Economic Evaluation of Smaquli dam under the light of Geographic Factors

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Abstract:

Dam especially small dams have enormous impact on socio-economic aspects. Kurdistan region of Iraq has a plan to construct many dams for socio-economic purposes. There are different ideas about the impact of small dams; this work takes Smaquli Dam as an example to evaluate changes after completion of the dam in the Smaquli Village. In this paper, questioner and interview with compression and analyzing methods were used to obtain clear vision about the study area. The main question in this paper is that, what are the main Economic-Geographic changes in the study area after completion of the dam? The paper gives information about, the study area, and the main changes that existed after construction of the dam. The paper has found that, because of the dam the area has enough amount of water to produce 1,134 Ton of Corn (Maize), the population size in this area increased by 14%, tourism sector flourished by more than 17000%, the price of land rose by 200%.

Keywords: Dam, Agriculture, Tourism, opportunities, Rain, Villages

1-1Introduction:

Water projects specifically dams, have accountable impact on socio-economic situation. Many works have been done to evaluate the consequence of the dams especially in developing countries. Although the negative and positive impacts have been recoded after completion of the dams, but the positive sides have been mentioned in Iran, Pakistan, India and China (Bhatti et al, 2019; Jamali and Raeesi, 2015**).** Both Kemman (2014); ATLANTIC (No date) believe, the social, economic and political consequences of dams must be taken into account.

Water infrastructure, especially dam can create changes, especially in the rural areas. The dam of Smaquli in Kurdistan region is located on Smaquli catchment. The aim of construction of this dam was to provide continuous water for irrigation of 1000 donems of land (GDODR, 2019). In 2015 collection of water in the dam has been started (GDODR, 2019). After four years of collection of water in the dam many changes has been accrued. Now, many people including villagers have different views about the impact of dam on the study area which is Smaquli village.

This work can be the first step in the direction of economic-geography evaluation for dams in Kurdistan region. Many works have been done in this direction outside of Kurdistan region like in Iran, Pakistan, India and China to evaluate the impact of dams on economic changes for specific Geographic location (Ali Akbar et al, 2015; Bhatti et al, 2019; Jamali and Raeesi, 2015**)**

The aim of this paper is to find the Economic-Geography changes of the Smaquli village after construction of the Smaquli dam. This paper try to find answers for questions like, how does economy of the study area like (agriculture, tourism and real estate) change? How do Geographic features like (population, crowd, and economic activities) of the study area change? In terms, of methodology of the work, interview and questioner are the main tools for collection of information and data, then, comparison and analyzing methods are being used.

The main problem that we faced was getting real data and information, because the governmental authorities have no sufficient data and the villagers did not want to answer all questions. The paper found that, huge changes have been existed because of dam, agricultural production rises, the paper estimates that the amount of the water in the dam is sufficient to produce 1,134 Ton of Corn (Maize). Moreover, the size of population of the village has increased by 14% and labor marked has flourished by 43%. The paper has found that, prices in real estate have increased by 200%. The first part of paper is about the geography facts of the study area like climate and topography. Then, methodology of the work has been explained. Then, the changes in terms of, agriculture, tourism, real estate, population will be explained. Finally, labor market and people felling, has been showed.

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1-2 Methodology:

Questioner and interviewing are the main tools to obtain data and information from villagers, 16 questioners were distributed and 16 people were interviewed, then the data and information transformed into database. Then the data from Governmental bodies added. After collection of data, both methods of comparison and analyzing were used to obtain the answer of our questions. In addition, water/economic simulation model has been used for analyzing and evaluation of data and information. GIS has been used to create map of the study area and Excel is another tool that helped to create figures.

1-3 Study area and the Dam:

Smaquli Dam located in Koya district 41KM East of Erbil city, capital of Kurdistan region. It about 12km is far from Koya city. The Dam situated between mountains of Awagrd in the North and North East; Bawaji Mountain in the South and South East, and Bina-Bawi Mountain in the South and South West. Astronomical location of the dam is (36°10'18.89") North and (44°22'51.28") East. According to Villagers, about 25 families are living in the Smaquli Village (R3, 2019), the total population can be estimated to be 130-150 capital (R2, 2019).

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Figure 1, artificial lake of Smaquli dam, 30 sep 2019 (taken by Researchers)

Figure 2, Tourism booth on artificial lake of Smaquli dam,30 sep 2019 (taken by Researchers)

Figure 3, Crowded on artificial lake of Smaquli dam,30 sep 2019 (taken by Researchers)

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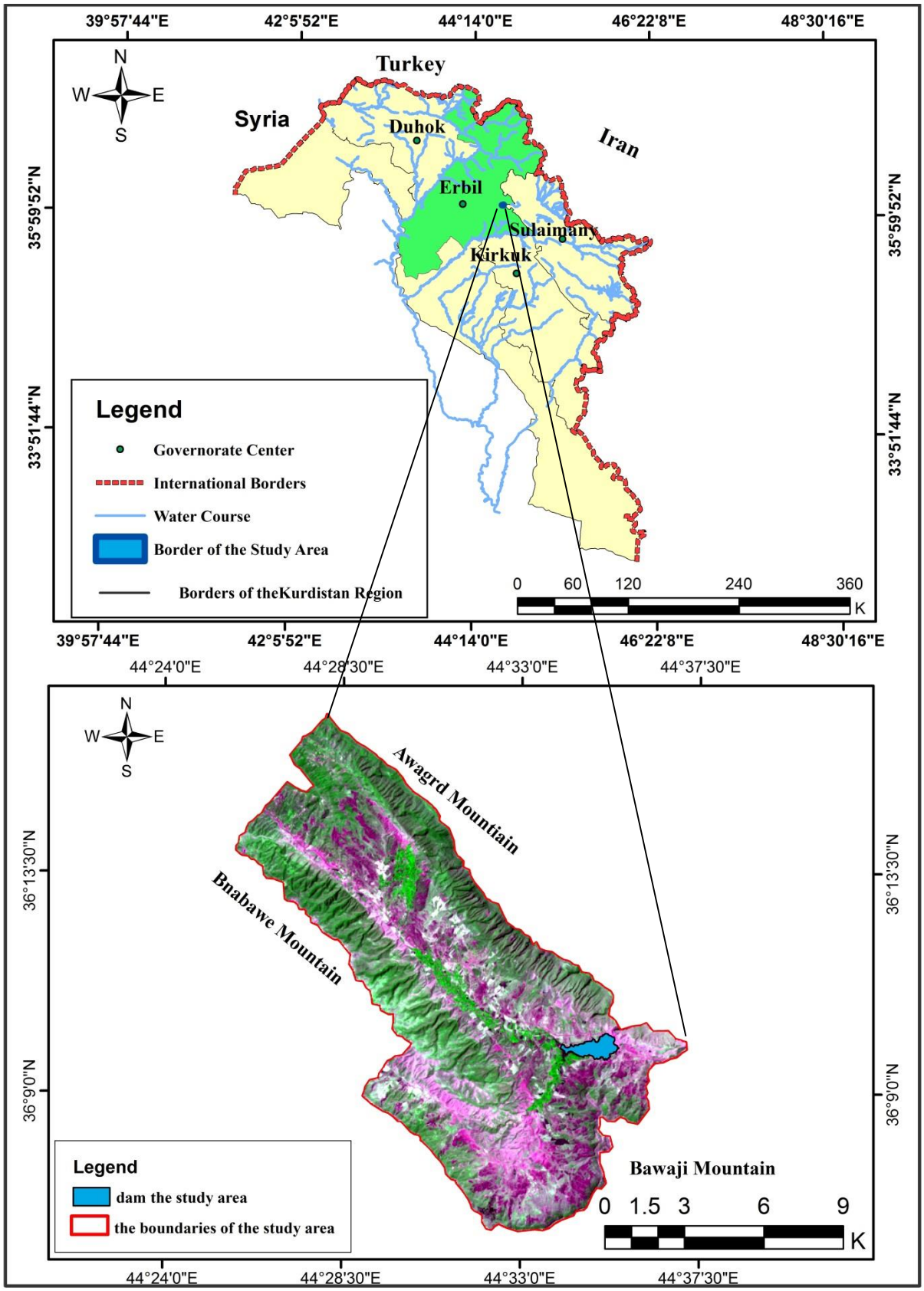

Figure4, Locational of the Study Area

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The Dam has been designed to irrigate 1000 Donem of agricultural land (GDODR, 2019). According to the initial plan of the dam hundreds of farmers will be benefited from. However, the initial plan has not mentioned the tourism benefits of the dam. See Figure 5.

Capacity in MCM	Dead Storage in MCM	Live storage in MCM	Height of Dam in M	Cost in IQD in Billion	Irrigation in Donem	Benefited	Detail
8.6	2.82	5.78	21	21.273	1000	200 Farmers	1 tank, 9 gates

Figure 5, the aim of the Dam of Smaquli (GDODR, 2019)

The figure explains that the dam can irrigate only 1000 donem of agricultural land, whereas the capacity of the dam which is more than 8.6 MCM with 2.8MCM as a dead storage. The total cost of the dam is more than 21.2 IQD billions, the data which have been collected can be used to indicate that the geographic value of the village has been changed positively after constructing the dam.

2- Natural aspects of the study area

2-1 Temperature

Vast part of Kurdistan region has semi-arid climate other part has a Mediterranean climatic system, in which winter is cold and wet and summer is hot and dry. Average annual temperature is 26.02 **ºC.** Look at the figure 6.

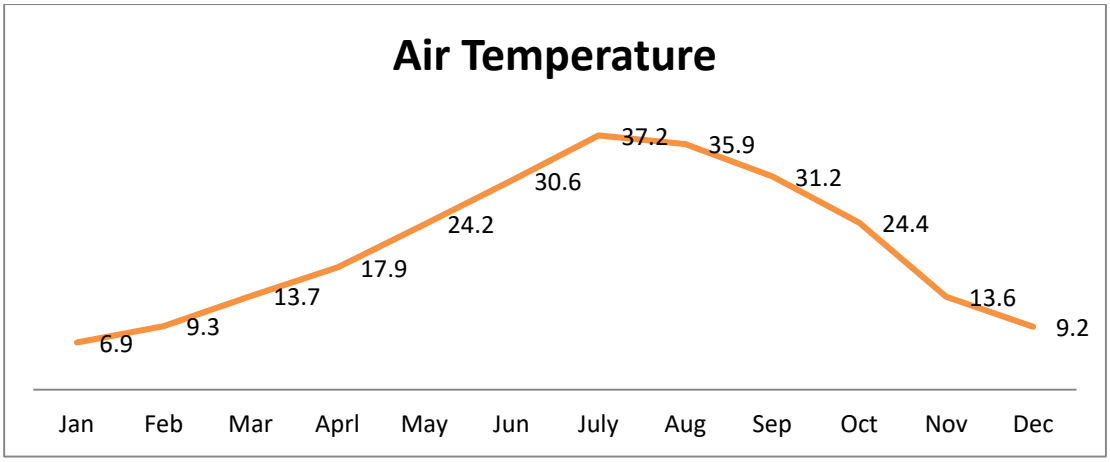

Figure 6, average Temperature of the study area from 2008-2018 (Directorate of Agriculture of Koya, 2019)

The figure shows that, the hottest time in the year is in July with 37.2c and August with 35.9c, because sun light angel directly gets the study area and day-time is longer. Neqshbandi (1999, 73) believes, the increase of temperature in the south is because of the clean Sky, length of the day-time and impact of continental wind. However, the situation is contrast, sunlight gets the area indirectly and night time is longer when the average of temperature reduces to 6.9.5c in January and to 9.2c in December.

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2-2 Precipitation:

The study area is a part of Mediterranean climate system, in which, winter is cool and wet whereas summer as absolutely dry. The annual rain is **592.8mm** whereas General directorate of climatology of Kurdistan region recorded that amount of rain in Koya city which is the nearest metrological station to the study area is 647mm/y (GDOC, 2019)**.** See figure 7.

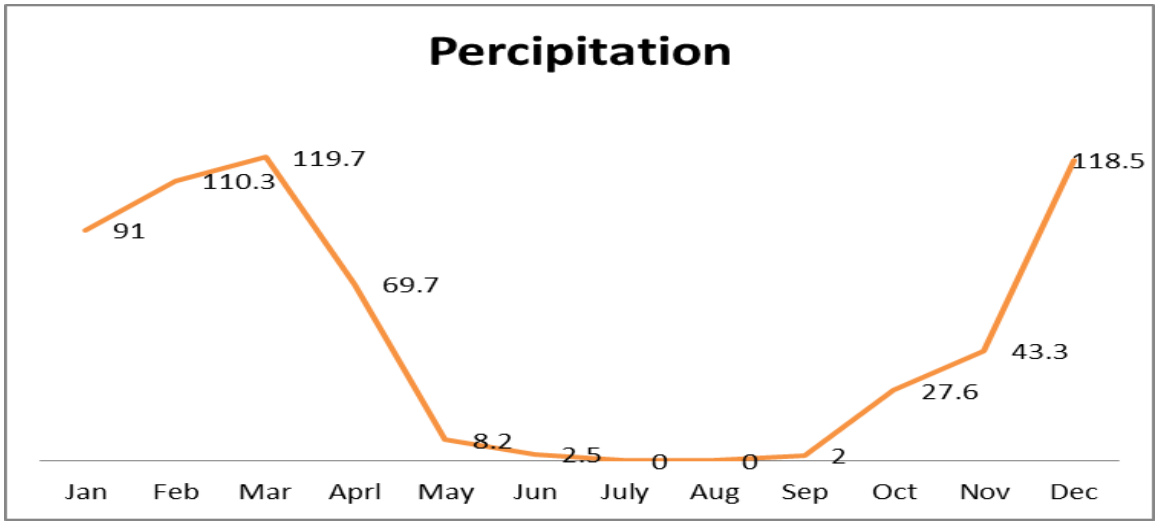

Figure 7, Precipitation in study area (in MM) between 2008-2018 (Directorate of Agriculture of Koya, 2019)

The figure shows, the highest amount of rain has been recorded in spring, in March 119.7mm, in summer, however, is totally dry in July and August rain has not been recorded. According to Naqshbandi (1999, 78), mountain areas in Kurdistan region that have more than 500mm/Y of rain can be classified under the zone of Mediterranean climatic region (Cs).

2-3 Humidity and Evaporation:

In winter the rates of Humidity increase whereas evaporation decrease, in summer, however, the rate of humidity decreases and evaporation increases. See figure 8.

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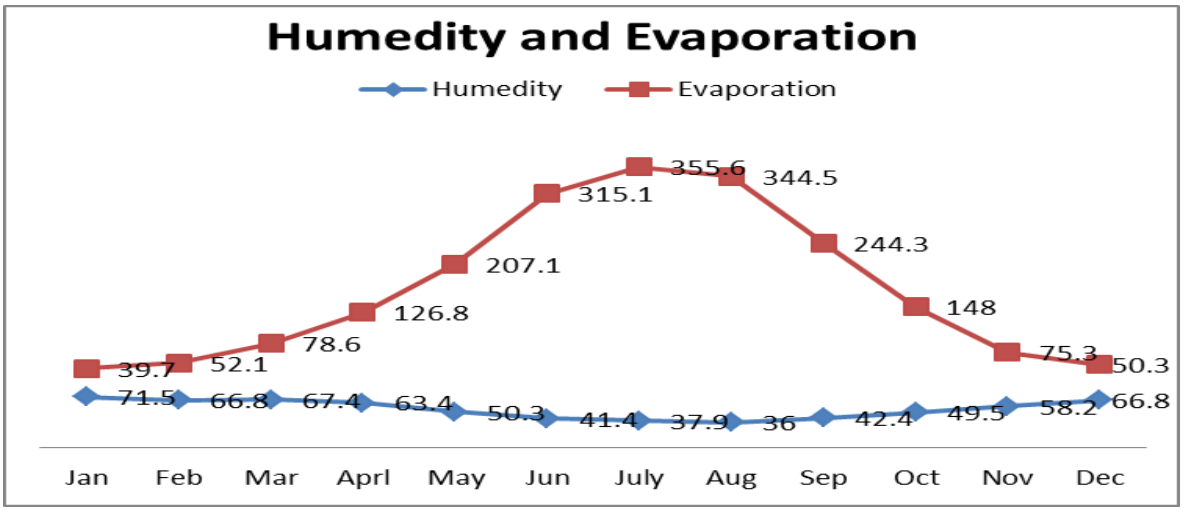

Figure 8, Humidity and Evaporation in study area (in MM) between 2008-2018, (Directorate of Agriculture of Koya, 2019)

Reduction in the rate of Humidity in summer is normal, because of lack of rain and increase of temperature, so, 36% has been recorded as a lowest rate of Humidity in August. In addition, the amounts of evaporation increase in summer to get more than 355mm in July because of increase in temperature and length of daytime.

3- Changes in the study area after completion of the dam

3-1 Agriculture

The dam can irrigate at least 1000 donem of land. According to the villagers, the main crops in this area are vegetables (R1, 2019). Previously, we explained that the dam capacity is 8.6MCM/Y of water with 2.82 MCM/Y of dead storage. So, live storage of the dam is 5.78MCM/Y which can be used for irrigation. This amount of water can produce 1,134* ton of corn**.**

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*live storage of the dam= 5,780,000 CM

Water requirement to produce one ton of Corn= 5095 (CSOI, 2012)

5,780,000/5095= 1134 ton of corn

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3-1 Tourism :

The Tourism sector can be developed and depended on in Kurdistan region. The dam located on the main road that connects Erbil with Sulaimany. So, this dam can attract more tourists in this area. See figure 9.

	Before Dam	After Dam	Change
Shop	1	15	1500%
Tourism booth	0	100	100,000%
Restaurant	0	6	600%
Bucher	0	1	100%
tourist boat	0	8	800%
Bakery	0	2	200%

Figure 9, Tourism impact of the Smaquli Dam

It's clear that, the dam has caused huge change in the number of tourist sites and services (R2, 2019); especially with tourism booth which the change is dramatic from 0 to 100 only in two years; this change is equal to 100,000%. The shops come as the second biggest sector in the economy of the study area which increased by 1500% and becomes 15 shops after dam comparing with before dam was only one shop. Tourist boat has become 8 from 0.

3-2 Real estate:

Because of the dam the total price of land, agricultural, commercial and residential land has increased sharply, the change is continuing to rise. See figure 10.

	Before Dam	After Dam	Change
Price of one donem of land	10,000$	30,0000$	200%
Demand on land	Agriculture	Commercial	
Losing of land		100 donem	

Figure 10, Real-estate sector changes in the study area

According to the field survey, about 200 donem of land has benefited directly form construction of the dam become commercial and residential place because of their distance into the lake and their vision direction. The price of land in the zone of dam has increased by 200%. However, according to farmers more than 50 donem of land has lost its value because of the water and its distance from the lake (R3, 2019).

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3-3Labor and population:

Before completion of the dam, the study area could not provide enough numbers of job opportunities for the local people (R3, 2019; R6, 2019). Moreover, According to R6 (2019), hidden employment was another problem specifically in Agriculture sector, "*So, many of the young left our villages moved to Erbil to find a job*" he said. After completion of the dam the job market in the village has flourished. See figure 11.

	Before dam	After dam	Change
Population	132	150	14%
Outside labor	0	43	4300%
Cars that stop in this point	50/ a day	2410 a day	1205%
Visitors of area	100 cap/day	4820 cap/day	4820%

Figure 11, change in population and labor market before and after construction of the dam

It's clear that study area has become a crowded site because of the dam and its road. The figure shows that population of this area has increase by 14% and visitors has got the peak which increase by 4820% comparing with before constructing of the dam. Rise in Population after construction of dams has been recorded in Pakistan, China and India (Bhatti et al, 2019). In addition**,** labor market flourished by 4300% , whereas, in other villages of Kurdistan the young's are migrating to cities to find job, in this village 43 worker are coming from cities like Koya and Rania. Same thing have been found by Jamali and Raeesi (2015), in Iran, where job opportunities increased after construction of dams. This point shows that, creating job opportunities in the villages is the best way to stop migration from rural areas in to cities.

3-4 Feeling toward the dam:

In terms of general attitude of people toward the dam, though interviews and questioners we asked people if they are happy with this dam or not? Majorities of them said "*yes*". Only one villager clearly said "*no*" (R1, 2019). On questioners two people chose "*no*", and two more people chose "*neutral*" others chose "*Happy*". By combination of the results, more than 84% of people of the villages were happy with the dam. In fact, some villagers were worry to say clearly that "they are happy with the dam", or "the dam has changed their villages positively". It looks, they are afraid to lose their lands and interests.

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4- Downsides of the dam :

The dam has downside impact on study area; people believe that the dam has changed negatively many things in their life (R2, 2019; R4, 2019). Figure 12 gives more explanation

	Very good	Good	I have not decided	Very bad	Bad
Road	0	0	10%	30%	60%
Livestock	0	0	10	20%	70%
Agriculture	0	10%	10%	30%	50%
Wild life	0	20%	0	20%	60%

Figure 12, Negative Changes in the Study area after the Dam

According to the figure the worst sector after the construction of dam, is Livestock and grazing which 90% of participated people in the survey believe that the dam destroyed this sector. The Shepherds say because of the dam "*they do not have enough space to graze their livestock*" (R5, 2019). Moreover, because of the crowd of the area, it is not suitable any more for traditional grazing. Whereas, in arid regions in Iran after completion of dam, livestock sector has flourished by 30% (Jamali and Raeesi, 2015)

In addition, people of the area are not happy with road and crowd of the area, 90% of them believe that the road is not suitable for the size of its traffic. Moreover, 80% farmers believe, they lost their suitable land for agriculture and they want time to adapt with the new Geographic changes (R2, 2019). Finally, because of the dam, the wild life has changed dramatically, many wild animals lift the area and new species have appeared, like some birds and Mustique (R1, 2019).

5- Conclusion:

The dam of Smaquli is one of the newest dams in Kurdistan region; there are different ideas about the impacts of the dam on study area. The paper found that, population of the area has increased by 14% after construction of dam. Moreover, the amount of water that the dam provides is sufficient to produce 1,134 ton of corn**. T**he price of land around the dam has increased by 200%. In addition, more than 84% of villagers are happy with the dam and its consequences on their life. However, the villagers believe that the road is not suitable for such crowd and traffic, their wild life has changed and new species like mosquito have appeared. In addition, they lost huge amount of agricultural land and their village is not suitable anymore for their livestock.

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6- Recommendation

1- Dams like Smaquli can develop rural area, can provide Job opportunities, water for irrigation and attract more tourists, so, Kurdistan Regional Government should implement its plan to build more dams like Smaquli.
2- Before construction of dams, local people should be participated in the processes of decision making
3- The governmental plan for dams should consist of Tourism, Agriculture, and Trade development plan
4- For each dam, the Government should have a plan for fishing and livestock sectors.

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(R5) 2019, Qader Ali, Villager, Interviewing is Sep 2019

(R6) 2019, Are Kamaran, Shop owner and student in Koya University, Interviewing is Sep 2019

خلاصة:

ان السدود لاسيما سدود الصغيرة و المتوسطة أثراً كبير في التطور الاجتماعي- الاقتصادي لاقليم كوردستان العراق وضعة خططاً متكاملة لبناء سدود عديدة للتنمية الاجتماعية – الاقتصادية، هناك الافكار كثيرة متنوعة حول اثار السدود في اقليم كردستان.

وقد اخذت هذة الورقة البحثية على عاتقها تقييم سد سماقولي أنموذجاً لتقييم آثاره الاقتصادية، ليكون وافقاً نحو بناء سدود أخرى في الاقليم. واستخدمنا في عملنا هذا استمارة الاستبيان و المقابلة الشخصية أداة للحصول المعلومات، فضلاًعن معلومات و البيانات التي حصلنا عليها عن طريق المقارنة بينها لمدة قبل انشاء السد وبعدهاعلماً ان تحليل و المقارنة هما الطرق الرئيسة للتحليل البيانات التي اعتمدت على كثير من الجداول و الاشكال البيانية لأظهارها. وتكمن اهمية البحث الى مجموعة من أستنتاجات منها، ان منطقة الدراسة لها قدرة لانتاج 1,134 طن من الذرة بفضل هذا سد ، مع ذلك، وان الكثافة السكانية للمنطة اخذة بالازدياد بنسبة 14%، وان نسبة التطور في القطاعات السياحية وصلت الى 17000% فادي الى ارتفاع قيمة الاراضيها بنسبة 200..%

پوختە:

بەنداوەكان بەتابیەتی بچووكەكان كاریگەری بەرچاوییان لەسەر پیشخستنی لایەنی كۆمەڵایەتی – ئابووری هەیە، هەرێمی كوردستان پلانی بینیاتنانی ژمارەیەك بەنداوی هەیە بۆ پێشخستنی ئابووری وكۆمەڵایەتی ئەو ناوچانە، لەبارەی كاریگەری ئەو جورە بەنداوانە لە هەرێمی كوردستان رای جیاواز هەیە. ئەم تۆێژینەوەیە بەنداوەی سماقولی وەك نموونەیەك بۆ دەرخستنی كاریگەری بەنداوەكان لەسەر گۆرانگارییە جوگرافییە ئابوورییەكان، وەرگرتووە. لەم تۆێژینەوەیەدا جگە لەبەكارهێنانی داتای فەرمی لەدام و دەزگا فەرمیەكان، بەشێوەیەكی مەیدانی پرسیارنامە و چاوپێكەوتن لەگەڵ خەڵكی ناوچەكراوە وهەلسەنگەندن و تومارکردنی بوناوچەكە كراوە، دواتر رێبازەكانی شێكاریی وبەراوردكاری بەكارهینراوە بۆ لێكدانەوەی داتاكان" جگە لەوەش سوود لە ئەزموونی تۆێژەران وتۆێژینەوەكانی دیكە لەو ئاراستە كە لە وڵاتانی دیكە ئەنجامدران" وەرگیراوە. شیوە و خشتەی جۆراوجۆر بەكارهێنراون بۆ رووندكردنەوەی راستیی و گورانییەكان. هەروەها تەواوی گورانكارییەكان لە ناوچەی لێكۆڵینەوە لە پێش دروستكردنی بەنداوەكە داوی تەواوبوونی رونكراونەتەوە وبەراوردكراون. تۆێژینەوە ئەوەی دەرخستووە، ئەو ئاوەی كە بەنداوەكە دابینی دەكات بەشی بەرهەمهێنانی 1,134 تۆن گەنمەشامی دەكات،هەروەها بەنداوەكە قەبارەی دانیشتوانی گوندەكەی بەرێژەی 14% وكەرتی گەشتوگوزاری بەرێژەی 17000% ونرخی زەوی وزاری بەرێژەی 200%بەرزكردەوتەوە.

Appendix

Salahaddin University **Department of Geography** **Questioner form**

(Economic Evaluation of Smaquli dam under the light of Geographic Factors)

First:

Age:( ) Gender: ( ) Career: ( )

Second: How do you evaluate the services in the Smaghuli village? Do you agree with them?

1- Clean water

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

2- Roads

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

3- Electricity

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

Third: Before Construction of the Dam

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1- Agriculture was flourish

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

2- The best crop was (1- 2- 3-)
3- Livestock was flourish

Strongly Agree ( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

4- The number of livestock was (1- cow: 2- sheep: 3-Goat:)
5- The best Sector for employment (Job opportunities) was (1- 2- 3-)
6- What was the number of Job opportunities in your Village? ( )
7- Tourists visited the Village continuously

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

8- Number of cars that was stooping while here: ( )
Fourthly:
9- How do you evaluate agriculture in your village?

Strongly good( ) good( ) I do not Know ( ) bad( ) Strongly bad( )

10- The best crop and agricultural production in the Village is: ( )
11- What is amount of Agricultural production in the Village? ( )
12- What is number of livestock? ( )
13- Livestock sector has flourished?

Strongly Agree ( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

14- Which sector can provide good job opportunities? ( )
15- Could you guess about number of job opportunities in different sectors? Rank them
(1- 2- 3-)
16- commercial Do you have fish production in the lake? ( )
17- How is fish production in the lake (estimate production)? ( )
18- How does tourist sector changed?

Strongly good( ) good( ) I do not Know ( ) bad( ) Strongly bad( )

Five: Your feeling

19- Are you happy with the dam?

Strongly Agree ( ) Agree( ) neutral ( ) Disagree( ) Strongly disagree( )

20- Hive your life changed positively?

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

21- Getting job opportunities now is better:

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

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22- Getting Job opportunities before construction of the dam was better:

Strongly Agree( ) Agree( ) I do not Know ( ) Disagree( ) Strongly disagree( )

23- Number of unemployment people in the village (estimate): ( )
24- Number of unemployment people in the village before construction of the dam: ( )
25- The best career before construction of the dam was (1- 2- 3-)
26- The best career after construction of the dam is (1- 2- 3-)
27- The main agricultural crop (crops) is : (1- 2- 3-)
28- Any other comment if you have

Six: Real-estate and land price

29 - How do you sell your lands? In Meter( ) hectare ( ) Donam ( )

30 How is the market of real-estate and land?

Very good( ) Good( ) I do not Know( ) Bad( ) Very bad( )

31- Which type of real-estate or land has bright market? Rank them

Tourism( ) Agriculture( ) Housing( ) Commercial( )

32- How did price of land change?

Too much ( ) Not bad ( ) Nothing ( ) reduced ( )

33- Could you estimate the change of land price?

Housing for 200m: Before dam ( ), After dam ( )

Commercial for 500m: Before dam ( ), After dam ( )

Agriculture 1 Donam: Before dam ( ), After dam ( )

Tourism 500m: Before dam ( ), After dam ( )

34- Who is the main buyer of lands? (1- 2- 3-)

35- Who is the main seller of lands? (1- 2- 3-)

36- Which part of the Village has seen increase in land price? ( )

37- Which part of the village has seen reduction in land price? ( ), And How? ( )

38- Are you ready to sell your land? Never( ) Maybe ( ) yes ( )

39- Do you have anything to say?

Thanks for your participatio

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