

IRRIGATION AND DAM HISTORY IN SISTAN

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Sistan in the eastern part of Iran is located beside Iran border and Afghanistan and because long- standing geographical particular position, continental specific conditions, contiguity with fruitful Hirmand and Hamoun (includes as the largest lake of freshwater in the world with international point which is known such as huge capacity of "biosphere"), also by political typical situation has had special validity to the point of strategic and is considered as passage of auriferous India and Far East too.

Sistan, the national mythology of land, has been bloomed like cultural cradle from the old days as its great and brilliant antiquities are seen nowadays and admired by the world. It has been recognized as the capital association of monumental cultures in Vararoudan (Mavaraonnahr), Mesopotamia, Send, India, China because of its cultural Characteristic.

Sistan is one of the most fertile lands in Iran with its alluvial soil and plentiful water which has been one of the prosperous states in Iran in the past. The Iranian and foreign notable experts who have evaluated Sistan's questions perfectly called it as "Auriferous Land" and "The Storage of Wheat of Iran and Asia".¹

The continental diversity, topography and geographical conditions, disharmonious distribution and crossing and inconstant of current flow beside water needs and changes during the year reckon hydrologic characteristics of the vast part of Iran, especially Sistan. So, the principals of irrigation engineering has been noticed by Iranian from the ancient times, who are named this "Irrigation Art".²

Iranian were telling water, purity symbol and immortality element and were revealing this opinion with sacred believes like Anahita, the guard angel of water, which was showed water's value.³

Precipitation and lack of water resources in Sistan has motivated Iranian to find new solutions for provide, storage and exploitation of water and Iranian engineers create intellectual and competent management methods to find, increase efficiency and water distribution. Monuments, buildings and many structure with variety in Iran water culture, among Sistan, in spite of centuries, events and natural variations have firmed show the intellect, facility and incomparable management of this region's engineers.⁴

In the ancient times Sistan has had real regular artificial irrigation by making extended net of dams, rivulet and streams separated from Hirmand river and Achaemenian kings

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have been enjoyed of dams in order to military aims.⁵ In the Sassanide Era, the irrigation method trascend not only in the western parts of that government domain but also in the eastern parts of it, that means in Khorasan in Morghabdistrict and Sistan in the Hirmand realm. Irrigation installation of Morghab had influenced on Arabs which they named "Morghab" one of the dug river in the eight century (AD). Also the engineers and hydrologists who had been taken by Arabs victors from Sistan to Mecca in 7 A.D, treated irrigation affairs and management around the Mecca with the whole Sistani slaves who had done water provision and irrigation have had released.⁶

One proverb in Sistan says: Sistan's prosperity conditions depends on three dams: water dam, gravel dam and corruptors dam. The Sistani historian has written this proverb with suit words in thousand years ago:

"Sistan's prosperity conditions has depended on daming on: water, gravel and corruptors. If these dams have been closed, there wouldn't be any pleasant place except Sistan in the world, if they do, it is possible and if it has done, consistency will be bring for Sistan through the times."

From ancient times Sistani have known that if they want to exploit of Hirmand river they had to hold it and dam. Sistan had been an instance which wants stone and mount, standing dams of Sistan were made by brick, lime and mortar.⁸ Monument relicts from some dams are so surprising and honourable for engineers and water managers affairs of Sistan in that time. For instance, Ta'am river which was separated from Roudbar dam had 150 kms length which had needed huge volume works for construction and retention.

This essay reports about ancient dams of Sistan which turns in Roudbar superior or a point which large arch of Hirmand changes its direction from the south into the west:

In this paper it hasn't been mentioned to diversionary dams on khash- Roud, Farah-Roud, Harout and khousepas although particular sections of Sistan territory have been irrigated especially by Khash- Roud and Farah river in different times.

The first step for research and detection in old dams sites is evaluation and definition of Hirmand river crossing in its delta from the initial terms.

The oldest remainder crossing of Hirmand is "Dour" river or "Poudaei" or "Poudeni" doubtless is the same "Ourouda" river wich mentioned in Avesta. Another crossing had been before settlement in Sistan after "Dour" river period. Today this passage is called "Sena-Roud" which is differ from Sena-Roud or Siah-Roud in Islamic epoch in which was a grand separated canal from Hirmand river. The water was flowed in present passage of Hirmad to about Kamal – Khan port next alternatively has left to the north and the northern delta or has been passed through the west and the southern delta in current dry passage named Biaban river or Terakoun. Most of the main diversion dams on Hirmand in several times have been charged water from named dam into the deltaic lands which have been naturally dispossessed of Hirmand water flow. So these dams were been placed on superior where Hirmand water has choosen its passage in the northern or the southern deltas.

It has been resulted from researched 114 sites by archaeologists:

1) PRE- HISTORY PERIOD (4 MILLENNIUM TO 1500 B.C.):

The Hirmand's flow was toward the southern delta. It hasn't come any considerable effects of human occupancy in the northern delta in this period possibly Biaban river had been the main crossing for Hirmand.

2) POST – HISTORY PERIOD (1500- 600 B.C.):

In uncertain time, likely about 1500 B.C.

Accumulation of Hirmand sediments in Biaban river crossing has been caused channel flood which made river to choose another way along one of prior minor branches toward the north and has gone to the northern delta about current Nad- Ali, where has been one of settlement centers in the northern delta.

This changing in Hirmand passage from the southern delta into the northern delta is the essential factor in abolishing settlemental centers in the southern delta (such as burnt city).

3) THE ACHAEMENIDIAN ERA (600-200 B.C):

In this period, the southern delta wasn't inhabited and Hirmand water has been poured into the northern delta. The most obvious sites of this term have been Dahaneh-Gholaman cities, Zarin or Darangiana and Sorkhdak of Nad- Ali fortifications.⁹

4) THE ASHKANID ERA (200 B.C TO 200 A.D):

In this ages has controlled the east part of Sistan by Sakas. But the Ashkanids could achieve Hamoun region, south delta and Saroutar gradually. Sakas has to leave Sistan for Helmand but named their name "Sistan " (Sakestan) on it forever. Segmentation of Sistan between Sakas reign as "Arakouzia" and Ashkanids as "Derangiana" is about the same current division of Sistan between Iran and Afghanistan. The famous centers of residence have been Kakha or Kak-ha city in Kooch- Khajeh, some places in Saroutar, province and temple of Dahaneh- Gholaman (slaves gate).¹⁰

5) THE SASSANID ERA (200-700 A.D.):

The Hirmand river has been nearly flowed into the northern delta and water has been arrived to the southern delta with diversionary dams. The occupancy centers in the Ashkanid era have grown in the Sassanid era and extended around the Hamoun lake, Saroutar in the east of Hirmand and the west of Margou plain to the next Chokhansour.

6) THE FIRST PERIODS OF ISLAMIC EPOCH (700-1400 A.D.):

The most evident of characteristics of this time is the quantitative and qualitative growth of cities and major habitational centers like Zahedan and Pishavaran and celebrated city, Zaranj has been reckoned as Sistan's capital.

7) THE LAST PERIODS OF ISLAMIC EPOCH (1400-1700 A.D.)

It was begun with Taymuriyan reign which Hirmand river has flowed into the south delta and Biaban river passage. But the northern delta had been received its water needs by diversionary dam and seven ample canals. Taymur Gurkan beside destruction of a strategic and large city, Zahedan and Tagh fort (Saroutar) and the other fortresses, ruined Rostam dam in 1383 (A.D)/ 785 (A.H.). Later his son Shahrokh ruined the substituted dam, "Havanak" again in 1408 A.D./ 811 A.H. Following devastation of this dam and the others, people of the northern delta moved around the lands near the Biaban river and settled there.¹¹ Afterward Malak. Ghotb-ed-Din could escape from his captivity place in Samarghand to Sistan. After domination for supporting water needs of the northern delta made Fath castle and two diversionary dams. This situation has been continued till again return of Hirmand water against the northern delta in 1692 A.D./ 1104 A.H.

8) NEW AGES (1700 A.D. TO PRESENT TIME):

This age has been originated from the first 18 century (A.D.) with regression Hirmand water toward the northern delta style. Upon this reaction, the Biaban river passed into a canal with limited volume and Malak- Bahram – Khan canal dried along this river and finally the southern delta, after Sistan political division between Iran and Afghanistan supposed to be dehydrated forever. The transition of the Hirmand passage into the northern delta during 1692 to 1722 (A.D.) in Malak Fath- Ali Khan reign coincided with a wide torrent which swept Boulba- Khan dam and the whole bulwarks and embankments.¹²

It is mentioned to some well – Known dams of Hirmand which had been built on vein and next to some noses as followed:

1. Kooshk, Gholaman

This dam has been located on 6.5 kms superior of Khabgah village and 3 kms superior of Kooshk ruins against Gavak castle. The building was accredited to Pishdadiyan dynasty and some sites of the Pre- History have had in it which Gireshman has written its inveteracy till 3 thousand years before the nativity and had been coeval with Burnt City period.¹³ But after turning the main flow of the Hirmand to the northern delta and fallen lands belong to Burnt City and Biaban river delta, occupancy and farmlands near Nad-Ali have developed and has been built a more permanent irrigation system. In north desolations of Haftarkand persists 4 old channel effects with one stream which is extended to the west called Gholaman river and the dam "Gholaman dam". "Key" city (instead of Nad- Ali), the capital of Sistan was survivor in Achaemenidian Era but according to Golshan Zarnegar the capital transferred to Zarin and to Dahaneh-Gholaman according to Ketziyas.

After Dahaneh- Gholaman the capital transferred into Ram- Shahrestan or Abar-Shahriyar and again Nad- Ali or key construction as "Zaranj" became the capital of Sistan.

2. Anoushiravan, Yakab

This dam has been built on Hirmand and entrance Sistan against Miski nose on a vein of alluvium next to the ruins of ancient cemetery and hilly which located a little castle named Dak- Deileh (Deileh castle) that protects spillover or dam.

This place rests on 19 Kms far from the north of Kamal- Khan port.¹⁴ Fath castle, the last capital of Sistan's kings before ceased domination is at 13 kms of the north of Dak-Deileh. Zarkan and Zourkan channels which were made in the Sassanid era have been separated like a individual channel from the right corner of this dam.¹⁵ They had drained a stream from the west part of this dam which should be the same large river of Sabouri-Shah city or the east Shilleh of the next Zahedan. The passage of current river Niatak in the underneath of connected to Maleki river is the proceeding passage of the east Shilleh.

In ancient writings among Ehya-ol-Molouk has been mentioned Yakab dam supposed the same Noushiravan dam.¹⁶ This dam has been provided Fath castle water and the east regions.¹⁷

Notwithstanding the Anoushiravan dam (later Yakab dam) had standed till the last 11 century (A.D) that the Hirmand river changed the passage into the southern delta and the dam became worthless. After that the irrigated dams to the northern delta have been transfered into Kamal- Khan port superior.

3. Rostam (Targhou dam) Havanak

The Rostam dam is the famous dam on the Hirmand river on the upper of Noushiravan dam where depends on the southern delta water flow (Biaban river) and the northern delta.

Most of the Iranian and Arabs geography writers scince Estakhri and some European geographers and archaeologists in 19,20 centuries (A.D.) have called each old dam as Rostam dam which is not correct while the Rostam dam or Targhou has been a special dam in a particular place. The Rostam dam has been built or reconstructed by one of the Kiyamid kings after the Hirmand direction change and flowing into the Biaban river passage. It was located at 6.5 to 8 kms superior of Kamal- Khan port against Rouding tower. The accumulated water behind the dam has been produced a lake where continued to the east part of the dam in Chahar- Borjak village. The water needs of the northern delta has been provided by this lake and flowed into the north in a crossing by an old channel.

A Kermanian engineer who has compiled the first map of Sistan of Iran in 1251 (solar calendar) has written:

"The dam sign is two Farsakh up to Kamal- Khan port which called Targhou. The stream which has been slaked by dam courses from north to the west just toward the north with 14 farsakh distance. All dams were made by bricks and lime.

If this dam is closed there wouldn't be any water in down."¹⁸

So, the Targhou dam is the same which Sir Persi Scicks mentions: Before Taymour Gourkan they had built a dam on the Hirmand river in the southwest of Roudbar. This

dam hasn't any space to the current Kamal- Khan port. Taymour conquered Sistan for the second time in 785 (A.H.) and ruined the fame Rostam dam or Aghvan or Afghan.¹⁹ The Rostam dam was made from baked bricks, lime and mortar. There were been placed great clayier pipes on the upper part which led flood into the west.

The Rostam dam has been repaired after demolition and called as "Havanak" means the dam which was made from stone and lime in Garshasb period and Sistan's survival depended on it. Shahrokh Taymouri destroyed Havanak, Yakab and Boulbaka dams in order to cut water flow into the northern delta.

4. Boulbaka

Also Boulbaka dam or Boulba- Khan has been built in Malak Ghotb-ed-Din times on the river spread in the beneath of Mashî nose.

This dam not only has been provided Fath castle water needs but also further regions to Nishak lands by separated channels.

In 3 kms the north of Fath castle, entrance Sistan there is a watershed where the water which was parted from the Hirmand river was distributed into the Boulba- Khan dam place. Thus a wide stream has circulated in the old passage of Zarkan which was ended to Ziarat- Omran or near it. The neighboring lands and surroundings regions were irrigated by this stream.

Kermani who had been traveled to Sistan in 1872 A.D. has written: "There are some traces of dam against Mashî nose and Madar- Shah citadel that have made with brick and lime where has been extended a stream from two sides of it."²⁰

In 1021 (solar calendar), and Indian soldiers line who had advanced in the Helmand valley ruined the Boulbaka dam, Surrounded the Fath castle sometime and destroyed perimeter regions. So the water flow ceased from entrance or division part of Sistan into the northern delta and the whole river water streamed to the southern zones.²¹

5. Kazak

The Kazak dam had been made on Basht- Roud near Karkouyeh. The word "Kazak" is written by Estakhri²² for the first time. From Estakhri explanation derives that Kazak channel has watered Karkouyeh region. This was the same channel where has Zaranj- Harat way with a long bridge between Karkouyeh and Basher means new Pishavaran. Moghaddasi has written: "Kazak dam was irrigating through karkouy of Zaranj".

Moghaddasi aim was one of the five gates of Sharestan of Zaranj which has been led to the north and Khorasan. In a house Zaranj of Ta'am river has been separated from Hirmand and was watering the whole villages to Nishak then another stream yclept Basht- Roud which was extended to Kazak has been flowed where they had built a dam in order to keeping water doesn't penetrate into lake.²³

6. Roudbar (Saroutar)

This dam under Pelalak and Landi has been built by brick and lime reputed as Roudbar or Saroutar dam. Roudbar is a name of a region nowadays where had been concluded

from two little towers with 800 ms distance. This dam is older than Boulbaka dam although haven't any distance and the separated left channels of them as "Garshasb Jouy" have joint passage from Mashi nose.²⁴ Frih says: After Dishou pass Helmand river near Roudbar village in labyrinthine survivor trees there was traces of a dam which its pier located inside water and had been made from bricks in a square yard.

Ravlinsoun has written: in the old- times a grand channel as Garshasb-Jouy has separated about Roudbar from Helmand superior. Accomplished works for river dam and turning this channel to the left had been so great and surprising according Mr. Frih reports.²⁵

The vestige of brick walls dam has been found but the bricks dam have been used in residential buildings. Also Poulak- Bilo group hasn't seen any channel at the right side of the river in this section.²⁶ Albeit Kermani writes: There is a sign of a dam over Karbask tower which 22 Farsakh has been extended the river, this dam is called "Saroutar".²⁷

7. Baba- Khan (Abol- Fath- Khan)

This dam has stood at 12 kms of Chahar- Borjak superior, against Hossein- Abad and Eshkinag. From the north of the river have been extended a stream which its traces remained and has been held about 60 kms. This stream has reached water into Fath castle and around lands.

Supposed Nouh- Kalan (1885 A.D) awful torrent overturned Fath castle where only the over part of the castle is out of water. Tomas Holdich has seen the torrent effects in fath castle region in 1885 A.D where on the plain coast and tower with 5 meters height.²⁸ Evidently Baba- Khan dam has been built coincident Fath castle choice for caliphate. The date of Fath castle and Baba- Khan dam constitution had been about 1397 A.D./800 A.H rather 1422 A.D.²⁹

8. Kohak (Sistan dam)

Instead of current Kohak dam has been another one (not the same name) which has been separated Milli river or Mileh river. The Mileh river was irrigating a zone where contains about Ghasem- Abad mill, Bonjar to Kachian now.

The Kohak dam likely is known today, for the first time about the foremost yeas of 1820 A.D. decade erected on the northern passage (Nad- Ali channel). Warlord Taj- Mohammad- Khan Sar- Bandy made more firm this dam in order to origination Taj- Mohammad- Khan river is 1855 A.D/1234 (solar calendar). The Kohak dam structure has been firm again in 1250 solar calendar. But in 1839 A.D. the river moved its passage about khajeh- Ahmad to a new path toward Dak- Tir and Eshkin swamp which was named Alamdar river and the western Sistan dehydrated. After formation insuccessful dam, finally shaped a dam which was joining the new path of Hirmand into the previous passage while was going toward Sekouheh with a pond named "Madar- Ab".

With Madar- Ab, two branches of joint Parian and large canal (Sistan river) hold gradually where was separated from Kohak.

9. Gazi dams

The Gazi dam of Sistan (Kohak dam) was made on Hirmand beneath part of separation of the main Channel or Sistan river on the Hirmand. Later because of Sistan river water addition specially after the new track "Nohrab" birth, the Sistan river attraction multiplied thus people had to build two Gazi dams, one on the Hirmand river another one on Sistan river. Each of dams were building on the beneath of Kohak on two rivers. Annually they were building both the Gazi dams till 1317 solar calendar, thereafter hasn't made any dam for two years because the depth of the two rivers was suitable and naturally was dividing water between them. After 1319 solar calendar Sistan river became more deep as a little water was flowing into joint parian (borderline Hirmand). "...were building river (joint Parian channel) in it ...".

Under this situation they had to dam only on the Sistan river in order to rising water surface and entered to the borderline Hirmand. So in 1320 solar calendar decade the Gazi dam was made just on the Sistan river lower than Kohak to lead water into joint Parian.³⁰ After 1326 solar calendar was used Gazi dam for watering new canal Azar³¹ in order to irrigation Miankangi part because the inner parian³² has been filled with sandstorms partly which water couldn't enter inner Parian from joint river except torrental time just strong torrents. Finally about 1331 solar calendar has made a concreted valvular³³ dam in the same place of provisional Gazi dams on Sistan river which is now famed to Kohak dam and in lower have build another one as "Zahak" dam.³⁴ While the Azar river was active (till 1340 solar calendar), this dam was called Miankangi because the water needs of Miankangi region was provided by Azar canal.

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