floating sediments

It is considerable that since the gravel and sand can preserve the nutritive materials have interactions with each other, they have become so essential for the trouts, red mullets and caviars. The gravel and sand settlement on the river bed can increase the pores and

followingly help oxygen solution, laying eggs and aquatics' birth raise.

The effects of extracting gravel and sand from the river beds on the environmental and physical problems shall be viewed as below:

2.1 The Effect of Extracting Gravel and Sand on the Fish Population decrease

The effects of extracting gravel and sand on the river fish is seen as the following:

- Darkening and spoiling the fish meat due to not receiving enough oxygen to the fish body texture
- Making sedimentary cover on the eggs and decreasing their fertility
- Destroying the places of procreating and laying eggs (beds of rubble stone, grave and sand)
- Damaging the fertilized eggs and decreasing the population of larvae (affected by sediments and mechanical devices)
- Nutritional disordering resulted from destroying nutritional sources
- Disordering the production regarding gaseous exchanges around eggs and increasing the period of incubation

2.2 The Effect of Extracting Gravel and Sand on Invertebrates

The statistics shows that the existing floating sediments from extracting (2 to 13 mg / lit) decrease the aquatic insects' compression up to 85% in the low part.

2.3 The Effect of Extracting Gravel and Sand on Marine plants

Marine plants play a leading role to produce oxygen, necessary materials for the aquatics and the river survival progression. The presence of floating sediments leads into sedimentary mounting on plants, preventing their growth, decreasing gaseous exchanges and finally their death

2.4 The Effect of Extracting Gravel and Sand on Birds' Emigration to the River Due to Destroying Their Inhabited areas

Exploiting the sediments can destroy the ecosystem and disturb the frame of living in the river and on the other hand, it can threaten the nutritional security and birds' emigration. Another reason that abandons birds from the river is the huge noise of mechanical devices.

2.5 The effect of Extracting Gravel and Sand on Destroying the Farming Lands nearby the River

Getting turbid is one of the consequences resulted by extracting the river materials .this turbid penetrates the fields around and makes problems for them and their irrigation.

2.6 Extracting Gravel and Sand from River Beds Disturbs the Balance between Settling Sediments and Transmitting Power and Destroys the River Beds

Sand supports the river bed and makes the banks strong .Extracting sand causes erosion in these areas. Levels of erosion and sedimentation in upper and lower parts loose their balance, and the bed easily gets eroded .Erosion in upper part increases high speed flows and makes torrents. However, torrents are seen more in areas that result in steep slopes and can move more sediment down toward the lower parts. They also make dyone and anti dyone beds. Though, they are accompanied by changes in depth. So, extracting gravel not only affects the place of cavities but also on the upper parts.

2.7 Extracting Gravel and Sand Increases the Floating Sediments and Flow Disturbance

Most of changes in the scale of distribution of sediments from extracting gravel and sand caused by segments' settlements in extracting sight. If irregular extracting happens, the segments are easily transmitted by temporary flows and might end into more disturbances and can increase the sedimentary transition and change both the canal shape and the bed protecting layer .The segments of sediments prevent and endanger the trouts ' survival .The first reason is that there aren't any empty places containing oxygen and nutritional materials. The second is that the segments of sediments destroy the

aquatics' eggs. The third reason is that their eggs' consistency cannot be carried on any more. The heavy load of such particles also affects the larvae and their multiplying that produce nutritive materials. It is remarkable that these particles' sticking to fishes' body and scales can make different diseases.

2.8 Extracting Gravel and Sand destroys the River Bed and Changes the Morphology and Canal Stability

Irregular extracting gravel and sand from the river deviates the flow in the extracting area can also make less deep tributaries that get wide on the same vast surface and might stop the aquatics' movements. The same condition is true for the nearby farming lands using tributaries for irrigation.

2.9 Extracting Gravel and Sand Makes the Sand Particles Hit Each other That Endangers the Aquatics' Survival

Whenever these particles hit each other, a wide section is made that a sheet like flow moves on. In such situations the sediments can not be easily transmitted and the sedimentary balance is lost they might hold a vulnerable bed. The existence of aquatics gets into trouble according to the movement of the sedimentary materials in the upper part and less depth in the lower parts.

Also the sand hitting makes both the riversides and insects' multiplying and reproducing (which are the main nutritional factors for the aquatics) get destroyed.

2.10 Extracting Gravel and Sand Can Change the Roughness of Banks and Layers and Affect on Fishes

The interior rough elements are often made up of gravel and other sediments, have an important role in the ecosystem. Not only rough elements affect the canal hydraulic and river morphology but also change the nutritional sources, the interior sediments and the type of the areas' aquatics.

2.11 Extracting Gravel and Sand in a Form of Dry or Wet Cavities on the River Flow

Direction Can Decrease the Level of the Underground Water Discharge and on the Other Hand, It Can Increase the Temperature and Trap the Fishes

Through digging cavities on the river path, the water inside is boiled, and the level of the underground water is decreased. Consequently, the river flow is slowed down and gets hazardous for the aquatics' survival during water reduction seasons. The underground relations of these cavities might increase the water temperature. As the matter of fact, such cavities have been exposed to sun lights and possibly change the aquatics' kinds. As the torrent flows, it first rushes into the cavities, these aquatics get easily trapped and after a while the canal is deviated to the cavities.

2.12 Extracting Gravel and Sand Can Destroy the Nearby Areas and Threatens the Aquatics

The nearby areas highly affect the aquatics' laying eggs. The capacity of trouts production in a river is related to the coastal actions. Aquatics grow in these areas and control the stability of the slope and the water temperature. So, their getting destroyed makes the sediments lose their balance and increase the water temperature and endanger the aquatics' survival.

2.13 Extracting Gravel and Sand Can Change the Flow Type of the Flow Which Affects Their Population and Kinds

The change in the type of the flow can result in: releasing torrents and lots of sediments in the system entering nutritional sources and / or and its sudden decrease. After a flood, These changes make the system not have enough time to return to the primary balanced state. Such conditions are so effective for the aquatics that their population might change And be dominated with replacing kinds.

3 Case Study

The river region of CHESHME KILE is located between 50 degree and 31 min to 50 degree and 58 min of the geographical lengths and also between 36 degree and 20 min to 36 degree and 51 min of the northern width which is a part of the Caspian Sea

watershed .Its limits to main geographical directions is as below:

From north to Caspian Sea

From south to ALBORZ Mountain and the granite mass of ALAMKUH

From west to TIROM River

From east to NESHARUD

The highest altitude of ALAMKUH peak is 4860 met and the lowest point is the coastal stripe of CASPIAN Sea with - 26/5 met height from the free sea level. The area of the case study region is 1025 s / km and its circumference is 177 s/km. The area is made up of two major parts: plain and mountainous. The plain part includes the alluvial sediments of the regional rivers where has the high qualified and fertilized soil to farm. Since Cheshme Kile has been the main source of water supply for farming , it embraces the most essential part of inhabitants ' economic activities . CHESHME KILEs water tastes sweet that is why it makes such convenient conditions for fishes' survival. From the view of fishing, it is also regarded as one of the most vital native nutritional sources. The mountainous part holds the southern regional areas. Any civil establishments haven't been built up there because of condensed plans and lack or absence of roads in spite of dispersion of the villages and having adequate situational potentialities. DOHEZAR and SEHEZAR villages are in this part. In fact, CHESHME KILE is one of the most important rivers in the west of ALBORZ in this area. As long as this river originates from the heights above 4000 met of ALBORZ, it is usually full of water during the year. On the other hand, it snows a lot there and there are branches and streams which prevent drying the river.

3.1 The Morphology and the Length Profile of Cheshme Kile

Generally, the main river's length profile indicates the speed of water flow, its power of erosion and the regional concentrating time. Due to the studies and researches the river's length profile can be divided into three separate sections: (fig 1)

1-The up span which is located in the approximate length of 12 km and between the heights of 3300 to 1800 met to the free sea level from Alborz with the slope of 12% that increases the speed of water flow and can cause erosion. Most of this slope from the origin of ALAMKUH is up to 2000 met height.

2-The middle span which is located in the approximate length of 20 km and between the heights of 750 to 1800 met more than the free sea level holding an approximate slope of 5/25% and is located between MIANRUD and SHAHRESTANAK. Most of the secondary branches join the main river and perpetually increase the discharge.

3-The permanent span with the approximate length of 31 km is located between the heights of 750met to - 26/5met and contains an approximate slope of 2/5% and is between SHAHRESTANAK and Caspian Sea . Because of energy slowing down in the length slope in this span, the flow is decreased and the sediments are settled. This span is important for settling both the alluvial and sedimentary materials.

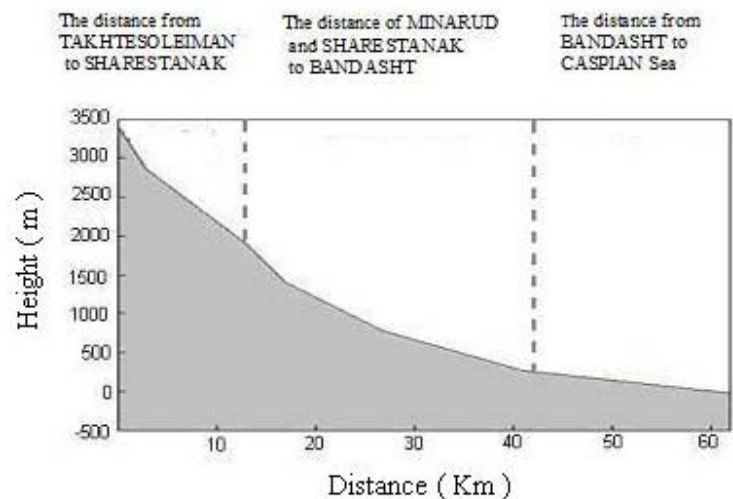


Fig.1 the length profile of CHESHME KILE River

Steep slope of the region with its distance from the up span to the CASPIAN coast and lots of sedimentary disposals affected by the area conditions have highly influenced the river's changing bed in the mountainous parts. According to energy increase and material loading from the mountainous sections, the river has got such an extreme power of destruction and forces both the river bed and banks the most.

3-2 Extracting and Exploiting Gravel and Sand

Extracting gravel and sand is the most obvious environmental problems of the area in the case study. This trend goes up when the river doesn't have a torrent state because in the phase of river violence, stones and sands are moved towards the lower sides. In CHESHME KILE river about 1000 met far away from the up stream, the stone breaking factory has been located. During the year, this factory is active. It collects the sand, gravel and the nearby under regional stones and after processing them, they are sent to markets. Next to one of these factories, there are establishments of asphalt which pollute the river. Extracting gravel sands and stones from the river bed deviates the water direction to the river banks. The consistency of such process will result in artificial terraces and has damaged rice farms and gardens throughout increasing the flood slope in the upper part. Irregular extracting gravel and sand in the areas that have been exposed to the most changes such as the distance between KABUDKALAYE to SANGARMAL that the river slope starts increasing, has been caused the waterfalls cavities orderly go up. And due to the destructive torrents, the upper parts have been moved down, and before filling up the waterfall cavities, they have made the walls water erodes and the nearby farming lands destroy. The walls' height in some areas like upper than KABUDKALAYE is already 12 met in which clearly implies the extreme destruction of CHESHME KILE river. Within 1971 to 2007, the water bed has been decreased an average of 7 met and approximately 25000000 cube meters materials haven't been replaced. However, the number of extracting has been much more and about 60 hectares of the farming lands and 20 hectares of the owners' gardens nearby the river have been destroyed.

3-3 Wild Life Distribution and Environmental Destruction

In the case study, the identified animals include mammals, birds, aquatics and reptiles. Regarding IUCN classification, there are families of goat, antelope, wolf and fox jungle cat and leopard, porcupine, badger, boar, bear. The goats' species are vulnerable (VU) and live in heights. While leopards have been subjected to danger and they live in jungle. In the past and before starting irregular extracting, because of river low slope from the distance of SANGARMAL to TONEKABON and the existence

of dense jungles in small measurement on the right and left banks of the river and small islands from TUSKA to raspberry and fig trees, all together have been such a suitable place for boar, jackal, fox and birds. But now, for their extinction, the above mentioned animals have been immigrated to jungle areas. Cheshme Kile River has been a remarkable and convenient place for aquatics for long ago. Salmon, eel, Trout and other local fishes can be observed in the river. It is noticeable that the main reason of intensive decrease of white fish supply in the Caspian Sea has been in the up stream of CHESHME KILE. The river bed destruction and the inadequate situations to lay eggs have made them emigrate and followingly have been led into the least fish and birth. And if the conditions be provided to lay eggs, the condense of eggs in one place makes them damage. This case will get into serious economic and social problems in the future. So far the fishes' population in CHESHME KILE river has been dramatically reduced.

Different kinds of eel and lizard are the examples of some of the reptiles of Cheshme- Kile. Due to their environmental destruction, their population is also moving down. In the up streams, there are poisonous Alborz vipers. By torrent and western flood from SANGARMAL to TONEKABON with 15km length, aqueous reptiles such as eel, turtle and frogs have been incredibly diminished.

The environmental varieties of native and emigrant birds have greatly brought about changes in Cheshme Kile region. Unfortunately, irregular extracting and exploiting the river environment have urged the birds to move. Consequently, the river isn't going to be a suitable winter shelter for the emigrant birds.

About 90% of the plants from CHESHME KILE watershed are the ones in jungle. In the distance from SANGARMAL to TONEKABON, around the river, there were TUSKA, raspberry and fig trees that are not seen any more and almost the river bed and the surrounding areas are all barren and only limited to farming lands.

4 Conclusion

Irregular extracting gravel and sand from CHESHME KILE have made the apparent shape of the river dissimilar, unfit and unnatural. Not having enough information on production capacity of river

sediments, place and time of extracting have been resulted in environmental disasters as the following:

- Intensive and severe torrents
- River widening
- Nearby beds 'destruction Underground water links obstruction
- Underground water links obstruction
- Aquatics' extinction

Therefore, such irregular extracting can carry out harms. The studies and researches are good references for better planning on extracting materials from KARGANRUD in order to preserve the environment.

If only 200000 ton be extracted from Cheshme Kile River, no serious changes can be taken place in river morphology and environment. If just a certain part of the river gets extracted, the bed fracture can be easily emerged because of not substituting alluvium in that part. Any changes on the bed balance will affect the profile of the water level which are related to the path of bed changing and its amount and might lead into intensive torrents. In such situations the extracting cavities and their distance from each other should be selected in a way that they don't make remarkable changes in the water flow profile. The dimensions of these cavities must not be more than 20 s/m due to sensitive makers and their length distances shouldn't be more than 400met.

Extracting river beds will settle the sediments in them by the river flow which changes particles in a way that the passing flow throughout the cavities leaves its particles and the others will be broken into smaller sizes. So, the gaps among cavities should be considered.

The last point to keep in mind is to remark how meanders are vital for animals' inhabiting and native and emigrant birds. Therefore, extracting sediments from meanders must be banned.

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