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ECOLOGY

REPORT

# The Main Drivers of Water Shortage in Daikundi Province

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Executive Summary	4
Recommendations	6
Methodology	9
Water sources in Daikundi	10
Springs and Karizs in Daikundi	10
Mountain snowpack	10
Water Wells	12
Rivers	13
Groundwater level in Daikundi	14
Irrigation System In Daikundi Province	16
Traditional and Non-Traditional Irrigation systems and their effect on water shortage	16
Causes of water shortage in Daikundi	18
Challenges of water management in Daikundi province	20
Land degradation in Daikundi	21
Reasons of Land Degradation in Daikundi	21
Water shortage and land degradation impacts on men and women in Daikundi	22
Conflicts over Water Resources	24
Impact of water shortage on economic situation of locals	25
Community's role in managing water	26

<b>Target districts (Meramoor, Shahrستان and Nili)</b>	<b>27</b>
Meramoor District	27
Shahrستان District	29
Nili District	30
<b>Conclusion</b>	<b>31</b>
<b>Imprint</b>	

# Executive Summary

The purpose of this study is to identify the main drivers of water shortage in Daikundi Province of Afghanistan. In addition, this research covers a comprehensive range of topics, broken down into the following: Water resources in Daikundi, groundwater level, Traditional and non-traditional irrigation systems in Daikundi Province and their effect on water shortage, causes of water shortage in Daikundi, challenges of water management, land degradation, water shortage and land degradation impact on men and women in Daikundi, conflicts over water resources, impact of water shortage on economic situation of local communities, the communities' role in managing water, case studies of three target districts, conclusion and recommendations.

A remote mountainous province, Daikundi is located in what is known as Afghanistan's Central Highlands. Daikundi's history as one of the more economically underdeveloped provinces in the nation has been defined by the landscape as well as the considerable distances from any significant urban centre. Over the years, Daikundi has faced numerous challenges in terms of water shortage and its management. There are a number of factors that have contributed to this, including climate change, natural disasters, a lack of vegetation, land degradation, a decline in rainfall and snowfall. In addition, local communities' lack of awareness to abide by the principles of effective water management, lack of proper mechanisms to manage water by the government, excessive unsustainable use of water resources, non-standard irrigation systems and population growth have been other contributing factors towards the water shortage crises and mismanagement of water resources in Daikundi. Between 2001 and 2022, there has been a significant decrease in the groundwater level and a good number of water sources such as streams, wells and the traditional 'kariz' system, which channelizes underground water to the surface, have dried up in recent years. Daikundi's water shortage is now obvious and noticeable and locals, especially farmers, in almost every region of Daikundi are complaining about the scarcity of water – both for irrigation and drinking purposes – in their areas.

The people of Daikundi have been employing traditional irrigation systems to provide for their livelihoods for many years. However, now with the scarcity in water resources, a vast number of kariz systems, streams and wells have already dried up. As an alternative to compensate for these water sources, solar powered water extraction systems have become popular among the people and are widely in use. Residents have dug up their own wells to supply water for their agricultural and drinking needs, as this has become a relatively cost-efficient and affordable way to pump water out of the ground compared to fuel-operated generators.

In many parts of the province, communities invested a lot of money in digging wells but could not achieve satisfying results because of the rapidly depleting groundwater level. At the same time, the terrain in this province consists of highly rugged landscape with numerous hills and valleys. Drilling a well in this type of terrain is unlikely to yield outstanding results, because most of the districts have high altitude mountains that encompass a sizable portion of Daikundi's lands. Similarly, the province's water reservoirs are based on its land structure and are situated at an elevation of 1,152 meters above sea level, making it almost impossible and very costly for the people of the provincial capital of Nili to have access to the water collected there. Compounding these challenges is the fact that the province has been receiving very little rainfall each year due to its geography; even the limited rainfall is not of much benefit given that most of it flows into the river in the form of surface water.

The lack of vegetation, trees, and bushes in this province's land areas has made it difficult for snow and rain to be naturally absorbed into the soil. Hence, there is a need for interventions in the form of resource management initiatives to address this problem as well. It is vital to plant trees, because trees capture rainwater with their leaves and roots and store it for later use and provide improved conditions for future precipitation to be absorbed into the soil. Increased vegetation also contributes to humidity rising and moisture to be released into the environment at the same time as well as aid in preserving adequate water levels in nearby water bodies.

# Recommendations

To resolve and address the current problems related to the use of water resources, the following solutions are recommended:

## **Comprehensive Programme Planning:**

- Creating an inclusive plan and programme for the management of natural resources is essential, because, so far, there are no proper mechanisms in place. The plan should be implemented in accordance with the Forestry and Grassland Law, considering the living conditions of the local people and in close coordination with the communities so that the responsibilities of all the stakeholders are specified and the responsibilities and associated actors distributed clearly. Determining punitive actions and incentives related to the compliance with and implementation of the programme should be included in this plan, because communities mostly do not adhere to the implementation of the law and regulations without any authority, monitoring and intervening when necessary. If such regulations are implemented and enforced, the cutting down of bushes and forests can be prevented and resources, including water, could be managed in a more effective and natural way. With the preservation and increase of the vegetation cover in the areas with vegetation in this province, rainwater absorption into the soil naturally increases and the groundwater level would increase as a result.
- All governmental and non-governmental institutions and the communities must comply with the principles and regulations of the environment at the provincial level, because the level of people's awareness about environmental issues is low. As a result, many communities already struggling to make ends meet have not been paying any attention to the environment. Today, the biggest challenge is the issue of pollution because air pollution has been attributed to as the cause of death for an increasing number of people in the country every year. Pollution of surface and underground water is also a new challenge, and people drink and consume drinking water without considering the health standards, meaning whether the water is clean and safe enough to drink. As a result of air pollution, a significant amount of acid rain has reached the ground and been absorbed by it, which also has had a negative impact on the soil quality and also on the agricultural products grown in the affected soil.
- Constructing dams and retaining walls in the canals that flow through the valley and the river in autumn, winter and spring is also important. With the construction of dams, the water can be diverted from the catchment areas and directed to specified areas and water can also be stored for the drought seasons. By excavating check dam trenches using modern water management techniques or changing the water course

through pipes to the appropriately position the water catchments, larger areas of the land will benefit from the water available and the level of groundwater can also be improved.

## **Community Engagement:**

- Involving communities in terms of water management at the village and district levels and encouraging people to participate in water management projects is essential for managing the crises of water shortage in Daikundi. Local communities in the districts are unemployed or underemployed for most of the fall and winter seasons. With proper plans for improving water storage, the local administration should put efforts into devising water management plans so that local communities are able to work on their lands in more than just the spring and summer season. Local communities should be involved in this planning; agricultural and water management experts should be working with them to identify opportunities and to set up a plan for the local agricultural communities.
- Associations should be established for the protection of water resources at village and district levels. Participation of active, influential and educated people as well as representatives of the local administration in these associations can prove to be beneficial to ensure collective action. The members of these associations should have the ability to attract funds and mobilise resources, prepare and implement the plan, conduct surveys to monitor implementation, and identify challenges and propose. In addition, the local administration should carry out comprehensive supervision of these associations and cooperate with them as well as coordinate their efforts. The associations should be able to receive funding and whenever any partner institution wants to implement a project, it should directly transfer the budget to the associations and in return supervise their activities and ensure accountability that all resources are indeed used for water and resource management projects. The relevant beneficiaries of each association should be entrusted with the responsibility of collecting money related to the management of water and agricultural resources annually under the supervision of the key members of the associations or committees from the communities for the management of water and agricultural resources, so that the communities consider themselves involved and partners in this process. In addition, all the beneficiaries of the association should have the right to comment, vote, complain and make alternative proposals. The rural communities in Afghanistan have a long history of collecting money or in-kind products to pay water managers such as mirabs (skilled persons or groups that traditionally provide irrigation operations and water maintenance services). Their role needs to be incorporated in the new associations.

## **Improve Awareness:**

- In the first step, the governmental, meaning the de facto, authorities and non-governmental institutions should provide complete information to communities regarding the use of water resources through training in schools, madrassas, councils and committee members at village and district levels. Also, the scope of work and limitations of governmental departments should be well defined so that the responsibilities of every department are clear and local constituencies know whom to approach for what kind of support.
- The lack of attention of the relevant departments in this sector has been one of the major contributing factors towards mismanagement of water resources, because local communities used water in their own way without managing it. On the other hand, a certain limit should be considered for the use of water according to the law, and certain separate criteria and regulations should be determined for the use of water for drinking purposes and agriculture in order to systematically address the challenges in one official approach. Due to insecurity, some of these communities did not experience close involvement with the management by the local administration. Hence now it is an opportunity to change these entrenched and so far ineffective relationships by involving the communities in the management process.



# Methodology

This study adopted a mixed-method approach to deeply understand the main drivers of water shortage in Daikundi. By integrating both qualitative and quantitative research methods, a comprehensive insight into the phenomenon was sought.

## **Qualitative Research:**

**Objective:** The qualitative approach was emphasised to delve into stakeholders' experiences and perspectives, providing depth to the research findings.

**Participants:** Interviews targeted local communities, de facto authorities, and NGO officials to represent a broad spectrum of stakeholders.

**Data Collection:** 40 semi-structured interviews were conducted. This format allowed participants to freely express their thoughts and experiences. Interviews were offered in either in-person or phone modes, accommodating participants' preferences and locations.

## **Quantitative Research:**

**Objective:** To provide breadth and statistical validation to the findings.

**Data Collection:** An extensive set of 1,200 structured interviews were carried out to gather data from a larger population segment.

## **Data Analysis:**

The collected data underwent thematic analysis, a robust method to identify patterns, overarching themes, and derive meaningful implications from the data.

# Water Sources in Daikundi

There are various water sources in Daikundi and they differ from one district to another. For instance, places like Shahristan and Meramoor, which are flatter and at lower elevation, have ariz systems as their main water supply. Additionally, springs are typically the source of water for communities that are situated at higher altitudes. In districts like Kiti, Kejran, Sang Takht, and Ashtarly, the river's water level is relatively high in some parts, so it is possible to use river water for irrigation. However, due to low water level of the river in Pato, Nili, and Khedir districts, it has been costly to divert river water for drinking or irrigation purposes of agricultural lands, springs<sup>1</sup> and kariz<sup>2</sup> are the primary sources for the mentioned purposes in these areas.

## Springs and Karizs in Daikundi

Springs in Daikundi			
From 2001 to 2005,	From 2005 to 2010,	From 2010 to 2015	From 2015 to 2021
24,900	21,165	14,815	10,582

Karizs in Daikundi			
From 2001 to 2005,	From 2005 to 2010,	From 2010 to 2015	From 2015 to 2021
20,750	17,637	12,345	8,300

Source: The Department of Agriculture, Daikundi

## Mountain Snowpack

Daikundi is largely a mountainous and high-altitude province, therefore if it snows, a lot of snow will accumulate and stay on the mountains. Prior to the droughts, the amount of snowfall was regular and the high quantity of snow was practically constant every year. The following mountains serve as this province's snow catchment area and as one of the main water sources.

<sup>1</sup> A spring is a location where groundwater naturally exits the aquifer and rises to the surface of the Earth's crust to become surface water.

<sup>2</sup> Kariz is an alternative source of water supply, in which people excavate the ground horizontally in the form of a tunnel to accumulate rainwater or melted snow water to provide water for drinking and irrigation of agricultural lands.

District	Details
Khedir	<p>A good source of water can be found in the high mountains of the Khedir district, known as Ochka, which are situated between the villages of Odema and Peshtrooq. In the past, snow covered these mountains up until 15 June, but last year snow covered some areas of these mountains only until the month of March.</p> <p>Sek Parideh Mountain is also located in Khedir district between Kurge and Khaskhab villages. This mountain also has an excellent feature for storing snow, because it has a high altitude, and in the past, this mountain was seen covered in snow until the first month of summer.</p>
Ashtarly	<p>Seya Mountain is situated in Ashtarly district between the villages of Nojok and Seya Dare Sheikh Meran. The snow on this mountain used to last until the end of April in the past, but in recent years, snow only lasts till the end of March.</p> <p>The high-altitude Baloch Mountain in the Ashtarly district is situated near Chaharqal and Ashtarly. The snow used to last until the end of April, but lately, it only lasts through the end of March.</p>
Sang Takt Wa Bandar	<p>In Sang Takht Wa Bandar District, Talkhak Mountain is located between Talkhak villages and some areas of Lal district of Ghor province. The underground water of many areas of this district is supplied by the snow melt from the mentioned mountains. These areas have a suitable snow cover, and in the past, snow remained until mid-June, but recently, a less quantity of snow has been observed and it only remains till the month of April.</p> <p>The Kotel Badam Mountain is situated in the Ghajurbash and Qol Dastak areas of the Sang Takht Bandar district. These mountains are high in altitude and contain areas that are ideal for storing snow, thus this is where a lot of snow is preserved. Historically, snow covered the mountain ground until June, but more recently, snow can be seen only until March.</p>
Shahristan and Meramoor	<p>Shah Tus Mountain, which is a long mountain range, is located between the districts of Ajiristan of Ghazni and Shahristan and Meramoor. This mountain range stretches from the northeast to the southwest of Shahristan. It has covered the Gerow areas of Shahristan and is the only water source for the areas. In the past, these mountain ranges were covered with snow until the end of April, but in recent years, it carried snow only up until around the middle of March.</p> <p>Sha Mashhad Mountain of Shahristan runs from the north to the south through the district's centre. Although it does not have a very high altitude, this mountain covers a large portion of the settlements of Bala Dasht and Al-Wadal. Previously, snow would stay on this mountain until the end of April, but more recently, snow has not even stayed until the end of March.</p>

District	Details
Nili, Kiti and Pato	<p>Takht Sulaiman is one of the famous mountains of Afghanistan. This mountainous area is located across the districts of Nili, Kiti and Pato and located between Kiti and Patu in a north to south direction. It has a high altitude and stores a large amount of snow every year. Springs flow from this mountain to Timran, Naveh Kiti and Kesiso areas of Kiti district. Also, in some areas of Pato district, such as Qakhor village, there are many fresh water springs. In the past, most of the snow on this mountain remained for most parts of the year. But in recent years, snow in some places only stays until the month of April.</p> <p>Uraghi Mountain, which has a high elevation, is located in the continuation of the Takht Suleiman mountain range. This mountain is located between the villages of Bari Sari Tegao, which in the past had snow until the end of April. But in recent years, snow remains till the month of March at most.</p> <p>Chogani Mountain is located in the center of Daikundi province, and it has a high elevation. This mountain supplies water for the areas such Dasht, Nave Nili, Sange Mom, Mesh Ha, Meyan Qul Ulya and Sufla. A lot of snow is stored on Chogani Mountain every year. In the past, snow remained until April, but in recent years, snow only remains till the mid of March.</p>

## Water Wells

Drilling wells in Daikundi province was not popular or common until recent years. Earlier circular wells with a diameter of about 1 metre and a depth of about 10 to 15 metres were common among the locals. In the past, there was enough underground water in all areas and people used it for drinking and for other daily activities. However, it has been about 15 to 20 years since the majority of these wells have dried up. Therefore, in recent years, particularly since 2018, as the drought has been more severe, people have started drilling wells in some areas of Kiti, Kejran, Sang Takht, Nili and Shahrstan districts; these wells reach down to 30 to 40 metres. Despite these efforts, local communities are not satisfied with the outcomes from drilled wells, because they failed to produce tangible results in some areas of the Nili and Kiti districts. For example, last year, due to a decline in underground water levels and rapid drying out of drilled wells, the relatively recently drilled wells turned out to neither have maintained or increased the quality of water available but actually have led to less water being accessible despite the significant costs and efforts of drilling these wells.

Information provided by the Directorate of Lands indicated that shifting levels of groundwater due to local geological specificities meant that drilling these deep wells has been incompatible with Daikundi's land structure. Groundwater flows out through specific channels and, therefore, people do not have the ability to manage this water through drilling deep wells that cannot access this stored groundwater. Attempts to do so have led to no sustainable results as yet. Furthermore, the government – under the Republic and post-2021 – has not carried out any significant activities to manage water.

## Rivers

Helmand is one of the few rivers that flow through Daikundi. However, there are more seasonal and other permanent waterways running throughout the province - some of them are not exactly rivers, but often constitute seasonal streams caused by snowmelt.

The Helmand River is considered one of Afghanistan's most notable and longest rivers. It enters Shahrستان district in Paye-Beni Bagh village after passing through Meramoor district from Dahan-Tol village. It passes through Meramoor for about 75 to 80 kilometres (km), but the Helmand River is used to irrigate the agricultural lands only in the villages of Tol and Akla.

The Sartaghan River originates in the Sang-e Takht district and flows through Khedir district in the areas of Sarteghan, Tajrib, and Kisoo until finally reaching the Gohargin region, where it meets the Helmand River. In order to irrigate their agricultural lands, residents of the areas near the Sartaghan River have carved streams that span 2.5 to 3 km.

Daryacha-e-Dara-Khodi is a small river in Khedir. This river's water is primarily utilised for irrigation of agricultural lands and drinking water, with little being used to generate electricity through hydro-electric means. The Dara E Khodi River starts from Sang-e Takht district and its other part starts from Sia Chob - going from north to south. This river eventually joins the Helmand River after passing through the districts of Nawamish, Kiti, and Kejran.

The Sange-e-Takht River begins in Lal Sarjantal district of Ghor and passes through Sang-e-Takht and then flows into Ashtarly district. When the river flows into Ashtarly, it joins the Shaikhmiran River in Ashtarly. Sang-e Takht district is irrigated by the river; about 50 per cent of the district uses the river.

The Bandar River originates from the areas of Seyah Choband Ghojor Bash and Upper Bandar of Sang-e-Takht district. This river passes through Bandar and flows into Kheder district. People of the Bandar region of the district use this river to irrigate their lands.

# Groundwater Level in Daikundi

Since 2001, the amount of groundwater has substantially reduced. People used to dig wells to obtain drinking water in the majority of the districts in Daikundi. When the wells were drilled to a depth between 10 and 15 metres, local communities typically still had access to enough water. However, this soon deteriorated as there has been a considerable drop in groundwater level over time. Currently, most of the districts do not have access to drinking water from wells until about 30 metres; in some areas the situation is even worse as water can only be accessed after a depth of 60 metres.

Reduction of Groundwater through Years in CFS	1990-2002	2002-2022
Total Decreased Rate of Water	15	35-30
Annual Decreased Rate of Water Level	0.12	1.5

Source: De facto Department of Agriculture, Daikundi<sup>3</sup>

District	Groundwater Level in Districts
Kiti	It is essential to highlight that drinking water can be accessed by drilling wells up to a depth of 40 metres in places like Kiti, Munmi, Oshi, some parts of Sartighan, Kiso, Tamaran, Panora, Nogonbad, and Kavumi villages of Kiti district.
Nili	In Nili, water can be accessed at around 35 metres through drilled wells in areas like Meyan Qul Ulya, Sufla, Shura Shesh Ulya, Takhak, Kete Jack, Jaref Ulya, and Badamek. In villages such as Naweh Nili, Dasht, Sangmom and Anuk, it is possible to access water at around 33 metres.
Shahristan	In the Sad Khana areas of the Shahristan district, wells have been dug up to a depth of 38–50 metres to access water; however, in the Dasht Bala areas of the district, from Alqan to Chebrask, wells can yield water at a depth of 30-47 metres.
Meramoor	In Bargar areas from Qonaq to Tahi Rah areas of Meramoor, access to drinking water is possible up to a depth of 28 metres. However, in the areas of Nawe Meramoor, from the villages of Spok to Bakrak, it is found at a depth of 34 metres. In the remote areas of Meramoor such as Barkar, Bardiz, Mirgholam, Dedeh Avaz, Chelang and Iskan, the water level varies from one village to another, but on an average, the depth is between 30 and 40 metres.

<sup>3</sup> The Department of Agriculture in Daikundi is functional, however, its services and research have decreased as compared to the Republic Period. Currently, there are fewer resources at the De-Facto Authority's disposal. The Department is collecting recent data but with less resources.

District	Groundwater Level in Districts
Ashtarly	Drilled wells can provide water at a depth of 30 metres in villages of Khusak including Sarbala, Sarvan and some areas of Lazir in Ashtarly district. In the areas of Chaharqol including Nojok, Siah Dara, Sheikh Miran and Band Mazar Ali of Ashtarly, water is available at 28 metres. Likewise, in areas such as Bagh Kandoh including the villages of Abdi and Prastan, it is possible to access water at 33 metres. In areas such as Nawe Ashtarly, Dahan Gardesh, Noyel, and Khadirbash, it can be found at a depth of 26 metres.
Nawamaish	It is possible to access well water up to a depth of 20 to 30 metres in the following villages of Nawamaish district: Shatot Ulya Wa Sufla, Siahseng, Nicheh, Dehan Qol, Warkak Ulya Wa Sufla, Jawzari, Shalgham, Joi Naw Saidabad, Pasab Rood, Velam Qol, Dasht Khairabad, Dehan Varkhan, Khanjak, Gerdani Ulya, Barghana Joy, Ghochak Ulya Wa Sufla, Zardsang, Qonagh Ulya Wa Sufla, Zol Varkhan, Gazak, Checher, Nichi, Markaz Ghach and Bazar Bhach.
Khedir	In Khedir district, well water can be accessed up to a depth of 20 to 36 metres in the following areas: Gorga Valley, Mohammad Khajeh, Ab Laily, Dehan Anbarsarkorgeh, Dera Sengchelak, Koneh Zarat, Sarab, Sheniye Jalil, Sarlik, Dera Jozari, Shalgham, Polband, Ghazbeiri, Dashtak, Dehan Qol, Dehan Kiti, Shekardara, Dare watma, Khushk Ab, Baraas, Sham Karam, Deyar Meyana, Sarqol.

# Irrigation System in Daikundi Province

In Daikundi, water is mostly used for agricultural purposes. Different irrigation methods such as traditional and non-traditional irrigation systems are applied in the province. Considering the compatibility of the kariz with the environment, it can be deemed the most effective irrigation system, as it allows collecting a significant amount of groundwater (in particular after the snowmelt period) and bringing it to the surface via sub-horizontal tunnels. However, locals believe that modern systems are required to ensure the sustainability of the water supply chain. This belief is based on the fact that the volume of snowmelt water that used to feed and replenish the kariz system decades ago has reduced considerably over the years.

A traditional irrigation system is a method or approach that has been passed down in Afghan society from one generation to the next. With this method, usually the farmers collect spring and kariz water in a ditch, then they direct the stored water to the agricultural lands. In some areas in Daikundi, where the main sources of water are rivers, locals usually transfer river water to agricultural lands through a diverted stream, which is an example of a traditional system as well. These streams and canals are outfitted with shutters so that even in these canals the water flow can be directed towards specific fields.

Considering the water shortage in recent years, the modern irrigation system has gained popularity among the locals in Daikundi. As a good number of springs and karizs have mostly dried up in the majority of districts in the province in recent years, the locals have been forced to adopt new practices of modern irrigation such as drilling wells and utilising solar power in order to get the water to the surface. Locals however believe that modern irrigation system is very hard for the poverty-stricken communities in Daikundi to manage. While using solar powered pumps are more affordable for these communities compared to fuel generators, using drilled deep wells to get irrigation water has hardly been an optimal and sustainable solution. Therefore, in recent years, locals have started digging large pits and canals in the river to divert this surface water. Yet the amount of water, which they manage to collect and divert to their agricultural lands, has been very costly and labour intensive without meeting the required irrigation needs.

## **Traditional and Non-Traditional Irrigation Systems and Their Effect on Water Shortage**

The majority of the water sources in the traditional irrigation system are springs and karizs. Therefore, according to the locals, they did not have a significant adverse impact on the water supplies. Farmers were able to irrigate their lands using majority of the springs. But in recent years, due to a lack of enough water in springs and karizs as



well as a result of frequent droughts, the people have switched to modern irrigation techniques that involved drilling wells and to using solar power to extract water. It is important to note that modern systems have had a detrimental impact on the groundwater levels, because the majority of the residents of Daikundi province recently began drilling wells to meet their irrigation needs. Unfortunately, this approach has not been responsive to the needs of the people, and despite spending a lot of money, the people have not been able to obtain the quantity of water they require to support their livelihoods.

From a hydrological perspective, digging a well in such a mountainous province is not a wise decision or a promising undertaking because the annual discharge of underground water is forced to come to the surface by solar power and this activity is depleting the underground water. As Daikundi's annual snowfall and rainfall have been decreasing as well over the past years, they are insufficient to replenish the groundwater. These dynamics constitute a worrisome challenge for the residents of Daikundi. If no attention is paid to addressing this issue systematically by the local and national governmental institutions and non-governmental organisations (NGOs), the possibility of an increase in desertification in this province is likely, which will also affect the residents of this province to a great extent. If the status quo prevails or the situation worsens, eventually, the local communities will be forced to leave their lands to migrate to other areas in Daikundi, inside Afghanistan and possibly abroad.

# Causes of Water Shortage in Daikundi

There are numerous causes for the drying up of springs, karizs, and the reduction of the sub-surface water level in Daikundi. For example, the kariz system, which has been dug horizontally in the ground often decades ago, has been used to access underground water channels and lead them to the surface. This process is unnatural since the water does not flow in a natural way and the vast volume of water flows till the underground water drains, which also has an adverse impact on farming when the groundwater depletes. This method meets farmers' short-term agricultural water needs; however, it has had detrimental long-term consequences on the water level, especially as snowmelt and rain have not been replenishing the kariz system sufficiently.

In the past several years, many springs have dried up in Daikundi to a great extent due to insufficient snowmelt and rain. The amount of rainfall in this province has also been quite low over the past 20 years, which has not been sufficient to meet the locals' needs, especially when needed to use all water sources also for irrigation. As a result, the level of underground water has decreased significantly.

The lack of sufficient rain and snowmelt water has been compounded by Daikundi province's high altitude landscape where the density of vegetation, trees and shrubs is naturally very low. In most areas of the districts, the level of vegetation is close to zero, thus this also has a negative impact on the ability of the ground to absorb the water. The most of rainwater in Daikundi flows through rivers or streams, which has a negative impact on the groundwater level as little water gets absorb, and also makes it difficult for residents to use the water effectively given the lack of water storage facilities.

The level of snowfall in Daikundi province has been gradually decreasing since 1999. The amount of snowfall was quite high before the droughts started. In the past, the local communities did not experience any issues related to a lack of or insufficient water for irrigation.

However, as the level of snowfall reduced, adverse impacts could be seen. It can be argued that the environment and local communities have suffered greatly as a result of decreased snowfall in recent years. The people of Daikundi are mostly engaged in the livestock and agriculture sector; with the increase in droughts and the associated less snowfall, all local communities suffered to some extent. Frequent droughts in the province have resulted in the drying up of sources for groundwater. Around 70 per cent of karizs and springs have dried up; the remaining water sources are not sufficient to meet the needs of locals. Droughts and water shortage issues have also led to displacement of more than 30 per cent of the population of Daikundi to other provinces or countries.

People do not have enough knowledge or information about the environment, the impact of climate change and how to access this, including the effective use of water. On the other hand, the government – under the Republic and post 2021 – has also not raised awareness about the water shortage and possible ways to manage and address this crisis in the short, medium and long term. In the absence of this information and concerned about the diminishing resources, the local communities use the insufficient resources indiscriminately. The proper culture of using these resources has not been promoted in a scientific and technical way among the communities.

As a result of the indiscriminate and amateurish drilling of wells by the communities in Daikundi, a significant amount of water has been diverted from the groundwater and underground channels to the earth's surface each year. This has worsened the crisis by causing the level of underground water to fall further and more rapidly. In addition, the majority of rainwater has not been stored and thus transferred to other provinces through the rivers.

Another reason for the water shortage in Daikundi is what is viewed as the people's negligence for the management of natural resources. Today, local communities often struggling to survive have indiscriminately cut down bushes and trees, without anyone holding them responsible or preventing this exploitation of the communities' resources. While the government – under the Republic and post-2021 – has been claiming that it has ultimate control over the natural resources, especially when they are on government-owned public land, in reality, the communities have been getting away with secretly cutting down the trees. As a result of the destruction of the bushes, shrubs, grasses and other vegetation, the ground soil has changed to an extent that it cannot absorb and hold enough water anymore. When the water is not absorbed, the springs and karizs dry up, and when it rains, the water creates floods, which rush into the river.

Besides, without the vegetation cover, rain or snowmelt water runs down the slopes and valleys that are too hard and dried up to absorb the water, and without check dams, this water is lost to the local communities. As a result, billions of tonnes of water pass through Daikundi without being used due to lack of proper storage and management of water on the other hand, because of the recent economic crisis and harsh winters, individuals have been forced to cut down trees in order to utilise them as a source of fuel because they cannot afford to buy firewood or coal.

As a result of insufficient annual rainfall, which has gradually decreased over the years, the majority of the distributaries of Helmand River have dried up or the water levels of the river have decreased up to 80 per cent; the Lazir River has completely dried up. Additionally, the water level of the Sartighan river, which runs through Sang Takht o Bandar, Kiti, and Kajran, has dropped by 50 per cent. The water level of the Helmand River, which flows through the districts of Meramoor and Shahrstan, has also dropped by 50 per cent as well. Thus, also the communities, which have been using river water for agricultural irrigation purposes, have been significantly negatively affected.

# Challenges of Water Management in Daikundi Province

The lack of appropriate methods and government policies to manage the remaining water has been one of the key issues in water management in Daikundi. The government – during the Republic and post-2021 – has so far been unable to develop a proper strategy that involves community consultation and awareness-raising. The problem of water management can be effectively solved if the local communities are informed and educated on how to utilise and manage diminishing water resources most effectively.

Another concern is the lack of constructive collaboration between local communities and government agencies. Presently, due to lack of collaboration at the provincial level, each sector is unable to carry out effective activities within its defined areas. There is also a lack of information, statistics and research, which means that most government departments do not even have the exact details for their respective departments in terms of the developments related to the environment, water levels and agricultural practices affecting water and other natural resources. For instance, the Department of Agriculture in Daikundi still lacks information on how many hectares of grassland and agriculture lands are in the province – vital statistics to address the water management challenges. If grasslands are managed at the district level and accurate figures are available, then local communities could be better motivated to pay attention to water management, because their livelihoods depend on the grasslands. In addition, the authorities of the Helmand River Basin do not know how many cubic metres of water are released every year; and there is also a lack of information about annual rainfall in the province, which is a challenge. Similarly, government officials lack information on how many hectares of land have been destroyed by floods or are affected by the cutting down of vegetation every year. Without these statistics, it is hard to predict and model possible outcomes and scenarios, which would be important for the local communities to understand and for devising strategies on how to address these challenges.

# Land Degradation in Daikundi

From 2001 and 2020, land degradation has increased for all sorts of lands, whether agricultural or rangelands. Data collected from the Directorate of Agriculture in Daikundi shows that land degradation pervasiveness has been estimated at around 53.5 per cent an average across key districts.

Land Degradation in Daikundi Districts from 2001 to 2020		
	District	% of degraded land at district level
1	Meramoor	70
2	Shahristan	65
3	Nili	50
4	Ashtarly	50
5	Kiti	60
6	Khedir	50
7	Sang Takht Wa Bandar	50
8	Pato	45
9	Kejran	45
10	Nawamaish	50
<b>Total Average across Daikundi Province</b>		<b>53.5</b>

Source: Department of Agriculture, Daikundi

## Reasons of Land Degradation in Daikundi

Land degradation in Daikundi province has become a significant issue, which has affected all local communities and their daily activities. No doubt, human activities have adversely affected the land, but natural causes and development activities have also contributed to the degradation. Following are some of the reasons behind land degradation in Daikundi Province.

Social conflicts over resources and agricultural lands and pastures have been a major factor, which has led to mismanagement of the resources, such as overgrazing by livestock. Removal of vegetation by local communities and turning the land into rain-fed agricultural plots is one of processes that has become common over the past decade as families grew and needed more farmland; it has significantly contributed to the land degradation.

Improper and wasteful use of water sources such as springs, wells, canals, and river water for irrigation has contributed to a general water scarcity, which, in turn, has led to lands used by local communities to experience desertification.

Rapid population growth has also been a key factor for land degradation as some families and communities turned the pasture land into residential areas out of necessity. Community members have traditionally built houses near water sources. Rapid increase in population in areas already without enough water storage capacity has led to water stress. With the increase of residential houses near water sources, the demand for water has also increased at the sources with already diminishing capacity.

The intensification of climate change affecting Afghanistan, particularly the central highland region, has meant that the levels of rainfall have decreased significantly, which, in turn, has contributed to land degradation.

The occurrence of natural disasters such as floods, landslides, heavy snow and cold temperatures without precipitation, and wildfires due to dried out vegetation have impacted water levels. As a result, the irrigation systems of agricultural and pasture lands have been affected, which also has been contributing to land degradation.

Fierce competition among Daikundi communities over the use of water resources has further impacted land degradation. The majority of the communities have been digging wells on their own in a desperate attempt to have access to the falling groundwater without considering the consequences as local authorities regulate the rapid proliferation of this practice. The situation has come to such a pass that neighbors have been competing with one another to dig wells to have access to the shrinking water supply. Such activities have caused a large amount of water to be consumed annually – even beyond what is actually needed; often well owners sell their surplus water to others. The province's water resources do not have enough catchment areas to sustain the current pace of well drilling under conditions of reduced rainfall and snowmelt and other negative impacts. Such conditions contribute to water shortages, which are ultimately also leading to initially very localised degradation, which then often quickly spreads to the broader areas.

## **Water Shortage and Land Degradation Impact on the Local Population in Daikundi**

The reduction of water supplies and increase of soil erosion in the majority of the districts of Daikundi has had a negative impact on society. In Daikundi, most of the people – men and women – depend on the livelihoods related to agriculture and animal husbandry. Therefore, all sections of society have been affected by reduced water supply, and loss of vegetation and land degradation. Many households have experienced a loss or severe reduction in their livelihoods during the recent years. Those involved in animal husbandry have had to reduce their livestock holdings because of lack of water and vegetation. In addition, due to overgrazing of the pasture lands, the vegetation, already affected by lack of water, has been destroyed. Droughts have had a significant impact on the farmers. Agriculture often does not even meet 20 per cent of their household needs. Thus, these communities are now confronted with issues directly affecting their lives and livelihoods.

When a household is affected financially due to water shortage, it means that all the members of that family suffer. Therefore, at the provincial level, all sections of society, including the elderly, women, men, children, and people with disabilities are affected. Children, women and people with disabilities are affected more than working men, because at times, male members of the households migrate to neighboring countries such as Iran and Pakistan in order to earn money, which they can send home as remittances. That leaves women and children in Daikundi in a deprived situation and forces them to work in farms or do other odd jobs that require hard labour. Traditionally and culturally, women are bound to their homes to earn their livelihoods.

# Conflicts over Water Resources

In most of the districts of Daikundi, there have been conflicts between households or even entire communities over the access to water resources. Many cases have been recorded both during the Republic period and now under the de facto authorities, the Taliban, since 2021.

The complaints are often related to the distribution of resources. Associated conflicts are not violent conflicts. However, due to water shortage, every community tries to divert water to its area. The likelihood for violent conflicts has arguably increased with the water shortage as it is now at its highest peak in Daikundi. In addition, due to poverty and lack of livelihood opportunities, communities have also started to ignore previously made arrangements for diverting water with everyone trying to benefit as much as possible from the water still available. Therefore, there is a chance of violent conflicts further increasing in the future if communities continue to compete over ever diminishing water resources.

The following table indicates the number of complaints made by individuals and communities to the provincial authority related to disputes and conflicts.

No.	Districts	No. of Complaints during the Republic Period	No. of Complaints during De-Facto Authority <sup>4</sup>
1	Meramoor	78	47
2	Shahristan	80	36
3	Nili	60	32
4	Ashtarly	67	17
5	Khedir	45	20
6	Sang Takht Wa Bandar	32	13
7	Kiti	43	20
8	Kejran	28	16
9	Nawamaish	50	12
10	Pato	25	9
<b>Total</b>		<b>508</b>	<b>222</b>

<sup>4</sup> These numbers were provided by the provincial authority. When the de facto authority came to power, mostly, those communities whose complaints were not addressed during the Republic period, referred again to the de facto authority to solve their challenges. These communities believed that the de facto authority might solve their water shortage challenges. In addition to communities, these complaints also include water disputes between individuals. Therefore, the number of complaints is higher in the de facto authority period.



# Impact of Water Shortage on Economic Situation of Locals

Naturally, the local economy has suffered due to the increased frequency of natural disasters such as droughts and water shortage as a result of the increase in the population. Many people have lost their livelihoods and many others have been forced to leave their homes due to the existing economic pressures; some have even migrated to other countries. Meanwhile, a large number of local families in Daikundi are in severe economic stress with no alternatives to improve their conditions and current situation.

The difficult economic situation has led to some resorting to drugs in order to escape the difficult conditions. This has resulted in a significant increase in the number of drug addicts in the province. Despite this precarious situation prevailing in the province, the current de facto government has failed to take measures to improve opportunities for local communities to support their households or provide assistance to the worst affected people. This lack of local support has, in fact, forced some of the people or even entire households to leave the province.

# Community's Role in Managing Water

According to a rough calculation, about 85 per cent of water in Daikundi province is used for irrigation and 15 per cent for domestic use in urban and rural areas. No exact statistics are available, though. The soil and overall landscape vary from one district to another. It is possible that in some districts, the water absorption capacity may differ depending on the soil texture, type of vegetation, structure of the land and the amount of rainfall at the district level, because Daikundi has a harsh geography. As it has plains with little vegetation, a large amount of water flows out of the province before it can be locally harnessed.

Communities and households affected by water shortages have been trying to manage the situation on their own for years and in some cases even decades. With little awareness about the causes of the environmental changes and little to no guidance on how to better address the challenges around water shortage, it is difficult for communities on their own to find more sustainable solutions, especially when communities and households often already compete with each other over water resources. Even those few who are aware of the sustainable approaches to water use are unable to change the entire community's practices on their own. Either they do not take the initiative to raise awareness among the people in the community because they feel that they cannot bring about change alone or they are complicit in the continuation of the current practices as they do not want to be the only ones opting out of the current competition over the water resources.

So far the de facto government has not taken any action in terms of proposing any plans to improve the water management, nor have they actually conducted consultations with the communities. The gaps between the population and the de facto authorities have not necessarily helped in fostering better working relationships. Those locals who do understand what is at stake believe the best and most suitable methods to raise the level of awareness of communities about water management are training and seminars held or at least supported by the local de facto government and NGOs for school students, who could then share the contents of the programmes with their families.

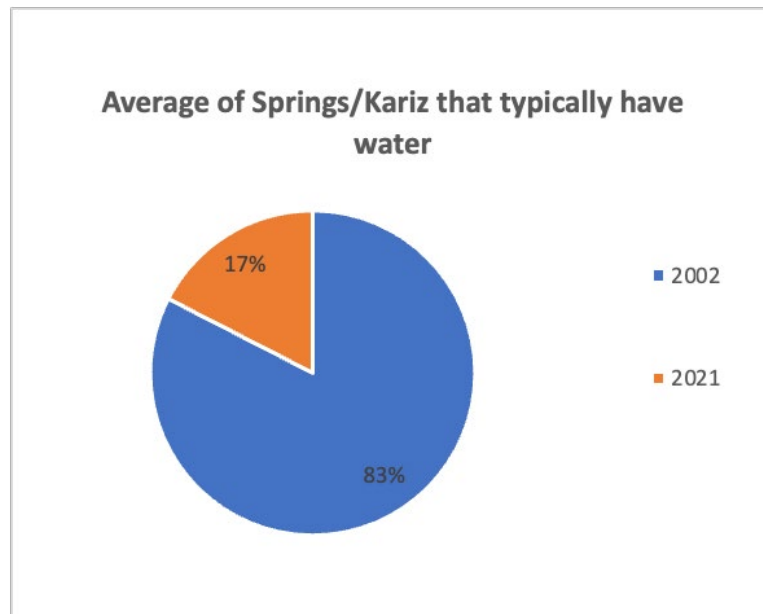
# Target Districts: Meramoor, Shahrستان and Nili

While water shortage is a challenge across Daikundi, there has been a particularly drastic decrease in the groundwater level in Meramoor, Shahrستان and Nili districts over the past years. Along with the receding groundwater levels, the annual rainfall levels have also decreased.

Like other districts of Daikundi, frequent droughts, lack of enough vegetation, lack of mechanisms to manage water, modern irrigation system using solar power, drilling wells, population growth, drying up of karizs and streams, ruthless competition over water resources, the destruction of canals or streams due to floods and landslides, the restoration of which is beyond the power of the local people, and long distances between agricultural lands and available water sources are some of the factors contributing towards water shortages in Nili, Shahrستان and Meramoor. In addition, the local communities laying pipes to bring water to agricultural lands and households for domestic use also contributes to water shortages across the districts. This diversion of water from one area to another has led to disruption of the natural water cycle in which water pumped from the ground was used locally and then returned to the soil via local irrigation in the process strengthening the trees and other types of vegetation and getting reabsorbed in the ground. Today, by using the modern system to pump and distribute the limited water still available through pipes, Daikundi locals have solved their water issues in the short term, but in the long term, their water woes will aggravate severely.

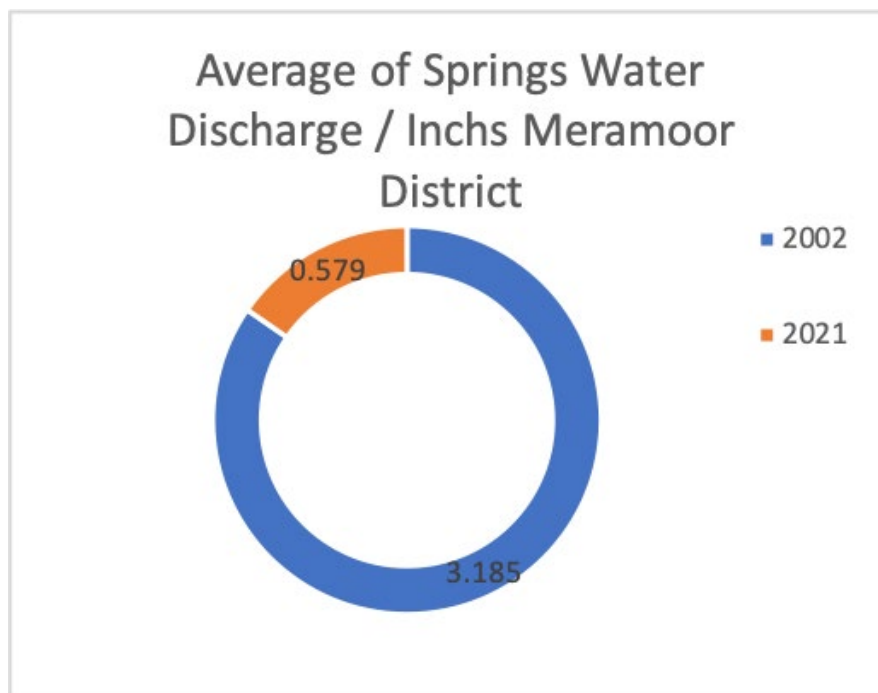
## **Meramoor District**

Between 2002 and 2021, there has been a drastic decrease in the water flow in the springs in Meramoor. A good number of springs and karizs have dried up recently. According to the data collected from the district, 83 per cent of springs and karizs had water in 2002, whereas only 17 per cent of the springs and karizs are active now – a 66 per cent drop.



Source: The Liaison Office (TLO)

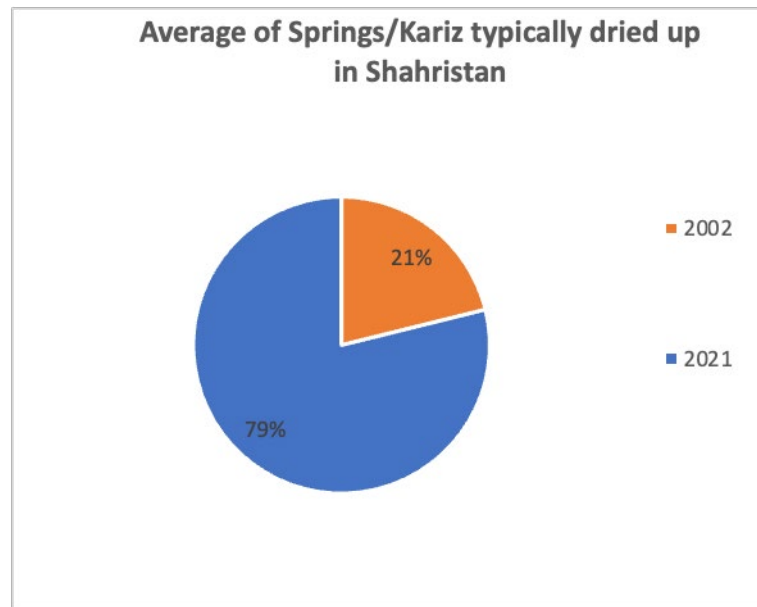
Likewise, when it comes to the spring water discharge in Meramoor, the water discharge in 2002 was 3.185 inch/ sec, whereas in 2021, the water discharge pressure decreased to 0.579 inch/ sec indicating significant decrease in the discharge level.



Source: The Liaison Office (TLO)

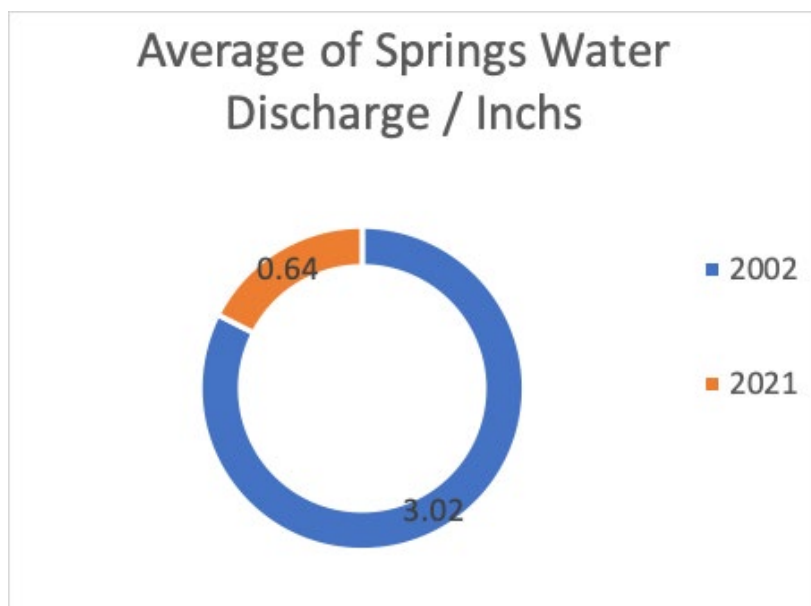
## Shahristan District

In Shahristan, the water shortage crisis was less noticeable in 2002 when on average 21 per cent of the springs had dried up. However, in 2021, 79 per cent of springs have dried up, thus showing a considerable increase in the number of springs drying up recently due to several factors.



Source: The Liaison Office (TLO)

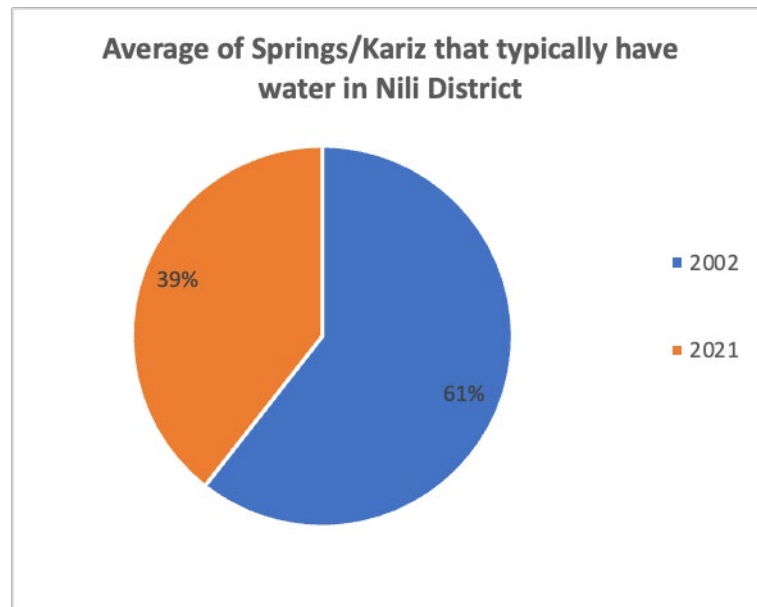
The average of spring/ kariz water discharge shows that there has been a considerable decrease in water discharge pressure between 2002 and 2021. In 2002, the average water discharge was 3.02 inch/ sec. However, in 2021 it has decreased to 0.64 inch/ sec.



Source: The Liaison Office (TLO)

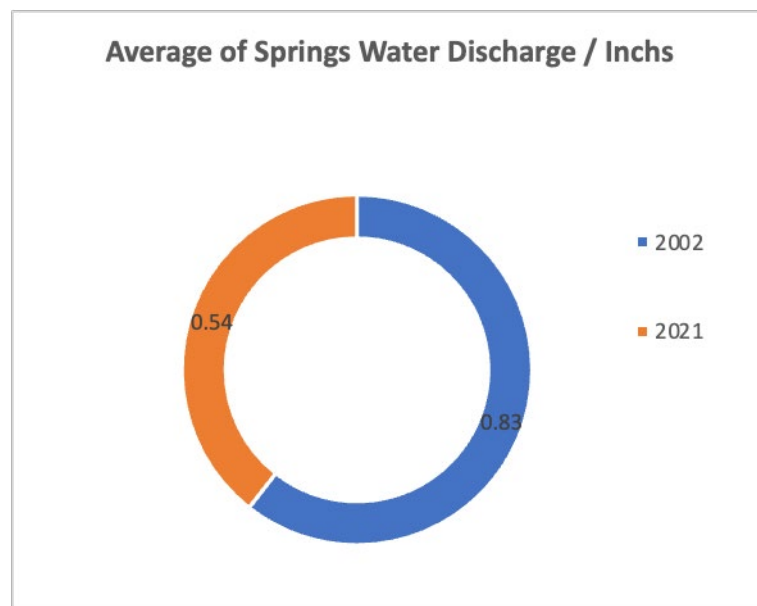
## Nili District

Nili, the provincial capital of Daikundi, is no exception to the water shortage crisis. In 2002, on an average, 61 per cent of the springs were active, whereas in 2021 it has reduced to 39 per cent. The water shortage problem in Nili has also been aggravated with the displaced people across Daikundi moving to the provincial capital to try to eke out a livelihood.



Source: The Liaison Office (TLO)

Similarly, with springs drying up overtime, the average of water discharge has also decreased. In 2002, the average of spring water discharge was 0.83 inch/sec, whereas, that figure has dropped; in 2021, the average of spring/ kariz water discharge is calculated at 0.54 inch/ sec.



Source: The Liaison Office (TLO)

# Conclusion

Water shortage is now an undeniable key issue in Daikundi since it has had a profound effect on the livelihood of the local population besides bringing along a number of associated challenges. Most notably, the water scarcity has resulted in limited access to safe water for drinking for the population in a number of districts, thereby directly threatening the ability for communities to stay in their current locations.

In terms of livelihood, which is related to agriculture and animal husbandry for the majority of the population of Daikundi, the water scarcity has severely impacted farmers who need to irrigate their agricultural land. As a result of water shortage in Daikundi, even those who have found short term solutions to irrigate their fields have been suffering from increasing long term effects of desertification of the land and the deterioration of the soil quality, which has also affected the agricultural productivity and output.

Lack of communities' awareness on the environmental impact of water mismanagement and how to address the challenge around water scarcity in Daikundi has further worsened the situation. The excessive use of water and lack of proper sustainable mechanism to manage water by the communities remains a key factor in this regard. Interventions or outreach efforts by the de facto government or NGOs to raise awareness among communities to manage water hardly exist, not least because at this juncture there are hardly easy and cost-efficient ways to halt and attempt to reverse the current deteriorating water scarcity. With conflicts rising among local communities over the water resources, undertaking comprehensive efforts on awareness raising, conflict resolution, water management policies and their enforcement is crucial to prevent not only further deterioration of the water scarcity but also to start addressing the effects of these developments and find sustainable ways to address the aspects that are threatening the livelihoods of the local communities in Daikundi.

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