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The Attitudes and Perceptions of the Local People Towards the Durgun Hydropower Plant

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Dedication

I would like to dedicate this research project to my family back in California. For allowing me the opportunity to study abroad, doing the conventional unconventionally. I know you guys were skeptical about my choice of place to study but thank you for standing behind my decision. Your love and support was always felt throughout this trip. I love you all with all my heart.

Table of Contents

Abstract

Humans have been using the kinetic energy generated by waters movement in the hydrologic cycle for thousands of years. Since the late 19th century people have harnessed this energy source and utilized it as a means of generating electricity. The use of hydropower in many different ways can be found in countries all over the world, including the United States, Canada, Brazil, Argentina, the Democratic Republic of the Congo, Egypt, Spain, Turkey, India, China and, of course Mongolia. However, in some developed countries including the United States and Sweden there is a growing movement of hydropower stations and dam removal. In countries like Brazil and Ecuador the governments themselves have halted plans on building more dam-like hydropower stations. Mongolia is at a crossroads in its development stage and although it still generates most of its electricity via coal-powered thermal plants it has made recent moves to diversify to more renewable energy. Some of this diversification has come in the form of proposed large hydropower stations on some of the country's largest and most pristine rivers. While hydropower is nothing new to Mongolia, the country currently has only two hydropower stations that can operate all year producing electricity. It is because of these planned projects for larger hydropower stations, that I decided to go to the country's current largest hydropower station, which is in Khovd Amag in Durgun Soum, and talk with the locals about how it has affected their lives and what were their feelings were about the hydropower station. There has yet to be any official research on the effects that the Durgun Hydropower Station has had on the local environment or any discussion of the local peoples' attitudes towards the plant itself. I spent three weeks in the area and conducted nineteen primary interviews as well as passed out thirty quantitative surveys. In additions, I made a visit to the actual Durgun Soum Hydropower Station. I met with government officials, hydropower plant workers and herders alike. What I found was a lack of any hard evidence about the stations environmental effects, but generally a positive attitude and feeling about the hydropower stations from the local people.

List of Key Terms

1. Amag- a province in Mongolia. There is a total of 21 different Amags in Mongolia. They are the equivalent of a state in the United States
2. Argalant Bag – The area just south of the hydropower plant located on the Chono-Kharaikh River and an area where I conducted countryside interviews.
3. Bag- The smallest administration unit in Mongolia. Bags consist of local people from the surrounding Soum
4. Durgun Soum- Located within Khovd Amag in the northeast corner of that province. The Soum Center is located on the north side of Khar Us Lake, and my primary location for research and interviews. Distance is 106 Kilometers from Khovd Amag Center
5. Ger- The traditional Mongolian nomadic herdsmen house. The structures are made of circular lattices and covered with felt. Ger's are easily assembled and disassembled and are common throughout Mongolia.
6. Khovd Amag- A province located in Western Mongolia with 17 soums and is approximately 1,580 kilometers from Ulaanbaatar
7. Khovd Amag Center – Is the capital city of Khovd Amag located within Buyant Soum but is administered by Jargalant Soum
8. Kilowatt- A unit for measuring the amount of energy either produced or consumed by a certain place, or object such as a hydropower plant or a light bulb
9. Soum- Administration areas located inside of Amags and are basically the equivalent of a county in the United States
10. Soum Center- The main city within a soum and the location of the local areas schools, hospitals and markets
11. Tugrik- The Mongolian currency, at the time of writing this paper the exchange rate was one thousand tugriks for seventy cents American.
12. Western Energy System (WES)- Mongolia's energy system is divided into three unconnected grids; Western, Central and Eastern, The Western and Eastern are both independently connect to Russia's energy grids, which is where they receive most of their energy supply. The WES serves the three most western Amags: Khovd, Buyan Olgi and Uvs and is also the energy system the Durgun Hydropower Station is connected to and operating for.

Images and Charts

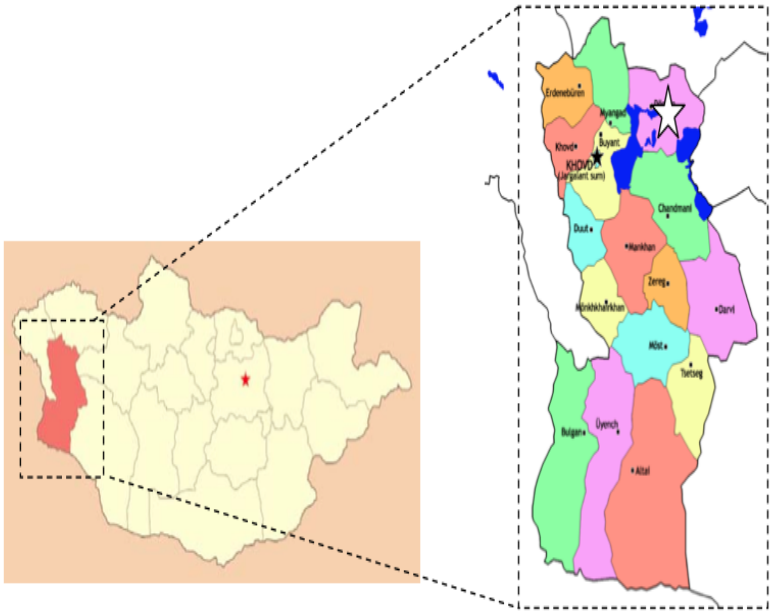
Hypothesis

Before heading out to Khovd Amag and Durgun Soum and actually engaging with the local people about the hydropower plant I had some preconceived notions about the things that I might find. Because of the deep cultural ties that Mongolians associate to nature and the environment, I thought that once in the area I would find people, both in the Soum Center and out in the countryside, with stark disapproval and negative attitudes towards the hydropower plant. I also anticipated that the focus of most interviews would be centered on the loss of pasturelands or how the hydropower plant was unwanted by the local people.

Objectives

The main purpose for conducting this research was to determine how much information the local natives in and around Durgun Soum had concerning the hydropower plant and what their feeling were toward the plant itself (see image 1 below for location of primary research). I wanted to find out if they were in favor of the hydropower station being constructed and if they were able to contribute any input during the construction or operations of the hydropower station. I also wanted to find out if since its construction the local people felt the hydropower station was positively or negatively affecting their daily lives. I also wanted to find out from the workers and operators of the hydropower plant if their

electricity station was measuring up to initial projections about how much electricity is could produce and who was on the receiving end of the electricity.



General Information About Hydroelectricity

Hydropower as a source of electricity has been in use around the world for over one hundred and thirty years (Sternberg, 2009). Globally, hydroelectricity is currently the world's largest renewable energy resource, making up roughly 20% of the worlds total energy supply (World Bank, 2009). In sixty-five countries around the world, hydropower accounts for more than 50% of those country's total energy supply; while in thirty-two countries around the world, hydropower accounts for over 80% of the total energy generated (International Hydropower Association, 2000, World Bank, 2009). There are many different ways to use

water to create hydroelectricity including tidal and wave movement, and “run-of-the-river hydroelectricity”. There is also the conventional, and the one this paper will discuss, way to generate hydroelectricity and that is to build a dam on a river and create a reservoir of water behind the large concrete barrier. The water in the reservoir is then funneled downward into pipes called a penstock. The downward movement of the water then passes through a turbine, causing the turbine to spin. The spinning turbine is attached to a generator that then converts the energy of the spinning turbine into electricity and the water passes out the bottom of the dam and continues down the river (see image 2 below). The water is taken in towards the bottom of the dam so that even in the harsh and cold winters of Mongolia when the tops of lakes are frozen, the hydropower plants are able to keep producing a constant stream of electricity.

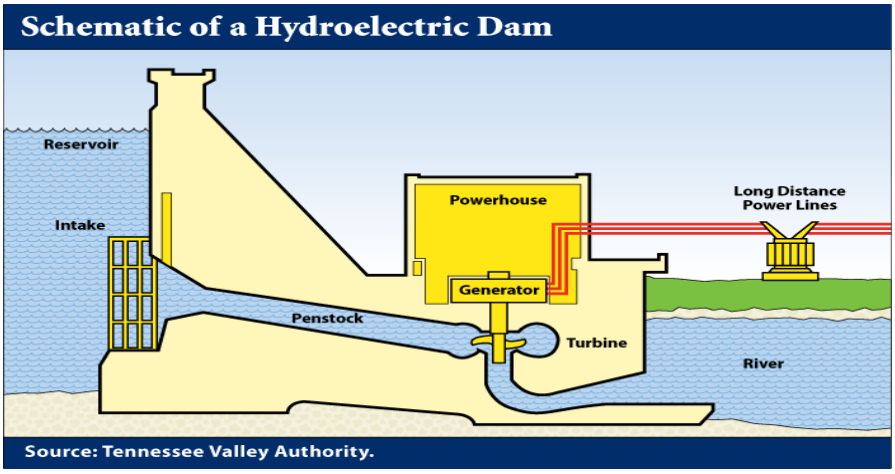
Hydropower stations come in three different sizes, small, medium and large. Although some descriptions vary large hydropower stations are defined as having the capacity to generate over fifty megawatts of electricity. Medium size hydropower stations have a capacity of ten to fifty megawatts. While small hydropower stations have the ability to capacity of less then ten megawatts (Hydro, 2012).

Studies by the World Bank and other international organizations have proven that hydropower plants can help developing countries with sustainable development while simultaneously working to alleviate the stresses of poverty in those countries (World Bank, 2009). Hydropower plants have the advantage of being able to create substantial energy production for rural areas that are currently

not connected to any larger national energy grid system. Hydropower plants also are notoriously reliable and flexible, in being able to generate either a constant flow of energy if demand is average, or also adjusting to times when consumption and demand are either higher or lower then normal (Schumann, 2010). The longevity of a hydropower plant has a much longer lifespan of 50-100 years as opposed to thermal coal power plants, which average only 25 years (International Hydropower Association, 2000). Hydropower stations and accompanying reservoirs also help countries and local areas with drought and flooding protection, as well as supply the local area with a reliable water management system (World Bank, 2009). After initial large economic investments, hydropower stations are often maintained and operated at very low costs while being able to produce inexpensive electricity (World Bank 2009, Schumann, 2010). Technological advances have also improved the harnessing ability of hydropower stations, which can efficiently gather 85%- 95% of the energy potential while other energy resources such as wind, solar and coal are only able to harness roughly 15%-20%, 35%-45% and 30%-45% of the total energy potential respectively (Why, 2009, Schumann, 2010).

Hydropower dams do come with some negative costs; primarily in the realm of environmental consequences from damming rivers and altering water flows. Also, hydroelectric dams are notorious for impeding fish movements and migration patterns. In the United States one thousand dams have been removed over the last fifty years. Causes for removal range from environmental harm and reduction of fish migration to structural integrity of the dam itself (MSNBC,

2011). Reservoirs, which accompany most hydropower projects have also been know to cause the relocation of people that were living in the area (Schuman, 2010). Most notably, China's Three Gorges Dam project caused the relocation of over 1.2 million people from homes and farmlands that had been cultivated for thousands of years (Watts, 2010). Building of dams and reservoirs also cause a sedimentation problem, where rocks, organic and other materials which usually travel with the flow of the river are trapped behind the reservoir barrier, this causes a lack of nutrients down river and in turn causes riparian (river) vegetation degradation (International Hydropower Association, 2000). Construction of hydropower stations and reservoirs can have a negative social effect as well, by disrupting the local peoples connection to the land and water (Schumann, 2010). Over and above these negative components, hydropower has been shown to be a productive source for supplying renewable energy around the world (EnergyInformative, 2012). There are currently roughly eighty to ninety thousand hydropower stations in operations around the world (Interview, 19).



General Information About Hydropower in Mongolia

Hydropower is also nothing new to Mongolia, which over fifty years ago built a hydropower plant in Kharkhorin Soum with the help of the Soviet Union. Currently, Mongolia has thirteen operational hydropower plants mainly located in Western Aimags (MREnergy, 2012, Interview, 19). Mongolia's two largest hydropower dams can only produce a combined maximum of twenty-two megawatts of electricity, which is only under the best conditions and is rarely ever achieve. Contrastingly, the country's hydropower capacity is estimated at fifty-six billion kilowatts an hour, roughly fourteen times the current total output of the country's entire power systems (Munkhchimeg, 2011). Mongolia currently has plans to build six more hydropower stations in the country on some of its largest rivers including the Selenga, Delger, Orkhon and Egiin (Energy Sector of Mongolia, 2012). Most of these rivers are Transboundary Rivers, meaning that their flow crosses national borders, either into China or Russia. The most prominent of these is the Selenga River, which flows into Lake Baikal, the world's largest freshwater lake. The Selenga River supplies half of the freshwater that ends up in Lake Baikal (Rivers, 2012). This has major geopolitical implications involving water security for Mongolia as well as trying to maintain a friendly relationship with Russia. In my interview with the government official from the Ministry of Environment and Green Technology, he stated, "about 80% of our (Mongolia's) water flows to our neighbors, so we need to close it and accumulate the water in our country" (Interview, 19). Mongolia has an arid dry climate where water can sometimes be scarce or nonexistent, being able to use

hydropower stations and their reservoirs to collect water can be an extremely beneficial tactic in securing a freshwater resource. These planned hydropower plants are significantly larger then the country's current largest hydropower plants with some potentially able to produce ten times the amount of energy then the Durgun Hydropower Station's max capability.

General Information About Durgun Hydropower Plant

The Durgun Hydropower Plant is located in Khovd Amag, Durgun Soum in a steep canyon ravine and is on the Chono-Kharaih (which translates into wolf-jumping) River. The main goal of this project was to supply the three most Western Amags which are, Bayan Ulgii, Uvs and Khovd with clean renewable energy, giving the area a more secure energy supply. While Soviet engineers approved the site to be a viable place to construct a hydropower station in the 1960's (Interviews, 6, 18) it wasn't until the early 2000's when energy relationships with Russia got tense did anything actually start happening with the construction of the hydropower station (Interview 6, 11, 19). A contract for the Durgun Hydropower Plant was signed on August 23rd, 2001 and was made between China and Mongolia (Durgun, 2012). The loan for the construction of the hydropower station was made with a Chinese based company called "China Shanghai (group) Corporation for Foreign Economic and Technological Cooperation" with the loan being for $26.5 million dollars (Durgun, 2012). Construction of the Hydropower Plant began on August 6th of 2004, and was completed on December 10th 2008, and the first commercial energy supply was

generated on July 1st 2009 (Durgun, 2012, UNFCCC, 2011). The hydropower plant's generating capability upon completion was to be twelve megawatts of electricity per hour, however as this paper will discuss, the power station has fallen short of this proposed production capacity. While a twelve-megawatt hydropower station is classified as a small-medium hydropower station, the Durgun Hydropower Plant is currently the largest hydropower station within Mongolia. The hydropower station has forty employees who rotate working in three different eight-hour shifts (Durgun, 2012, Interview, 6, 7, 8). The dam itself consists of a two hundred and ninety meter long barrier (two hundred and thirty meters is an "earth-filled" dam and the other sixty meters is a concrete gravity dam) (Durgun, 2012, UNFCCC, 2011). The concrete dam section includes the powerhouse (turbines and generators), low-level outlet spillway and fish-way (UNFCCC, 2011). However, numerous interviews including an engineer at the hydropower station said the fish-way, a channel for fish to move from the lake to the river, was poorly constructed and unable to actually assist in fish movements (Interviews 1, 2,6, 13 & 17). In 2011 the hydropower plant made thirty-four million kilowatts per hour and of that produced, thirty million kilowatts per hour for the WES (Durgun, 2012).

Methodology

My main methods of gathering data for this research project were primary interviews in Khovd Amag Center, Durgun Soum Center, the Argalant Bag countryside and Ulaanbaatar as well as through surveys that I wrote and passed out in Khovd Amag Center, Durgun Soum Center and the Argalant Bag

countryside. I also gathered some information from secondary sources using Sonoma State University's online library research and also Google scholar.

The surveys covered basic questions such as age, gender and monthly income as well as specific questions such as hours of electricity use per day, general feelings about the hydropower station, energy security and one fill in the blank question asking about the biggest change they have seen since the hydropower plants construction. Survey was first written in English and translated into Mongolia, then after the completion of the surveys they were again translated back into English. Thirty surveys were distributed throughout Khovd Amag and Durgun Soum and surveys were left near the door of locked ger's in Argalant Bag but only twenty were returned during my stay in the area. Of the twenty returned surveys thirteen people lived in the Soum Cener, six lived in the countryside and one lived in the Amag center.

During the interviews, interviewees were asked question involving their occupation, how long they had lived in the area, when did they first hear about the hydropower plants construction, if they had felt positively or negatively towards the electricity station, if they had seen any changes to the surrounding area since construction, how much they paid for electricity, promises made by local and central government officials and also about current energy security. I conducted three interviews in Khovd city with a government official, the Khar Us Lake National Park administrators and NGO workers. Some of these interviews required formal scheduling of time and date but others were conducted on a walk-in type of manner. I interviewed nine local people in The Durgun Soum Center,

from park rangers and schoolteachers to retired herders. The interviewing process within the Durgun Soum Center involved walking around with my translator and going into ger's where people were present and where dogs did not seem to vicious. Once I was granted permission to visit the Durgun Hydropower Station I was able to interview three workers including the top ranking engineer and two hydropower station operators. Out in the countryside of the Argalant Bag I was able to find three different herding families who were willing to give me an interview. This interview process consisted of driving around the countryside locating ger's knocking, on the doors and asking if the residence would be interested in conducting an interview. Once back in Ulaanbaatar I was able to meet with one high-ranking government official who worked for the Ministry of the Environment and Green Technology and also worked for the National Water Committee and is the overseer of the Durgun Hydropower Station. This interview was the most formal of all the interviews, where scheduling needed to be conducted before hand. The questions in the interview with the Ulaanbaatar government official were more catered to hydropower's future in Mongolia, the operations at the Durgun Hydropower Station and other basic energy questions about Mongolia's Western Energy System. All nineteen interviews were conducted with the help of a translator. The eighteen interviews that took place in Durgun and Khovd my translator was a man named Tilek, while my interview in Ulaanbaatar I was accompanied by a women named Enebish. Most of the interviews were from thirty to forty-five minutes long with the shortest being twenty-three and the longest being an hour and fifteen minutes. Most interviews

were conducted in the middle of the day from the hours of 10 A.M. to around 5 P.M. Out of the nineteen people that I interviewed, twelve were male and seven were female. In regards to the surveys, nine were male and eleven were female.

I did give financial compensation to many of my interviewees and also a smaller amount to the people who filled out surveys and returned them to me before my departure. Most interviewees received five thousand tugriks (roughly three dollars and fifty cents American) to compensation for their time and information, while people who filled out surveys were paid two thousand tugriks (about a dollar fifty American). Government officials were not given money and many of the NGO interviewees did not accept the monetary compensation.

Obstacles and Limitations

While aware that this research project was going to be a challenge, I was definitely surprised by the amount of obstacles and limitations that I encountered during my research period.

Five to six days prior to my arrival in Khovd Amag, a local ninja miner found a large deposit of gold inside of the Khar Us Lake National Park. This National Park is located within and around the Durgun Soum, and is very close to the Durgun Hydropower Station, which is actually defined as being in the area of the buffer zone for the National Park (Interviews, 1 &17). The finding of gold in the area was the greatest unseen challenge and obstacle that I faced during my stay in Khovd Amag and Durgun Soum. It caused problems such as the inflation of food and housing prices because the local area saw a large influx of ninja

miners, who needed a place to stay and a place to eat. The discovery of gold also caused a shortage of local vehicles and drivers for my translator and me to rent. Every car and their driver could make more money going to the mining site and collecting dirt then driving me out to the hydropower station or to the Argalant Bag. Furthermore, when we finally found a car willing to take us, we found the quality of the car to be very poor -the left front tire actually fell off the axel on our way to the hydropower station. The driver was also able to charge fifty thousand tugriks- around thirty-five dollars American- for the very short distance to and from the hydropower station.

During the second week living in Durgun Soum, local elections were being held. This caused an unnecessary uneasiness with the local politicians and others who were running for office at my presence in the area. The first day my translator and I attempted to go to the hydropower station we were told we would need to get a permit from the Durgun Governor, who was very busy and unable to meet with us until the next day. When we were finally able to meet with him he essentially asked my translator if I was there because of the gold or if I was attempting to spy on the current local elections. Luckily, I had a pretty descriptive consent form outlying all of my intentions, as well as a letter of recommendation from my academic advisor of SIT. After a few tense minutes, the governor signed a letter giving me permission to go to the hydropower station for one day; however, I was not allowed to go further downstream into the Argalant Bag. The governor thought it would be an unsafe location for me, and since I was not there for the gold, there would be no need to go past the hydropower station. When we

got to the hydropower plant, my translator and I thought we could maybe still be able to go further, but there was a police barricade on the bridge that would have allowed us into the Argalant Bag area. This was extremely problematic because in many interviews conducted in Durgun Soum the people told me they were happy with the hydropower station but the locals living in Argalant Bag were very upset with electricity station (Interviews, 2, 4, 11, 12). One Durgun Soum local said, "people around this area are pretty happy with it (the hydropower station), but the people from Argalant Bag are opposite" (Interview,12) or another Durgun Local stated, "most of the people are happy with it, but in the area in Argalant most of the people are very against it" (Interview,11). Luckily, a couple days later we were able to locate a different driver who knew of a second bridge away from the hydropower station that did not have a police barricade present and would allow us inside of the Argalant Bag.

I was very please to finally talk with people who were possibly against the hydropower plant. However once in the Bag many of the ger's we drove to were locked or only had the children present. When asked where their parents were, the children informed us that most of the adults had gone to the gold mining site. We did however find 5 ger's, which had adults home, but at two of the locations the members of the household told us they did not have any feelings towards the hydropower station and did not want to be interviewed. In total I was only able to get three interviews from people living in the Argalant Bag.

Another obstacle I faced was the amount of survey questions that were left blank by the respondents. Eight people failed to respond to the question "What

has been the biggest change since the construction of the hydropower station? Please explain?". This question was the only question in which the respondents actually needed to give a written response and was the questions I had hoped I would get some of the most insight of the local people understanding and feelings towards the hydropower station.

A lack of academic research on hydropower in Mongolia, zero academic papers written and no academic or professional research conducted about the Durgun Hydropower Station was also a limitation for both my interviewees and myself. Numerous interview topics and issues were brought up that were either prefaced with "this is just my opinion" or declarations such as, "there's no actual information" were added to the end of other sentences. These statements were coming from, wildlife and government officials, hydropower plant workers and locals alike (Interviews, 1,2,4,6, 13, 17,18,19). So although there were concerns about fish populations and fish migration, pastureland degradation and energy efficiency, there are no actual academic secondary sources to back up all of the claims and concerns associated with the Durgun Hydropower Station specifically.

Data, Findings & Interpretations

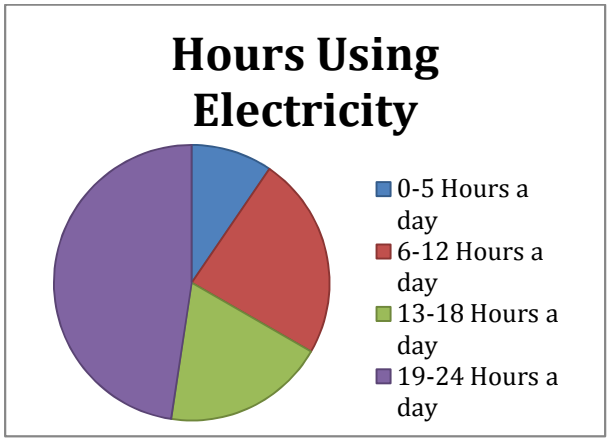
This section will be a combination of both the data that I recorded as well as my individual interpretations of the aforementioned data. For the sake of fluidity in this paper, I found it better to combine both sections into one; in order to show the reader specific quotes from primary interviews as well as survey

answers, and then immediately follow that up with my own individual interpretations about that information.

After the nineteen primary interviews and the twenty surveys, the basic attitudes, and perceptions of the local people were that of approval and acceptance of the Durgun Hydropower Plant. I affirm that the hydropower station represented development for the local people, which is what the majority of them want and what they expect in this day in age. One interviewee stated, "The main thing is that we have electricity…having electricity is development" (Interview, 5). Furthermore, an Argalant Bag herder said, "our Soum is developing because of the hydropower station" (Interview. 15).

Many of my interviewees in Durgun Soum Center were happy with the construction of the hydropower plant. Before its construction, the Soum Center only received three hours of weak electricity during each evening. Now they have twenty-four hours of stronger and more stable electricity. It is easy to see that locals are satisfied, even the wildlife ranger stated, "the good thing about the hydropower plant is that we are having electricity for twenty-four hours now"(Interview, 2) or a local Durgun Soum resident said, "most of the people are very happy, they used to have only three hours of electricity…and now they have twenty-four so they are pretty happy with it (the hydropower plant)" (Interview, 5). A retired herder now living in the Soum Center had a conflicted answer, insisting that, "having electricity for twenty-four hours is good but it's ruining the environment which is bad" (Interview, 4). Out of the twenty surveys that were returned ten people reported using electricity for nineteen to twenty-four hours a

day while only two reported using electricity for five or less hours a day (See chart 1). In regards to more of a stable electricity source one Durgun Soum woman said, “before (the hydropower station) we could not use an electric boiler, the electricity was not strong enough, now we can use it whenever we want” (Interview, 10). Five of the people surveyed stated, that now they are using more electrical appliances. Two responded that they are using a lesser amount of appliances, and the other thirteen answered that they were still using the same amount of electrical appliances. This information affirms that while most did not go out and buy new electrical appliances, the ones they already possessed, such as, televisions and light bulbs would stay on for longer periods during the day and night. I found this to be true in my interviews as well; for instance, my translator, on occasion needed to ask the interviewee if they could possibly turn off or turn down the television while we conducted the interview.



The people in the area were also please to have diversification in their energy supply. Before the hydropower station was operational, almost 100% of the WES was being supplied by importing electricity from Russia (Interview, 6,

18, 19). Because of the total reliance on Russia for electricity, the Russian Government was able to charge exuberant prices for the electricity, and when the local people failed to pay, the Russians would completely cut electricity imports to the WES (Interview, 18). One local of Durgun Soum said, “To be honest, its better to have the hydropower plant here, we don’t want to get electricity from Russia and pay a lot of money” (Interview, 2). While another local reiterated, “If Russia cuts electricity again, they (the hydropower plant) can turn on the third generator and still have energy for the area” (Interview, 3). This however is somewhat of a miss conception as the hydropower station engineer said, “60% of the electricity is coming from Russia and 40% is coming from the Durgun Soum Hydropower Station” (Interview, 6) and the Khovd Government official stated, “we are importing electricity from Russia and the Durgun Hydropower Station is actually just assisting” (Interview, 18). The Khar Us Lake National Park Administration worker said it best while talking about energy security of the area, saying, “I don’t think it is secure because it is not working with all its capabilities and in the beginning the project said it would give enough energy to the Western Amags but now, see, we are still getting most of our energy from Russia” (Interview, 17). A question in my survey also tried to address the question of whether the locals felt that the hydropower plant gave them more energy security. Eleven people responded that yes they did feel more energy secure, and nine people said no it did not make them feel more energy secure (see chart 2 column 4 below). In regards to the local who said by turning on the third generator and having enough power for the Amags the engineer cleared it up by saying, “it (the

hydropower station) can not give enough energy to all the Amags there are categories like 1st, 2nd, 3rd. If it (the electricity) gets cuts from the Russian side we can only give (electricity) to the hospitals, schools and heating system" (Interview, 6). This illustrates that the information the locals take as fact is actually unreliable and the local's lack some basic knowledge about how the hydropower station is actually ran and operated.

Another section where I found the local people to be harboring certain opinions that they thought were facts was, surrounding the question of, who owns the hydropower stations and what promises were made by local officials. Many of the Durgun Soum locals were under the assumption that Uvs Amag somehow owned the Durgun Hydropower Station and all the profits from the power plant were going to them. A retired herder in Durgun Soum said, "The hydropower plant is owned by Uvs Amag and if there are any possibilities to make it owned by Khovd Amag or even Durgun Soum and locals, I think that would work well" (Interview, 12). I believe this information was coming from the local government and other political candidates who were trying to use the hydropower station as a political platform. The Durgun Soum teacher said, "right now the hydropower plant is bad because it is becoming government parties main goal on the election. If Khovd Amag or Durgun Soum owned it, it maybe useful, but right now the parties are just using it for entertainment for the elections" (Interview, 13). One of the women herders that I interviews stated, "Khovd Amag and Durgun Soum are trying to get a permit from the government to own the power plant, if they get it will be better" (Interview, 10). A man who resides in the soum center also brought

up that "they (Durgun Government) have a plan that after six years the hydropower plant will give all its debts to the central government and the hydropower plant will give local people free electricity" (Interview, 3). When talking with the governmental official in Khovd Amag Center I asked him about locals in Durgun Soum receiving free electricity, to which he responded, "the local people are very innocent, to have free electricity is very impossible" (Interview, 18). When asking the Ministry of Environment and Green Technology official about these claims being made by the local people about ownership and also about local politicians using the hydropower station in their political campaign he said, "they can not do that…the hydropower plant is the states property" (Interview, 19). Again things, such as ownership of the hydropower station, that local people hold as factual have actually turned out to just be political jargon and rhetoric.

While relocation of local herders did happen because of the Durgun Soum Hydropower Station, neither them nor the Durgun Soum Center locals actually seemed to be bothered by that consequence. When I asked one Argalant herder if he knew before the construction that he would lose his winter camping site he responded, "We knew, but could not do anything about it" (Interview, 14). In other interview with a woman herder of Argalant bag, while talking about her new wintering campsite she said, "these new winter campsite are not suitable to my animals and many die" (Interview, 15). In a completely different mentality a local in Durgun Soum told me, "I have heard that some winter camp sites became sank, but they are just complaining to get money from the government" (Interview, 3).

However, when I asked all three Argalant Bag individuals, not a single one of them was compensated for the loss of their winter camping sites (Interview, 14, 15, 16).

However, even these herders who live south of the hydropower plant, whose wintering ger sites were lost and underwater because of the large reservoir, whose animals drown when the hydropower plant releases large amounts of water at a single time, and who do not receive any benefits from the electricity produced by the hydropower station (they are not connect to the WES and get all their electricity needs from solar panels), said things such as "for us who live in the countryside it is useless, but for the urban people maybe it's a good thing" (Interview, 14) in response to the question, "do you think the hydropower plant is a good thing for Khovd Amag and Durgun Soum or a bad thing?". Other members of the Argalant Bag reiterated this same response by saying things such as "it's development and its useful…they don't put chemicals into the water, however, the Chono-Kharaikh River has shrunk in recent years" and to a question if she would want to see the hydropower plant removed she said "no, we don't know well but it wouldn't be good if it (the hydropower station) got removed. Since people are benefiting from the hydropower it doesn't have to be removed"(Interview, 15). I found this to be a very interesting finding because some of these same herders had lost sixty or more livestock to the hydropower plant and were making comments such as "at first I was very against it (the hydropower plant), I heard (the hydropower plant) gives bad effects to the nature, that's why I was against it but now it seems quite okay" (Interview, 16). These

interviews with people who themselves saw no personal benefits from the hydropower station were still able to look past the personal negatives, such as pasture lost, drowned livestock and a loss of wintering sites and were able to see that it did indeed give the people of Durgun Soum Center positive benefits and more electricity.

While sedimentation problems were not specifically brought up in any of my interviews or did locals who completed my survey discuss them, one lady in the Argalant Bag, located downstream of the hydropower station, responded when asked about changes to the pastureland and environment by saying, “I think its only the riverbed that’s really changed, there used to be aquatic plants in the middle, but now its not growing anymore” (Interview, 15). The blockade of organic and other materials by dams causes a lack of vital nutrients downstream (International Hydropower Association, 2000). While there has yet to be any actual research on riparian vegetation in the area, I believe the locals have been and will be the first to notice environmental nuances that are happening to the river and the local environment.

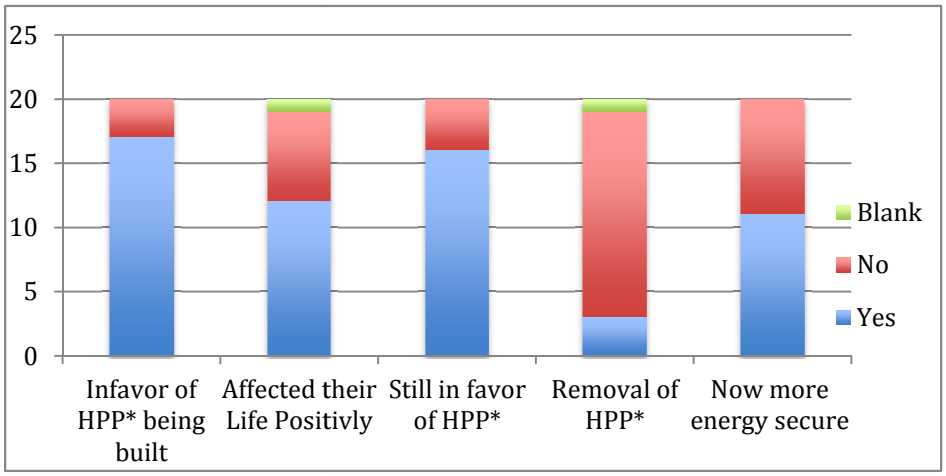
One of the main topics brought up against the hydropower station was the fact that people did not think the fish were moving from Khar Us Lake to the river or the other surrounding smaller lakes where they usually to go to spawn. The WWF worker said, “After making the power plant, it is impossible for the fish to go to the (other) lakes” (Interview, 1) the local wildlife ranger also mentioned that “the negative effect is that after the hydropower plants construction none of the fish in the big lake are going to the other lakes” (Interview, 2). Furthermore, in

another interview a Soum Center local stated, “people say the fish are not going to the other lakes or coming back, but I don’t know very well” (Interview, 11). The local biologist and high school teacher also stated, “it is only the channel that needs to be changed because the fish are not passing though it” (Interview 13). My interview with a worker at the Khar Us Lake National Park Administration also said “the main thing is fish movement has stopped and the water level is getting high, none of the fish move to the other lakes” (Interview, 17). My interview in Ulaanbaatar with the government official in the Ministry of the Environment and Green Technology who is also on the Mongolian National Water Committee said “at the Durgun Soum Station there is a pass for the fish” (Interview, 19) he then went on to mention about 80% of all the hydropower dams around the world do not contain a fish pass and “they don’t give as much high concern for the fish pass, even highly developed countries compared to ours” (Interview, 19). However, only the Durgun Soum Hydropower Station constructed a fish pass, the second largest hydropower station in Mongolia, Taishir Hydropower Station has no type of fish channel at all (CDM, 2005). I talked about this with the engineer at the hydropower station and his first response was “people say fish are dying and no fish are going to other lakes or making movements but those people don’t have any proof” (Interview, 6). I asked him to talk more about the fish channel to which he responded, “from the beginning it was made incorrectly so we have to find someone who can rebuilt it properly” (Interview, 6). In my interview with the Khar Us Lake National Park Administration he talked about the workers at the hydropower station saying,

"after one year they knew the fish were not moving through it. And even if they did open it (the fish channel) none of the fish would swim though it" (Interview, 17). Again, with no hard data to reference I can not make a statement with 100% accuracy, and even though in my Ulaanbaatar interview he said it was working, my interviews with the WWF, Khar Us Lake National Park Administration, an engineer at the hydropower station and numerous local interviews, I can say that the current fish channel is flawed and unable to help with the movement of fish. Therefore, it can be a factor for environmental and species degradation in the area.

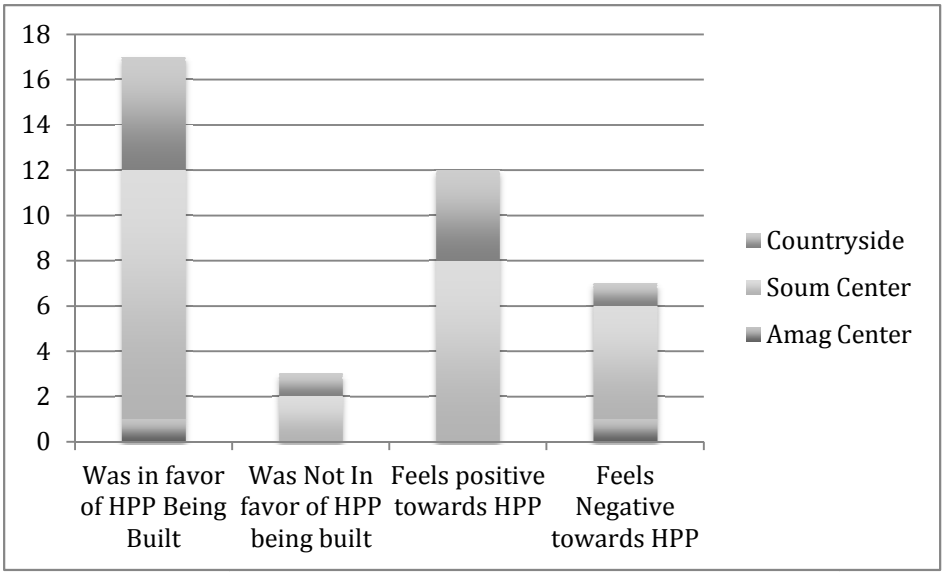
On the other hand, as charts 2 and 3 illustrate, the majority of the people surveyed were both in favor of the hydropower station being built and still to this day have positive feelings towards the hydropower station. Chart 2 column 4 shows that an overwhelming majority would not want to see the hydropower station removed, but chart 2 column 5 shows that only 55% feel more energy secure since the construction of the hydropower station. Chart 3 shows however, that there has been a slight increase in negative attitudes towards the hydropower station but this is still a smaller portion of the people surveyed in comparison to the grouping of people who are in approval of the hydropower station.

Chart 2



*HPP in this case stands for hydropower plant

Chart 3



Conclusion

Since conducting this research I have found out the majority of the local people in Durgun Soum, Khovd Amag are in favor of having a hydropower station located in the area. While this was the complete opposite of my original hypothesis when I started out to conduct this research, after talking to the people I

have realized that their view of the situation is completely different then my initial view. My view was one of environmental protection and pastureland preservation while theirs was one of development and the building up of the local infrastructure. My primary interviews and surveys pointed to the fact that electricity and development were what the local people have been wanting and looking for, and this hydropower station has seemingly fulfilled both of these needs. This has been done through providing constant reliably electricity and the ability to use electrical appliances that either before could not be used because the electrical gird could not supply or because of the limitation of only three hours of electricity a day. Even though local people made comments about environmental degradation, loss of pasturelands and living areas and still having to be energy reliant upon Russia. Many still seemed to be weighing the positives and negatives and have come to the conclusion that the Durgun Hydropower Station has been and still is a positive thing for themselves and their soum. Even people in the Argalant Bag countryside who saw no benefits from the hydropower station, were still in favor of it because of the overall benefits to their family, friends and others who lived in the Soum Center. While local people do not have a complete grasp of all the facts and operations of the hydropower station, when it comes down to it the thing they are looking for is a cheap, reliable and constant supply of energy.

Hydropower has the ability to become a major contributor to Mongolia's energy system that will simultaneously offer a supply of renewable energy and an ability to have a more secure and stable source of freshwater. Besides Ulaanbaatar, most of Mongolia's populations live in rural amag and soum centers

and the countryside. Hydropower both small and large projects have the ability of generating relatively clean and renewable energy resource for these people living in areas where the central electrical gird in unable to reach. This research has also changed my overall outlook about hydropower for developing countries, especially places like Mongolia who struggle to create renewable energy resources and are also in a situation where freshwater security is paramount and extremely important to overall national security. While our foreseeable future still will be one focused on supplying energy from thermal coal powered plants countries like Mongolia have the ability and obligation to start exploring more renewable energy resources. Hydropower is not the all solving answer and does come with negative consequences, with the right about of proper research and planning hydropower can have a central position in the energy developmental process of Mongolia and other developing nations.

Interviewees

Who they were/gender/age/where interview took place/Date of interview

1. World Wildlife Foundation worker/Male/Unknown/WWF office Khovd City/ 11/13/12
2. Amag wildlife Ranger/Male/Unknown/Durgun Soum Center/11/16/12
3. Durgun Local (driver)/Male/55/Durgun Soum Center/ 11/16/12
4. Durgun Local (retired herder)/Male/42/Durgun Soum Center/ 11/16/12
5. Durgun Local (driver)/Male/43/Durgun Soum Center/ 11/16/12
6. Hydropower plant worker (engineer)/Male/31/Hydropower plant station/ 11/17/12
7. Hydropower plant worker (operator)/Female/35/ Hydropower plant station/ 11/17/12
8. Hydropower plant worker (operator)/Female/27/ Hydropower plant station/ 11/17/12
9. Durgun Local (school guard)/Female/50/ Durgun Soum Center/ 11/18/12
10. Durgun Local (herder)/Female/ 34/ Durgun Soum Center 11/18/12
11. Durgun Local (retired)/Female/71/ Durgun Soum Center 11/18/12
12. Durgun Local (herder)/Male/71/ Durgun Soum Center 11/18/12
13. Durgun Local (biologist & school teacher)/Female/ 31/ Durgun Soum Center/ 11/18/12
14. Durgun Local (herder)/Male/40/Argalant Bag countryside/ 11/19/12
15. Durgun Local (herder)/Female/35/ Argalant Bag countryside/ 11/19/12
16. Durgun Local (herder)/Male/43/ Argalant Bag countryside/ 11/19/12
17. Khar Us National Park Administrator/Male/52/ Khar Us National Park Administration building Khovd City /11/22/12
18. Khovd Government Official/Male/37/ Khovd Government building Khovd City /11/23/12
19. Central Government Official/Male/Unknown/ National Water Committee building Ulaanbaatar/ 11/26/12

Information About People Surveyed*

Gender/Age Range/Monthly Income (Tugriks)/Years Living in or around Durgun Soum/Place of residence

1. Male/ 29-39/ 410,000-500,000/ 25-40 years/ Soum Center
2. Female/ 40-50/ 500,000 or more/ 25-40 years/ Soum Center
3. Female/ 40-50/ 310,000-400,000/ 25-40 years/ Soum Center
4. Male/ 51-61/ 410,000- 500,000/ 41 or more years/ Soum Center
5. Male/ 40-50/ 100,000 or less/ 41 or more years/ Soum Center
6. Female/ 29-30/ 100,000 or less/ 25-40 years/ Countryside
7. Male/ 40-50/ 210,000-300,000/ 41 or more years/ Soum Center
8. Female/ 40-50/ 210,00-300,000/ 25-40 years/ Soum Center
9. Female/ 29-39/ 160,00-200,000/ 11-25 years/ Countryside
10. Female/ 18-28/ 100,000 or less/ 11-25 years/ Soum Center
11. Female/ 72 or older/ 310,000-400,000/ 41 or more years/ Soum Center
12. Male/ 62-72/ 210,000-300,000/ 41 or more years/ Countryside
13. Female/ 29-39/ 500,000 or more/ 25-40 years/ Soum Center
14. Male/ 40-50/ 100,000 or less/ 11-25 years/ Countryside
15. Female/ 29-39/ 100,000 or less/ 25-40 years/ Countryside
16. Male/ 29-39/ 500,000 or more/ 25-40 years/ Soum Center
17. Male/ 40-50/ 100,000 or less/ 25-40 years/ Countryside
18. Female/ 18-28/ 410,000-500,000/ 1-10 years/ Soum Center
19. Female/ 18-28/ 4010,000- 5000,000/ 1-10 years/ Soum Center
20. Male/ 51-61/ 500,000 or more/ 25-40 years/ Amag Center

*This information is provided to the reader to show the diversity in gender, age, income, and location of residence of the people who completed the survey.

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Consent Form

Hello my name is Francis Clougherty and I am an American college student. I am here in Mongolia studying abroad and am currently conducting a research project for my school. My independent research is on the local hydropower station and the accompanying dam and reservoir. I am trying to understand local peoples attitudes, perceptions and feelings towards the power station, and I am conducting interviews with people from the area and would like to ask you a few questions. I will be using a recording device during the interview and there is a possibility that the information you give to me will be used in a research paper that I am currently writing. However none of your personal information will be used in my research paper and your confidentiality is my upmost priority. You do not have to answer any question that you don't want to and have the right to terminate the interview at anytime. I would like to interview you and ask you certain questions about daily life in the area as well as life before and after the hydropower station. This interview should take around one hour and you will be compensated for your time. I also have a survey that I would like for you to fill out and return to me, upon completion of the survey you will also receive a small compensation for your time, and work. Signing this document means you understand that information given to me is all honest and truthful to the best of your abilities and you also understand that any information given has the possibility of showing up in my research paper. Thank you for taking the time to sit down with me

Participants Signature:

Date:

Durgun Hydropower Station Survey

Circle the letter that best fits your answer

2,000 tugrik if returned completed and filled out

1. Gender
    a. Male
    b. Female
2. Age
    a. 18-28
    b. 29-39
    c. 40-50
    d. 51-61
    e. 62-72
    f. 72 and up

3. Where do you live
    a. Amag Center
    b. Soum Center
    c. Countryside
4. How long have you lived in the area?
    a. 1-10 years
    b. 11-25 years
    c. 25-40 years
    d. 41- and up years
5. Amount of money you make a month
    a. 100 thousand or less
    b. 110 thousand – 150 thousand
    c. 160 thousand – 200 thousand
    d. 210 thousand – 300 thousand
    e. 310 thousand -400 thousand
    f. 410 thousand – 500 thousand
    g. 500 thousand and up
6. Before the hydropower station was constructed were you in favor of it being built?
    a. Yes
    b. No
7. How do you feel about the hydropower station now?
    a. Positively
    b. Negatively
8. Before construction of the hydropower station were there promises or assurances made to you by either the government or hydropower station construction company
    a. Yes (If yes please explain)

i.

b. No

9. After construction of the hydropower station are you still in favor of it being built?
    a. Yes
    b. No
10. What has been the biggest change since the construction of the hydropower station? Please explain
    a. The surrounding nature and environment
        i.
    b. An increase in the livelihood of the surrounding Soum and its people
        i.
    c. A negative reaction to the livelihood or the surrounding Soum and its people
        i.
    d. A change in the water supply of the river and lakes
11. Have energy prices changed since the construction of the Hydropower plant
    a. More expensive
    b. Less expensive
    c. Stayed the same
12. What amount of energy do you use since the construction of the hydropower station?
    a. More appliances
    b. Less appliances
    c. The same amount of appliances
13. How many hours a day do you use electricity
    a. 0-5 hours a day
    b. 6- 12 hours a day
    c. 13-18 hours a day
    d. 19-24 hours a day
14. Has the construction of the hydropower station changed your life?
    a. Yes (In a positive way)
    b. Yes (in a negative way)
    c. Stayed the same
15. If the hydropower station could be taken down would you want it removed
    a. Yes
    b. No
16. Since the hydropower stations construction do you feel more energy secure
    a. Yes
    b. No

Дөрөний усан цахилгаан станцын судалгаа

Тохирох хариултыг сонгоно уу.
Бүрэн хариулсан судалгаанд 2000□ өгнө

1. Хүйс
    a. Эр
    b. Эм
2. Нас
    a. 18-28
    b. 29-39
    c. 40-50
    d. 51-61
    e. 62-72
    f. 72 түүнээс дээш

3. Та хаана амьдардаг вэ?
    a. Аймгийн төв
    b. Сумын төв
    c. Хөдөө
4. Энд хэр удаан амьдарч байна вэ?
    a. 1-10 жил
    b. 11-25 жил
    c. 25-40 жил
    d. 41- ээс дээш жил
5. Танай гэр бүлийн сарын орлого хэд вэ?
    a. 100,000 болон түүнээс бага
    b. 110,000 – 150,000
    c. 160,000 – 200,000
    d. 210,000– 300,000
    e. 310,000-400,000
    f. 410,000 – 500,000
    g. 500,000 түүнээс дээш
6. Өмнө нь цахилгаан станц барина гэдэгийг сонсоод баяртай байсан уу?
    a. Тийм
    b. Үйщгүй
7. Цахилгаан станцын талаарх таны сэтгэгдэл ямар байна вэ?
    a. Эерэг
    b. Сөрөг
8. Цахилгаан станц бариглахаас өмнө нутгийн удирдалгуудын зүгээс болон цахилгаан станцын зүгээс ямар нэгэн амлалт өгч байсан уу?
    a. Тийм (хэрэв тийм бол тайлбарлаж бичнэ үү)

   b. Үгүй
9. Цахилгаан станц баригдсаны дараа ч та баяртай байгаа юу?
   a. Тийм
   b. Үгүй
10. Цахилгаан станц бариглсанаас хойш гарсан хамгийн том өөрчлөлт юу вэ? Тайлбарлаж бичнэ үү?
   a. Хүрээлэн байгаа орчинд гарсан өөрчлөлт
      i.
   b. Цахилгаан станцын орчимд амьдардаг хүмүүсийн амьдралд гарсан дэвшил
      i.
   c. Цахилгаан станцын орчимд амьдардаг хүмүүсийн амьдралд гарсан доройтол, сөрөг нөлөө
   d. Гол
11. Цахилгаан станц баригдсанаас хойш цахилгааны үнэ нэмэгддсэн үү?
   a. Арай үнэтэй болсон
   b. Арай хямдарсан
   c. Хэвэндээ байгаа
12. Цахилгаан станц баригдсанаас хойш тогны хүчдэл ямар байгаа вэ?
   a. Илүү сайн байгаа
   b. Арай муу байгаа
   c. Хэвэндээ байгаа
13. Өдөрт хэдэн цаг цахилгаан хэрэглэдэг вэ?
   a. Өдөрт 0-5 цаг
   b. Өдөрт 6- 12 цаг
   c. Өдөрт 13-18 цаг
   d. Өдөрт 19-24 цаг
14. Цахилгаан станц баригдсанаас хойш та цахилгааны эх үүсвэртээ аюулгүй байдал талаас нь санаа зовох болсон уу?
   a. Тийм
   b. Үгүй
15. Цахилгаан станц баригдсанаар таны амьдралд өөрчлөлт гарсан уу?
   a. Тийм (сайнаар)
   b. тийм (муугаар)
   c. хэвэндээ байгаа
16. Хэрэв цахилгаан станц хаагдахад хүрвэл та үүнийг дэмжих үү?
   a. Тийм
   b. Үгүй