



Drought

**Impact Assessment, Recovery
and Mitigation Framework
and Regional Project Design
in Kurdistan Region (KR)**

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**Drought Impact Assessment, Recovery and Mitigation Framework
and Regional Project Design in Kurdistan Region (KR)**

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1. DEFINITION OF DROUGHT

The scientific consensus on drought defines this phenomenon as the condition of insufficient moisture caused by a deficit in precipitation over a period of time. The difficulties associated with the drought are primarily related to the time period over which deficits accumulate and to the connection of the deficit in precipitation to deficits in usable water sources and the impacts that may result. Therefore, the impacts of a water deficit are a complex function of water source and water use over time. Usable water sources include soil moisture, ground water, surface water (lakes, rivers and stream flow) and reservoir storage. Simply, whenever human demands for water exceed the natural availability of water, the result is drought.

Droughts have characteristic timescales; the timescale over which precipitation deficits accumulate becomes very important and functionally separates different types of drought. For example, 'agricultural drought' represented by soil moisture droughts, have a much shorter time scale than hydrologic drought represented by groundwater and surface water sources.

There are three types of drought, as follows:

- ***Metrological drought*** *This type of drought is related to the climate and precipitation rates and patterns. It occurs when there is an extended period of below average precipitation that will create natural shortages of available water.*
- ***Agricultural drought*** *It occurs when the moisture needed to support the average crop production or grass is not enough or not available. It occurs usually during dry, hot periods of low precipitation. However, it can also occur during periods of average precipitation when soil conditions or agricultural techniques require extra water. Data sets required to assess agricultural drought are soil texture, fertility and soil moisture, crop type and area, crop water requirements, and climate.*
- ***Hydrological drought*** *This type of drought occurs when water reserves in rivers, streams, lakes, aquifers and reservoirs fall below the statistical averages. It may also occur if the human water demand is high during average precipitation, and these increased usages will result in a lowered water reserves. Although climate is a primary contributor to hydrological drought, other factors such as changes in land use, land degradation, and the construction of dams all affect the hydrological characteristics of water basins.*

There are important issues that must be taken into consideration in the analysis of drought that include: time scale; probability of occurrence; and precipitation deficit. From this perspective; drought planning and monitoring are crucial to mitigate the effect of this phenomenon. Drought planning is the process that focuses on enhancing the abilities to monitor drought, understand its changing vulnerabilities, and mitigate its negative impacts and consequences. The proactive

planning can definitely prepare the society to be prepared and to deal with the damaging effects of drought in the most efficient and manner.

The components of drought mitigation plan shall include: prediction, monitoring, impact assessment and response. Climate studies, statistics and coupled models can be effective tools in the prediction of drought. In monitoring phase; the ground-based information (such as rainfall, weather, crop conditions, and water availability) and satellite observations can be significant aids in monitoring the drought. Impact assessment is carried out on the basis of drought intensity, demographics, land-use type, persistence of stressed conditions, and the drought effect on agricultural harvest, public health, and water quantity and quality. Finally, response includes improved drought monitoring, better water and crop management, increased public awareness and education, improved legislations, intensified planning, reduction in water demand, and water conservation policies.

United Nations' (UN) different agencies have launched several proactive and coordinated programmes on drought monitoring and early warning. The UN was also identified as a key partner with governments around the globe in facilitating new frameworks, strategies to avert the impact of drought. The UN's different agencies intensively acted to build institutional capacities in drought planning and research, promoted the adherence to international conventions and treaties pertaining to water use, and foster regional and international networks for best practices in drought management.

2. SPREAD OF DROUGHT

2.1 Spread of Drought in the Middle East

Many countries in the Middle East are facing serious drought conditions since the beginning of the current century. These countries – including Iraq, Turkey, Iran and Syria- have been dealing with decreased rainfall, reduced water storage, and irrigation water shortages which affected seriously their agricultural sector, and consequently many of these countries have declared drought. The following map shown in Figure 1 illustrates the affected areas in the Middle East, the widespread drought and the devastated agricultural areas.



Figure 1

A recent map of the Middle East that shows the wide spread drought.

Global warming and climate change has affected the regional precipitation patterns which resulted in reduced rainfall rates. At the same time, the increased water consumption for domestic, agricultural and industrial uses have exacerbated the drought conditions. Damming of water sources have also led to shortages of water across the region. Figure 2 demonstrates a comparison between the available water resources in the year 2000 and the year 2010 in many countries in the region.

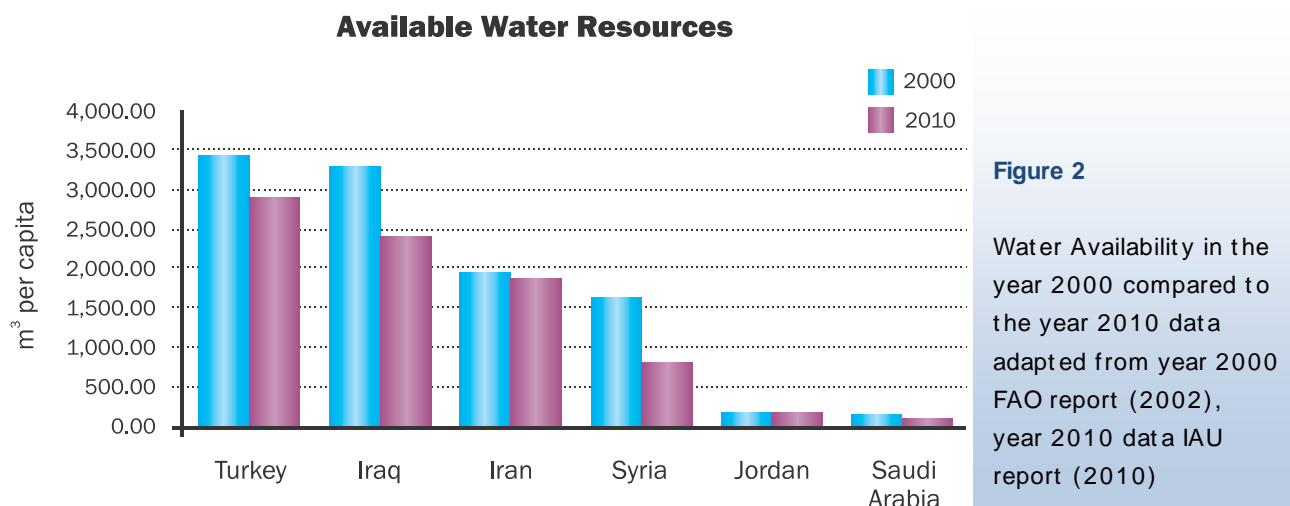


Figure 2 indicates that the available water resources have declined significantly in some countries between the years 2000 and 2010. Results of many models confirm that the declining trend will continue for years to come.

The drought crisis in the entire region has placed an extreme strain on water resources, livestock and agriculture, leading to greater hardship and human suffering. Drought over the past two years has significantly affected the agricultural sector in the region. For example, wheat growing regions in southern Turkey, Syria, Iraq and northern Iran faced drought threats due to lower precipitation rates, and forced these countries to increase their importation of wheat and other food products influenced by the drought. Also, drought affected negatively the water coverage and allowable amount of drinking water that was provided for the population, which resulted in severe living conditions that forced many of them to relocate, consume polluted water and live with minimal water limit.

2.2 Spread of Drought in Iraq

Drought conditions have been declared in Iraq since the year 2007. The annual rainfall has decreased in the past few years. Both the Tigris and Euphrates flow through Iraq in less quantity from a lack of rainfall and dams constructed in Turkey and Syria. The population growth also affects the water supply. Iraq's population tripled to 30 million between the years 1970 and 2007 as reported by IAU (2010), which increased the demand and more stress on available water resources.

The extended drought conditions seem to have had a disastrous impact on the lives of the people in the country. The limited access to water has led among others to the erosion of livelihoods, decrease in crop production, increase in unemployment, and increase in some diseases such as typhoid and diarrhoea.

The Iraq 2009 Report prepared by OCHA, UNAMI, IAU declared that the impacts of drought in Iraq are severe due to the following reasons:

- *Poor rainfall rates, resulting in decreased levels of underground water tables, decreased river flows, drying-up of water sources (springs, deep and shallow wells) that were available in the past years. Also, the shortage of rainfall across the country compared to previous years has led to an obvious impact on water levels in Tigris and Euphrates and their tributaries,*
- *Inadequate management of water resources by the authorities, communities and farmers,*
- *Increase in population, especially in urban centres,*
- *Development and construction operations requiring large amounts of water,*
- *Lack of appropriate control/ management on main water sources,*
- *Unavailability of longer-term strategic water projects,*
- *Lack of long term and comprehensive strategy to combat the impact of drought,*
- *Agricultural land reform on the account of limited water sources, and*
- *Water policies of neighbouring countries: Building dams by neighbouring countries on Tigris and Euphrates or changing course of tributaries led to dangerous decrease in water levels and a huge deficit in drinking water and irrigation.*

The same report demonstrated how coping mechanisms that the people of Iraq tried have ranged from deepening shallow wells in an attempt to get water, buying or hiring water tanks to transport drinking water for their livestock and household use and migrating to the nearest town where water is available. The awareness of the degradation of Iraq's natural water resources and ecosystems is high among Iraqi decision makers; however, concrete actions at the local and national levels remain uncoordinated and limited.

The drought has affected significantly to the Iraqi GDP. After oil revenues, the agricultural sector is the second largest contributor to the Iraqi GDP. This sector has been declining in terms of production and productivity since 2002. FAO report (2009) illustrated that the contribution of agriculture has steadily decreased from around 9% in the year 2002 to 4% in the year 2009. The decline in this vital sector is serious, as it has increased the unemployment and consequently poverty in Iraq. Furthermore, farmers seem to consider selling parts of their land, especially orchards, to support their families. The An IAU Report (October 2010) declared that due to drought, almost 40% of cropland throughout Iraq experienced reduced crop coverage and that livestock was devastated between 2007 and 2009. Figure 3 shows the affected cropland due to drought and its impact on agriculture.

Drought and Impact on Agriculture

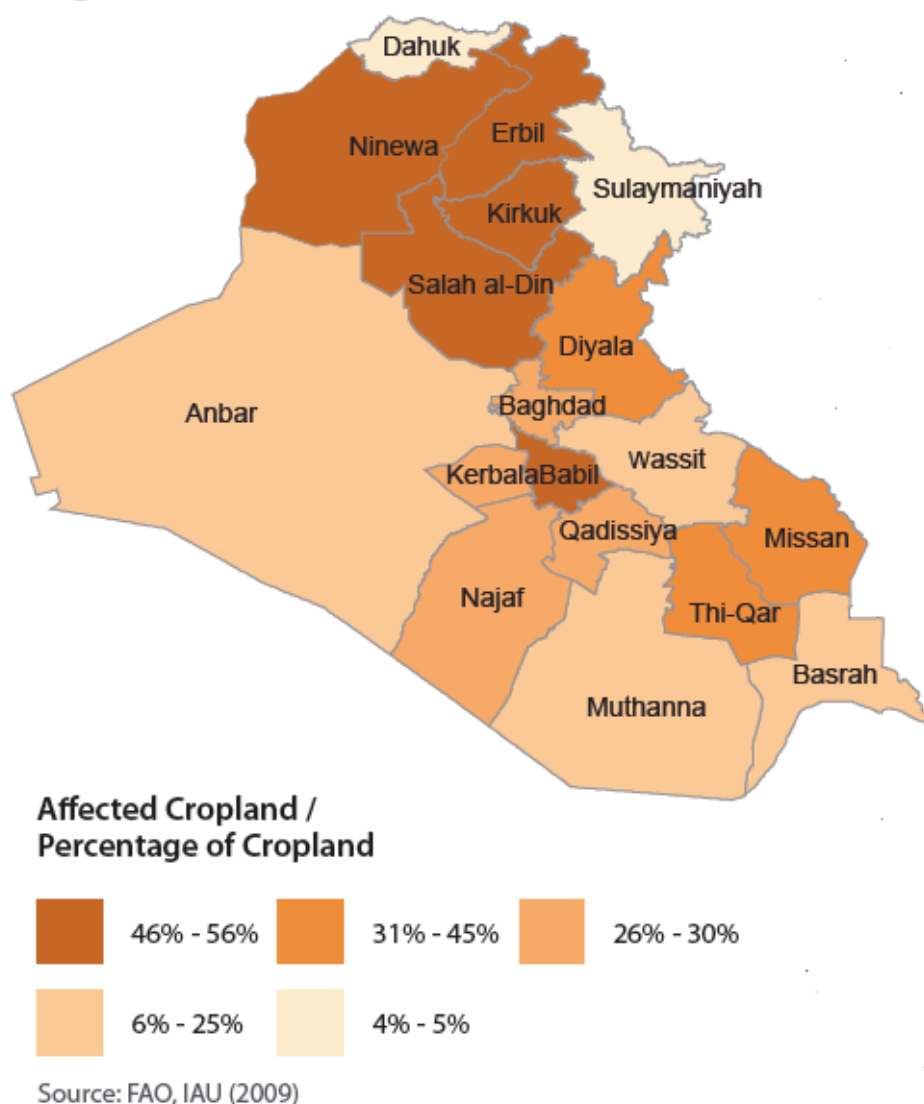


Figure 3

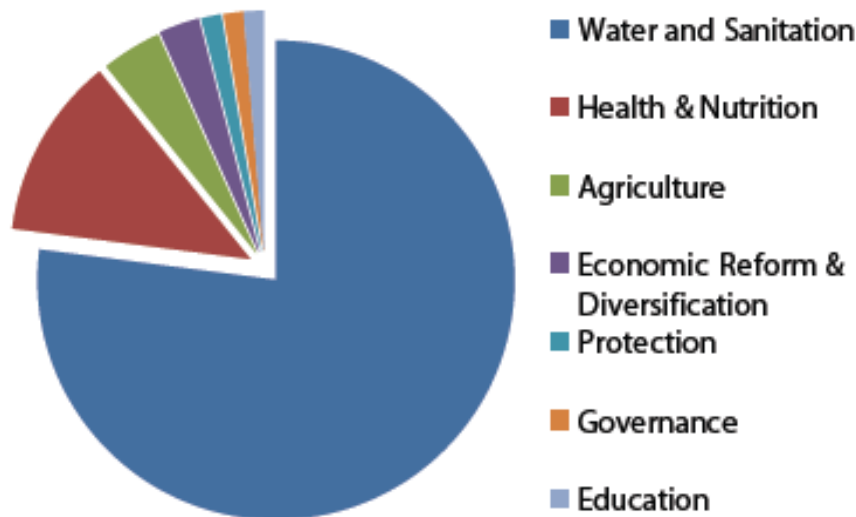
Drought and its Recent Impact on Agriculture throughout Iraq (Adapted from IAU 2010)

Figure 3 indicates that the affected cropland varies from region to region. For example, the percentage of affected cropland due to drought in KRG varies from 4 to 5% in Sulaymaniyah and Dahuk to 46–56% in Erbil.

Several efforts should be taken to rehabilitate the Iraqi agricultural sector and to move towards sustainable gains in the Iraqi well-being (FAO Report 2009). The UN responded to drought crises by supporting the Government of Iraq and other partners in implementing 121 water projects between 2008 and 2010. Figure 4 illustrates the completed UN projects in Iraq by sector from 2008 to 2010. As shown in Figure 4 the focus of the majority of UN executed projects was for water and sanitation. The aims of these projects were: the rehabilitation of the infrastructure to enhance water supply and drainage; improve planning of agricultural projects and enable

sustainable management of Iraq's underground aquifers; and to enhance the quantity and quality of water delivered to underserved and residential areas.

Number of water projects by sector (2008-2010)



Total number of projects: 121

Source: Who Does What Where (3W) database, IAU.

Figure 4

United Nations
Implemented Water
Projects in Iraq by
Sector between 2008
and 2010 (Adapted
from IAU 2010)

The drought and shortages of water resources did not have only severe effects on agriculture, but also had negative impacts on:

- *The economic activities in production of commodities and provision of services that can be accomplished or sustained without the availability of water,*
- *The social well-being: the water is needed to meet the basic requirements of human and animal lives, to preserve the environment, and to maintain acceptable personal and hygienic levels and standards,*
- *Desertification: The areas of desertification in Iraq has increased as a result of drought,*
- *Sand dunes and recurrence of sandstorms,*
- *Hydropower: The suspension of electric power systems at dams due to water shortages have affected the industrial and infrastructure water purification stations and oil refineries and other industries that rely on the hydropower generated at dams,*

- *Sanitation: Problems of sanitation occurred in Tigris and Euphrates due to untreated sewage disposal, which lead to water pollution. There is increasing concern about the spread of waterborne diseases and the increase in concentration of contaminants as untreated sewage pours into the rivers and as the volume of water declines. Also, decreasing of water levels in rivers has negatively affected the efficiency of intakes and catalysed the growth and gathering of excessive plants & duckweeds around intakes and then disrupting the treatment processes in most of water projects. Decreasing levels in lakes has led to slack water and increase the possibility of pollution, and*
- *Salinity: Low level of water has increased the saltiness in many of the agricultural areas around the rivers and streams.*

The above mentioned negative effects will continue unless serious actions are taken to minimise and mitigate the effects of water shortages and reduce the rates of increase in water consumption. The IAU Report (2010) indicated that water level in Tigris and Euphrates – Iraq's main sources of surface water have fallen to less than a third of normal capacity. The critical issue that this trend is expected to continue in the future. Figure 5 shows a comparison of the average discharge of water to these two rivers between the year 2009 and the year 2025.

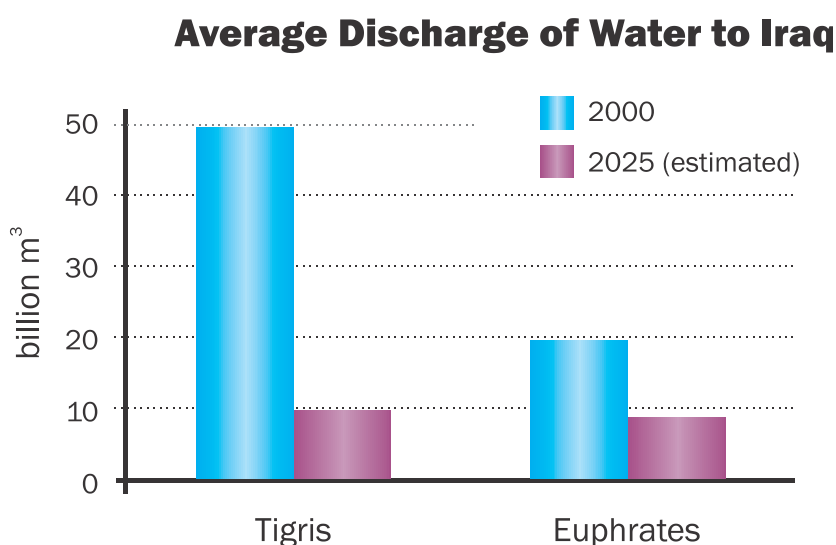


Figure 5

Average Discharge of Water to Tigris and Euphrates in the Year 2009 and the Expected Discharge in the Year 2025 (Adapted from IAU Report 2010).

The expected loss in the average water discharged to the two main sources of surface water in Iraq – Tigris and Euphrates – will decrease in the year 2025 to about 50-80% of the water discharged in 2009. The reduced water discharged to the main rivers is expected as a result of the drought affecting the region, as well as the damming of water resources in the neighbouring countries. Some reports projected that the Tigris and Euphrates rivers might be depleted by 2040 (IAU 2010).

Additionally the reservoirs, lakes and streams are diminished to critical levels which forced many people to rely on groundwater and consequently these are showing signs of decline as well. The over-exploitation of many of groundwater wells affected their quality and many of these underground sources are unusable due to high salinity and pollution.

2.3 Climate Change Effect on Water Resources in Iraq

The conventional scientific agreement on global warming is becoming clearer and more compelling everyday; changes in our climate are real and underway. The evidence that human induced global warming is real and cannot be ignored. There are many predicted and observed changes attributed to climate change and global warming, such as: increased temperature, change in precipitation patterns, and significant change in precipitation rates. There is wide international concern about the magnitude and significance of the consequences of the increase in Earth's temperature in terms of how these consequences will affect the instability and conflicts around the world. The conflicts and instability risks are complex but related to economic weakness, food insecurity, and large scale migrations. Recent research has shown that conflicts and instability in populated areas could be linked to key-sectors in water quantity and quality, agricultural production and food security, urban hydrological problems, and impact of modern civilisation on water environment.

Climate change has different impacts in different regions; consequently, the traditional patterns of conflict may change in many areas. In some cases, nations might achieve successful collaboration due to less water stress; however, in many regions, such as the Middle East, the conflicts and disputes are likely to increase in intensity and complexity, which would require effective conflict management strategies. In many published reports and several occasions, the UN warned of an increased risk of conflict over scarce resources, and this will threaten the region. Additionally, these reports warned of climate change effects on water shortages. The influence of climate change on the Tigris and Euphrates rivers basins are currently under investigation by the countries concerned. One sensitive issue, more than have of Iraq's water relies on the precipitation falling outside its borders, making the water resources management in the country vulnerable to climate change and storage projects in the neighbouring countries. Figure 6 illustrates the water supply by country as presented in the IAU Report (2010).

Water Supply by Country

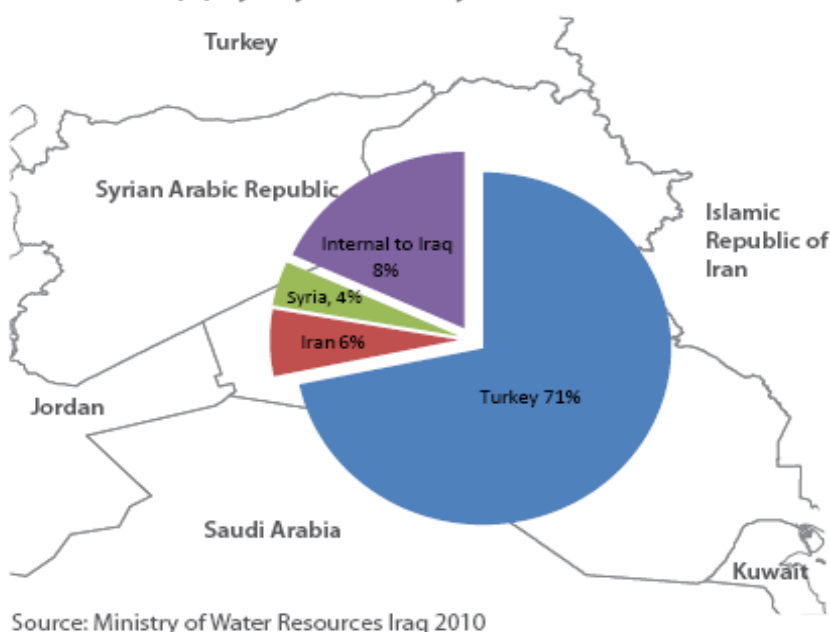


Figure 6

Water Supply by Country (Adapted from IAU Report 2010)

As demonstrated in Figure 6, almost 71% of the water in the Euphrates River is derived from the precipitation falling in Turkey; therefore, the water discharge to Euphrates River is highly sensitive to the precipitation rate and storages projects in Turkey.

The severity and magnitude of water resources stress in Iraq's neighbouring countries is presumably to be aggravated by the prolonged presence of unsustainable trends in environmental degradation and global climate change. The adverse impact of climate change on water resources is likely to reduce agricultural output and make water shortages in Iraq even worse. Therefore, several and serious adaptation measures should be taken to mitigate the effect of global warming on water resources, and to develop non-conventional sources of water that can be exploited in the future such as water reclamation and reuse, seawater and brackish water desalination, and the use of surplus winter runoffs. In addition to conservation measures, institutional reforms, capacity building, and intense public awareness are definitely needed.

3. DROUGHT ASSESMENT IN KURDISTAN REGION (KR)

The droughts that KR faced in the past few years were very severe, affecting a population that was already suffering from the impacts of previous drought spells, with a wider geographical reach and a disastrous impact on the lives of the population. Drought seems to have had a disastrous impact on the lives of the population. The limited access to water has led to the erosion of livelihoods, migration to the cities, a weakening of the livelihood systems, decrease in summer and winter crop production, increase in unemployment, and water induced diseases such as typhoid and diarrhoea.

3.1 The Description and Classification of KR Territories

Sulaymaniyah, Erbil and Dahuk Governorates forms the Kurdistan Region (KR), which is located in the northern Iraq. In the KR, approximately 3.8 million inhabitants, around 70% of population are served by treated water supply. The three governorates share similar physiographic, geology, hydrogeology and climate conditions and are divided mainly into three physiographic zones, namely:

- *The northern range of the Zagros Mountains,*
- *The central range of the Border Folds, and*
- *The northern plains of the Tigris River.*

The Kurdistan region of Iraq covers the mountainous land, uphill and the most fertile plain part of Iraq. Geographically it is located on longitude 42°15' E to 47°30' E and from latitude 35°25' N to 37°50' N. The region shares its borders with Syria in the west, Turkey in the north and Iran in the east and covers an area of approximately 165,000 km² (FAO, 2001). The lowest point in the region is Kifri, which has an elevation of 140 meters above sea level, and the highest point is the peak of Hasarost mountain in Hawler governorate, measuring 3,607 meters above sea level. Kurdistan region mainly extends across the Zagross Mountain up to Taurus Mountains in Turkey. The region shares its borders with Syria in the west, Turkey in the north and Iran in the east.

Generally, the climate of Kurdistan region is characterised by cold and snowy winters and warm and dry summers. On the plains, typical semi-arid climatic conditions prevail. Precipitation occurs from October to May, decreasing from the NE to SW. Rainfall is the main climatic parameter and it is seen to vary highly within short periods of time. The magnitude of rainfall ranges from 100 to 1,300 mm/year, with an annual average of about 700 mm/year. The direction of the wind often is from north to east. When the summer wind blows this causes drought weather and erosion. During summer, the atmosphere is dusty and very hot, but during winter, the climate is very cold with snowfalls and frost (Zohary 1974; Saeed 2001; and Ahmed 2001).

As a whole the soils in Kurdistan region are calcareous and originated from limestone and dolomite of different formation (FAO 2001). There are also scattered spots of blue Marle, red mud and chalky soils that are belong to Kolosh, Gercus and shiranish formations, but parent material, slope, runoff, soil depth and maturity affect soils variability (Rzoska, 1980).

The brown mountain and hill soils are prevalent in Iraqi Kurdistan region, showing the effect of higher precipitation and eroded material of rocks, modified by the richer plant cover, these brown soils are fertile.

KR is divided into three different regions based on precipitation rates, as follows:

- *The zone where annual rainfall exceeds 550 mm/year: This zone is mainly the agricultural zone due to secured rainfall. The area of this zone is around 1.5×10^9 m² of rain fed land, and more than 8.0×10^9 m² of forestlands and good quality pastures. As a result of the sufficient quantities of rain, the cultivation of crops such as wheat, barley, chickpeas, lentils, winter vegetables is possible in areas such as: Pinjween, Sharbazher, Sulaimanyah central district, Peshdar, Rania, Dokan, Halabja and Darbandikhan in the Sulaimanyah Governorate; Rawanduz, Choman, Shaqlawah, Koya, Mirga Soor in the Erbil Governorate; and Amadia, Akre, Zakho, Sheikhs in Dahuk Governorate.*
- *The zone where annual rainfall ranges between 350 and 550 mm/year: This zone covers an area of 3.5×10^9 m² of exploitable farmland with around 4.0×10^9 m² of pastures and forests. Winter sowing of all kinds of crops is usually undertaken in this zone. Due to the uncertain level of rain and to the recurrent droughts, two complementary irrigations are usually necessary, one at the beginning of the planting season before germination and one before the maturity of the grains. This zone includes Chamchamal district of Kirkuk Governorate and the central districts of Erbil and Dahuk Governorates.*
- *The zone where the annual rainfall is less than 300 mm/year: This zone is the dry zone, and it covers 2.0×10^9 m². In this zone, agriculture cannot depend on rain and an average of three to five complementary irrigations is required between sowing and the maturity of the crops. This area includes the rest of the districts of the governorates of Kirkuk, Erbil and Dahuk Governorates.*

Despite the fertile lands in KR region, the agricultural development sector in KR is facing a number of challenges, inter alia, including:

Water scarcity and unavailability,

- *Recurrent drought events,*
- *Ineffective marketing,*

- *Remoteness from major cities and market places,*
- *Lack of access to services,*
- *Land tenure system and small sized properties,*
- *Lack of integrated agricultural strategy,*
- *Lack of know-how of modern techniques,*
- *Lack of expertise, and*
- *Need for improved infrastructure.*

The following key factors are proposed to enhance the farming and agriculture sector in the Kurdistan Region:

- *Sustainable use of water resources: building small dams to increase the irrigated lands and reducing the production costs linked to pumping of underground water. These dams would also contribute to the reduction of the flood risk,*
- *Creating incentives for the use of irrigation systems and sustainable agricultural practices,*
- *The development of markets in collaboration with municipalities,*
- *Finding solutions for the land tenure system and for the land fragmentation, such as reducing taxes on properties,*
- *Extension services and capacity building to farmers to improve the yield, reduce the production costs and find new markets,*
- *Sustainable development of intensive agriculture under greenhouses (wherever possible),*
- *Development of management plans for forests and other wooded lands,*
- *Development of the rangelands, encouragement of sustainable grazing of goats or other livestock in forests and other wooded lands as a tool for forest fires prevention and for increasing the incomes of the local populations,*
- *Development of ecotourism, agro-tourism and other forms of sustainable tourism in mountain areas,*

- *Development of the food industries sector,*
- *Encouragement of small house-industries and handicrafts with the appropriate marketing chains,*
- *Providing the farmers with health insurance or coverage system (social security...) and retirement plans, in addition to special funds for reimbursement in case of natural disaster, and,*
- *Improvement of social and medical services provided to the farmers.*

3.2 Legal and Institutional Framework

The Ministry of Municipalities and Tourism of the Kurdistan Regional Government (KRG) manages the water supply system in the three Governorates of Northern Iraq. The operations are entirely financed from the KRG and are managed by local Directorate. The overarching responsibility for planning in KRG lies with the Ministry of Planning, while the Ministry of Environment and Ministry of Health providing the environmental standards that monitor data respectively. Moreover, the water security and stability responsibilities are the task of Ministry of Agriculture and Water Resources. The Water and Sanitation Directorate of each KR's Governorate self-performs its services without involving the private sector.

Although, National Development Strategy (NDS) being at the central point of the Ministry of Planning and Development Corporation activities in KRG play a pivotal role in placing policies at a national level, the Regional Development Strategy (RDS) also plays the critical and foundational roles for formulation and implementation of the national development strategy through laying the ground for the generation of policy options, the prioritisation of objectives, and the consequences of water strategies.

3.3 Water Resources in KR

The hydrology in Iraqi Kurdistan region is characterised by the presence of high variety of rivers, streams and springs, which have different lengths, sizes, discharge and flow characteristics, catchment types and water quality (Maulood and Hinton 1978).

In Hawler area, there are three major aquifers: the Bakhteari formation, the alluvial residual deposits and the recent alluvial deposits. All three aquifers are hydraulically interconnected (Bilbas 2004; Goran 2006). The Bakhteari formation is the principal aquifer with several handling wells. The discharge rate is high during and after the rainy seasons but decreases in dry seasons.

The springs can be classified according to their temperature into non-thermal springs and thermal springs. The springs are described as a concentrated ground water, they flow from aquifer to the surface as a current of flowing water, that contain several salts (radicals), which are in a dissolved state as Sodium (Na^+), Potassium (K^+), Calcium (Ca^{++}), Magnesium (Mg^{++}) and aluminum (Al^{+3}), acid radical as Cl^- , SO_4^{-4} , CO_3^- and HCO_3^- (Rasheed 1994).

Generally, in the Iraqi Kurdistan region, the lakes and impoundments are artificial such as Dokan, Derbandikhan, and Dahuk impoundment.

The sources of water in Kurdistan that feed the surface water resources are in general rainfall and snow with precipitation rates of 300 up to 1000 mm/year. Figure 7 illustrates the annual precipitation rates in different regions of Iraq.

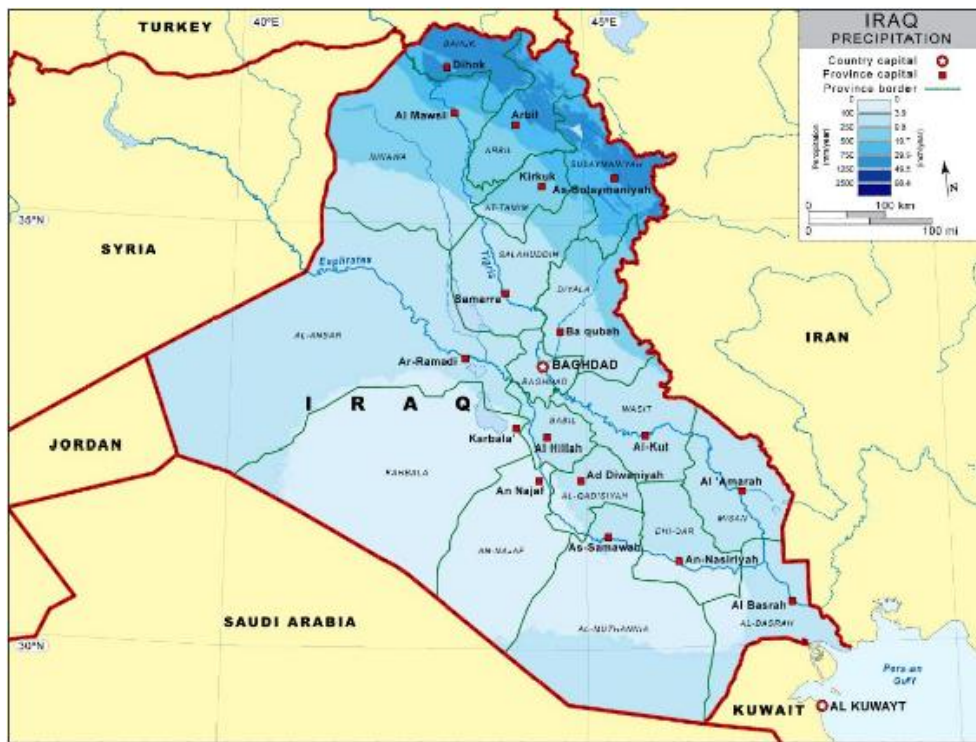


Figure 7

Annual Precipitation in Iraq Different Regions.

As shown in Figure 7, the KR receives annually the highest precipitation rates compared to other regions in Iraq.

Surface Water resources that include rivers and streams make up about 18 billion m³ inside the region, 40% of which comes from outside the region. The main rivers within the region are Khabur, Greater Zab, Lesser Zab, Sirwan & Awa Spi (Uthaim). The ground water resources are deep and shallow wells, and springs in addition to the Kahrezs. These resources contribute significantly to the main budget of underground water in the region. Water springs in the region are numerous. The water from springs are primarily used for drinking and domestic uses, and only if water is abundant, can it be used for irrigation as well. Although, the region cannot be considered a region with poor groundwater resources, these resources have been generally assessed as limited and variable in time and space. Almost 40% of the springs in the region were depleted during previous drought periods.

Despite the notable efforts that have been performed to improve the water situation in KRG, still there are heavy criticalities both in terms of quantity and quality, namely:

- *Water shortages,*
- *Water leakages,*

- *Limited storage capacity,*
- *Contamination in water wells,*
- *Insufficient distribution networks, and*
- *Insufficient operation and maintenance that lead to low drinking water quality.*

3.4 Characteristics of Livelihood Systems in Mountains and Rural Areas in KR

In order to better describe the mountain and rural areas in KR and their livelihood systems, it was found appropriate to base the analysis on the Sustainable Agriculture and Rural Development in Mountain Areas (SARD-M), developed by FAO. This approach is based on the common characteristics of most mountain areas, their constraints (inaccessibility, fragility and marginality), their diversity and the potentialities and opportunities they hold. It allows for a better understanding of the livelihood systems, the challenges they have to face and their development potential.

3.4.1 Mountain Specificities (Based on FAO 2005 – SARD-M)

Mountains and rural areas provide a wide range of goods and services essential for guaranteeing the availability of vital resources to the rest of the society in relation to: water, biodiversity, landscape, risk prevention, specific products and culture, resulting in a series of interdependencies between upland and lowland areas.

There usually tends to be a lack of recognition of the importance of these interlinkages in the institutional and policy frameworks of countries. Thus the promotion of sustainable mountain development can play an important role to benefit lowland areas by ensuring adequate supplies of water, environmental stability, conservation of biodiversity, rural-urban population balance, etc.

Constraints: In terms of constraints, mountains are characterised by inaccessibility, fragility, marginality. It should be noted that these specificities are not only interrelated in several ways, but not all locations in mountain areas are equally inaccessible, fragile, or marginal. Nevertheless they help to shed light on some of the key constraints facing the development of mountain areas:

- ***Inaccessibility:*** *Its core manifestations are isolation, distance, poor communication, and limited mobility. Besides the dominant physical dimension, it has socio-cultural and economic dimensions which are reflected by socioeconomic differentiation and inequity of access to resources, information and opportunities. Inaccessibility augments other conditions such as marginality and diversity. It also increases the vulnerability of the rural societies to drought and other natural disasters.*

- **Fragility:** *Due to altitude, steep slopes and other biophysical conditions, mountain areas are vulnerable to degradation. In most cases, the damage is irreversible or reversible only over a long period of time. Because of the water un-availability and scarcity, the societies are vulnerable to drought.*
- **Marginality:** *Mountain areas tend to be marginal in terms of their remoteness and physical isolation, fragile and low-productivity resources. There are also several man-made handicaps which prevent participation in the mainstream pattern of activities.*

Diversity: Diversity is an innate feature of mountain areas as one can find immense variations among and within eco-zones, even within short distances. Not only is there diversity in terms of the degree to which inaccessibility, fragility, and marginality affects different mountain areas, more importantly mountain areas are home to a large number of biological resources. They provide an important source for water and unique produce such as fruits, spices, flowers, medicinal plants, minerals, etc. There is also diversity in terms of the economic, social, cultural and institutional make-up of mountain areas. The socio-cultural diversity leads to variations in social organisation, attitudes, and methods of managing collective goods and community resources. The harnessing of this diversity in a sustainable manner is therefore an important issue for mountain areas.

Potentialities or “building on potential”: Despite the constraints characterising mountain areas, the diverse nature of the culture, resource base and environmental conditions create potentials for products and activities that have a comparative advantage. It offers a number of opportunities for resource and product-centred activities, which could enhance both productivity and human welfare on a sustained basis.

As an example, mountain agriculture is much more than the mere production of food, wood and commodities. When practiced in a sustainable way, it will contribute to the sustainability of the livelihood systems and contribute to the provision of:

- *Food security,*
- *Environmental stability,*
- *Conservation and sustainable use of the biological resources,*
- *Rural incomes and employment,*
- *Rural-urban population balance,*
- *Social equity and cohesion,*
- *Maintenance of cultural features and identity in the overall context of globalisation, and*
- *Resilience to drought and climate change.*

3.4.2 Common Specificities in KR Mountain and Rural Areas

The analysis of the different territories has shown common problems, similar levels of diversity and richness and common potentialities. The different community groups that were met during the process have expressed the same needs in terms of local development, water management and conservation, and drought mitigation proposals.

The identified specificities, characteristics and needs are described below:

Constraints: The different constraints (inaccessibility, marginality and fragility) coupled with water scarcity and unavailability lead to an increased vulnerability to drought and other natural and man-made risks.

- *Inaccessibility:*

Although the water resources are abundant in the villages with the relatively good amounts of annual rainfall and the presence of rivers, streams and water springs, the water adduction system is very weak with many households not connected yet to the drinking water network,

The sewage system is often non-existent,

The existing road network is old and is no longer sufficient to cover the livelihood needs of the villages,

Basic educational, social, health and environmental services are either non-existent or rare,

Remoteness of markets from the villages and difficulty to buy and sell crops or food,

Remoteness of rangelands from the village and consequent increase in water consumption for livestock,

Inaccessibility of credit facilities, and

High cost of agricultural inputs.

- *Marginality:*

For several years, the villages have suffered from wars and lack of attention from the government,

Even in times of drought, water is available in the cities, whereas villages in mountain areas need to receive tankers of water for their basic needs,

Lack of job opportunities,

Migration from the villages to the cities and unwillingness to return,
 High competition by imported crops and products (yogurt, cheese...etc),
 Incompatible land tenure system,
 Taxation of irrigated lands; exemption of taxes for rain-fed lands,
 Lack of awareness on health issues,
 Lack of awareness on sustainable agricultural practices and on sustainable livelihood systems, and
 Lack of transformation units and small industries (including food processing).

▪ ***Fragility:***

Despite the richness in water, the visited villages and several other villages from the different districts suffer from the unavailability of water for irrigation purposes and only a limited amount of the total land is irrigated. This is mainly due to the mountainous nature of the region and to the lack of irrigation projects,

The unavailability of water is exacerbated by drought and climate change,

Recurrent drought events,

Livelihood systems are very fragile and unstable,

High level of economical and livelihood dependence on agriculture,

Aged farmers and manpower,

High level of dependence on rainfall for agricultural purposes,

Destruction of water canals, kahrezs¹ and other water adduction systems because of successive war events,

Difficulty to use modern machinery,

High rehabilitation costs of abandoned agricultural lands,

High production and transformation costs, and

Dependence on crops not suitable for dry lands and periods of drought (rice fields...etc)

¹ Kahrez traditional man-made irrigation channels

- **Diversity:**

Natural:

The nature in KR is much diversified with its mountains and plains and the wide range of climatic conditions and micro-climates,

It is considered as an agricultural region, where the mountainous nature with its cold climate, its narrow lands and its sloping terrain plays an important role in the determination of the nature of crops and imposes primitive agricultural techniques. The plains are suitable for intensive agriculture, greenhouse production, cereals...etc,

Most of the agricultural lands are rain-fed. Many lands used to be furrow irrigated and planted with horticultural crops and rice,

An important part of the region is covered by forests and other woodland areas formed of broadleaved oak species and accompanying flora. Forest lands are often used for the production of various crops and fruits and for grazing, and

The natural and biological diversity has not been fully studied and much still needs to be discovered and understood.

Social:

The political power has always played an important role in the decision making process, in addition to the tribal (in the extended family sense) mentality and its direct links to local politicians,

Several religious communities are living in the mountain and rural territories,

The decision making structure is therefore based on a combination of political, tribal and religious considerations, and

Because of drought and its implications on the livelihood systems, the region suffers from migration to the major cities, to the extent that some villages have lost more than 50% of their population.

Economical:

Fruits, cereals, and vegetables are important sources for income of the local families,

After 1991, the government implemented several development projects in the different sectors, but neglected the agricultural sector leaving implementation to the local and international NGOs and organisations who had a particular focus on agriculture,

Oak trees and forests are scattered and not properly exploited in the area,

Abandoning irrigated horticulture and rice culture for rain-fed cereal production (wheat and barley) resulted in the weakening of the livelihood systems and to a decrease in

the village economy as vegetable crops and rice were a better source of income than cereals,

People are abandoning agriculture and/ or leaving the villages for better paid and more stable jobs,

The industrial sector is not well developed. Small industries and some handicrafts are developed in some villages, and

Some families have succeeded in diversifying their income by enrolling in some government and civil service jobs, such as the “Peshmerga”, which provides sustainable income and builds the resilience of the society in times of drought and other natural risks.

▪ *Potentialities:*

The relief and the nature of the region are suitable for rearing of sustainable livestock (mainly sheep and goats),

The most important sources of drinking water in the area are frequently deep wells and springs, but most of the springs have dried up since 2007, because of the repetitive drought events, the severe wars and the total destruction of villages. The dry natural springs are usually within the village and belong to the villagers. Cleaning and rehabilitating natural springs will contribute to the sustainability of the livelihood systems,

In areas very rich in water, it would be possible to increase the irrigated surface through the installation of new irrigation systems and rehabilitation of the old and degraded networks,

The agricultural road network should be developed and maintained,

The forests, rangelands and other wooded lands should be properly managed as they could provide good sources of income in addition to their important contribution to the adaptation to climate change, conservation of biological diversity, mitigation of the effects of droughts and combating desertification and land degradation,

Fertile land,

Availability of water (rivers, streams, springs, and underground water)

Favourable climatic conditions (in years of normal rainfall),

Diversity of landscapes and altitudes allowing the production of a wide range of crops,

Early maturity of the crops, and possibility to earn the high prices of the early seasons (in some of the regions),

Good quality traditional crops and products (rice, Erbil yogurt, honey, fruits...etc),

Traditional agro-sylvo-pastoral management system combining agriculture, forestry and rangelands,

High potential of fish production in dams and rivers Development of the agricultural sector,

Development of the water and irrigation network,

Insuring the sustainability of the water for the different uses,

Establishment of sewage systems, and

Provision of basic health and social services.

3.5 Stakeholders' Current Actions and Drought Responses

3.5.1 At the Municipalities level

The involvement during the period of drought was negligible and limited to some distribution of water tanks. The identified plans and/ or needs at this level are the following:

- *Implementation of green belts,*
- *Development of Erbil and major cities urban plans; master plans are also required for the towns, not only major cities,*
- *Water treatment and sanitation,*
- *Rain water harvesting,*
- *Improvement of sewage systems, and*
- *Improvement of road networks.*

3.5.2 The Directorate of Surface Water and Irrigation (MoA-WR)

The Directorate of Surface Water and Irrigation was involved during the drought events through:

- *Management of surface wells;*
- *Cleaning and rehabilitating springs;*
- *Rehabilitating and lining irrigation canals;*
- *Distribution of water tanks to the local communities*

As the water demand is expected to increase because of the population growth and their growing livelihood requirements, the identified needs and plans of this Directorate are:

- *Increasing the budget in order to buy more water tankers,*
- *More sustainable and more efficient management of the greater Zab,*
- *Development of the rain water harvesting in the mountains,*
- *Reduction in the number of drilled wells, and*
- *Promotion of modern irrigation techniques.*

3.5.3 Representatives from the Directorate of Dams (MoA-WR)

Representatives from the Directorate of Dams have stressed on the following facts:

- *Hydro-power generation has the primacy for the use of water,*
- *It is important to develop multi-purpose dams,*
- *Inflow and outflow is currently equal in most of the dams, with the inflow reaching its minimal values in the last few years,*
- *The level of water in one of these dams has dropped from 5.6 to 3 billion m³ because of the decrease in the rainfall, and*
- *The storage and recharge capacities of the dams are not enough for irrigation purposes.*

The identified needs and plans of the Directorate of Dams are:

- *Implementation of a co-ordination mechanism with the Ministry of Electricity and the Ministry of Agriculture and with the Central Government in Baghdad for a better distribution of the water, and*
- *Increasing the storage capacities of the dams.*

3.5.4 The Representatives from the Directorate of Water Reservoirs and Dams

The representatives from the Directorate of Water Reservoirs and Dams (MoA-WR) have stated the importance of small and large dams for the recharging of groundwater and storage of water. This directorate does not have any control over the upper rivers. Up to now water is not

distributed to all the villages; it is mainly used for agriculture. Dahuk and Mosul dams are used for domestic use.

The Directorate of Water Reservoirs and Dams is planning the following projects:

- *Four dams are currently under construction (one being the Bawashaswar dam),*
- *150 sites are identified for the construction of dams, and*
- *Connection of dams to the villages, mainly through irrigation canals, to provide water for the different uses.*

3.5.5 The Directorate of Forestry (MoA-WR)

Although this directorate is not directly involved in times of drought, it plays a major role in the conservation of water resources through sustainable forest management and in the sustainability of the livelihood systems.

The needs identified by the Directorate of Forestry are the following:

- *Land improvement and management,*
- *Building stone dams (micro dams),*
- *Improved irrigation, and*
- *Demand management.*

3.5.6 The Directorate of Ground Water (MoR-WR)

Representatives have noted the strong impact on ground water by the decreasing amount of snow and rain. During the period of drought, the following activities were undertaken by the Directorate of Ground Water:

- *Drilling deep wells; 92 wells were drilled for agriculture and cities,*
- *Provision of water from the Dahuk and Erbil artesian aquifers,*
- *Drilling wells for drinking water and other uses, and*
- *Ground water treatment.*

The following needs and plans are identified:

- *Recharging ground water,*
- *Management of the nine aquifers identified,*
- *Survey of deep wells,*
- *Undertaking geological inspection for wells in vulnerable areas,*
- *Deepening wells and fixing pumps,*
- *Undertaking water supply and needs study,*
- *Implementing irrigation networks for orchards,*
- *Development of co-ordination mechanisms between villages, KRG and Baghdad,*
- *Recycling sewage and used water,*
- *Recharging shallow wells,*
- *Rehabilitation of kahrezs,*
- *Pollution control and management of water resources,*
- *Rehabilitation of destroyed habitats, and*
- *Development of water master plan.*

3.5.7 The Directorate of Studies (MoA-WR)

This directorate is not involved in the emergency intervention during drought period. However, the following needs and plans were identified for the future, and for the strengthening of the institutions:

- *Information transfer,*
- *Strengthening cooperation between ministries,*
- *Implementing cooperation mechanisms with UN agencies, and*
- *Strong need to increase budget.*

3.5.8 The Sulaymaniyah Governorate

Representatives from the governorates, represented by the Sulaymaniyah Governorate, have stressed the importance of water management with 70% of the water estimated to be lost. During periods of drought, the governorates were involved in providing feed for animals and distributing water tanks.

The representatives from the Governorate have expressed the following needs and plans for more sustainable livelihoods and better resilience to drought:

- *Finding more sustainable solutions than drilling wells and tankering water during drought events,*
- *Building small dams,*
- *Better management of irrigation projects to avoid using ground water,*
- *Development of a strategic plan for agriculture addressing drought responses,*
- *Facilitation of access to credits from agricultural banks,*
- *Development of ground water and surface water storage,*
- *Rain water storage,*
- *Improvement of water management and irrigation techniques,*
- *Water adduction through pipes and not canals,*
- *Treatment of used and sewage water, and*
- *Encouraging negotiations with Turkey and Iran on water and trade issues.*

3.6 Proposed Lines of Intervention at Different Levels

The representatives from the different stakeholders and line ministries consulted during several meetings and workshops have proposed the following different lines of interventions, in the different sectors, at the institutional, legal, technical and financial levels:

3.6.1 Institutional

- *Capacity building and extension services at farmer level,*
- *Improvement of agricultural education system (access to college),*

- *Introduction of agricultural teaching in all rural schools,*
- *Improvement of gender participation at all levels,*
- *Raising the level of interest of youth in agriculture and rural based activities,*
- *Promotion of agro-industries,*
- *Establishment of multi-disciplinary teams to study dams and water resources,*
- *Raising the awareness on the value of water and on appropriate water management,*
- *Implementation of land and water management committees at the village level,*
- *Monitoring land and water resources (pollution etc..) and water quality control,*
- *Undertaking environmental and socio-economical impact assessments of all structures and projects,*
- *Implementation of early warning systems,*
- *Implementation of disaster risk reduction and management institutions,*
- *Implementation of data collection and dissemination network unit (including information and monitoring of wells) – mapping demand and availability of water,*
- *Development of urban planning for all cities and town,*
- *Implementation of co-ordination mechanisms between villages, KRG government and central government of Baghdad,*
- *Promotion of land use planning and agriculture production planning,*
- *Implementation of agricultural and urban development strategies for rural areas,*
- *Promotion of traditional and environmental architecture and building material mainly in rural areas, in order to protect and preserve the authenticity of the landscape,*
- *Implementation of sustainable land and water management practices, and*
- *Capacity building at the institutional level on planning, budgeting and co-ordination.*

3.6.2 Legal

- *Water distribution rights,*
- *Water conservation laws,*
- *Develop legislation to control water use,*
- *Empowerment of law enforcement authorities,*
- *Regulation of drilling and control of illegal drilling,*
- *Reducing the use of underground water,*
- *Dealing with trans-boundary water issues to increase water share in KRG, and*
- *Finding alternatives.*

3.6.3 Technical

- *Digging wells to improve agriculture in areas suffering from drought,*
- *Facilitating access to modern irrigation techniques and equipment,*
- *Providing free animal feed when needed,*
- *Increasing the plant cover with drought tolerant plants (local and introduced),*
- *Building micro dams along streams,*
- *Rain harvesting in small basins (ponds) at farmer level,*
- *Providing improved and high quality seeds and seedlings,*
- *Implementing experimental plots for seeds and reproductive materials,*
- *Planting wind breaks and shelter belts,*
- *Implementing erosion control structures and activities,*
- *Improvement of range and forest management practices,*

- *Promotion of multi-purpose dams (not limited to electricity),*
- *Find alternative techniques to electricity production,*
- *Diversification of agriculture and economical activities,*
- *Maintaining dams and other water structures (channels, basins etc) to prevent silting,*
- *Building different kinds of small dams depending on geology, geomorphology needs (earth dams, concrete dams, rock filled dams),*
- *Implementing water saving technologies,*
- *Implementing ground water recharge structures,*
- *Building under-ground storage dams (sub-merged dams),*
- *Implementing used water treatment plants and structures,*
- *Using the treated water for different processes,*
- *Water quality assurance,*
- *Rehabilitation of springs, kahrezs and canals,*
- *Building small reservoirs and storage basins next to the springs,*
- *Implementing intensive agriculture (greenhouse production, certified seed etc),*
- *Promotion of multi-purpose land use, and*
- *Promotion of olive production, as part of drought tolerant agriculture.*

3.6.4 Financial

- *Increasing donors interest,*
- *Encouraging private investment,*
- *Promoting cost efficiency principles in all future interventions (value of water),*
- *Providing financial incentives or educational grants to farmers,*

- *Increasing availability of financial tools to farmers, and*
- *Development of a resource mobilisation strategy.*

4. CURRENT POLICIES, INSTITUTIONS AND PROCESSES TOWARDS DROUGHT

It is important to understand the strengths and weaknesses of various policies related the livelihood systems in rural mountain regions and to develop a cross-sectoral understanding of these in order to implement an integrated development policy that would lead to a higher resilience of the vulnerable community groups to drought and other natural or man-made disasters. The viability of this integrated policy, planning and social learning processes depends on the full participation of the affected population groups with the support of the government and social and private institutions. Such a process of sustainable development will have to be perceived as a journey rather than a destination with a continuous monitoring and evaluation mechanism.

The lack of the recognition of the mountain specificities in the development processes is widely recognised as a main cause of interventions ineffectiveness in mountain and rural areas. Mountain specificities usually limit the opportunities in mountain areas, making production activities risky or not income generating. They also restrict the scope for upgrading and manipulating the resource base and make mountain systems exposed or, on the contrary, totally ignored by the development strategies from the plains and external environments. On the other hand, if properly harnessed, mountain specificities, such as diversity, niche, and people's adaptation experiences, can offer useful opportunities for sustainable use and development of mountain areas. The resilience and vulnerability of the mountain and rural communities to drought and other risks will directly depend on these specificities and on the extent to which they are taken into consideration in the planning and development process.

4.1 Livelihood Sectors and Activities in Mountains and Rural Areas of KR

4.1.1 Agriculture and Forestry

Agriculture in KR tends to disappear with livelihood strategies of the past becoming no longer viable. The current agricultural landscape is mainly composed of fruit orchards, cottage gardens, traditional crops and rain-fed fields of cereals (and other crops). Livestock production used to be mainly composed of goats and sheep herds with some traditional cattle production in some areas. The current practices are favouring cattle production.

A traditional yet very efficient management system is applied in the forests and rangelands, integrating agriculture, forestry and grazing. This agro-sylvo-pastoral system is very well integrated in the landscape. It is currently threatened by the changes in the practices. Planted forests are distributed in marginal lands and around the cities and villages.

Out of 1.7×10^{10} m² of landscape in Kurdistan almost 74.6% is agricultural land, which includes cropland in plain areas and forests in mountain areas, plus natural rangeland and orchards, with a proportion of 34.5%, 15.5%, 20% and 2.3% respectively. Sulaymaniyah and Erbil governorates

represent $6.8 \times 10^9 \text{ m}^2$ and $6.0 \times 10^9 \text{ m}^2$ respectively, whereas agricultural lands in Dahuk governorate do not exceed $3.9 \times 10^9 \text{ m}^2$.

The KR is a major food importer. Fruits, vegetables and poultry are imported from neighbouring countries like Syria, Iran and Turkey. The opening of the neighbouring countries markets and the trade agreements will certainly affect the agricultural production, by allowing the import of cheaper fruits and vegetables.

The current average agricultural labour force is approximately 12.8%, with high regional variations, going up to more than 19.4% in Sulaymaniyah Governorate compared to only 6.6% in Erbil Governorate.

In terms of rural development, KR through the Ministry of Agriculture and Water Resources with an international support has implemented a 100 million US dollar programme for agricultural development and integrated rural development aiming at the provision of small and medium scale farmer assistance which would lead to sustainable human development through start-up activities. These activities include digging deep wells, providing seeds, fertilizer, plastic houses, sprinkler and drip irrigation systems, rehabilitation of springs and kahrezs. Several Non-Governmental organisations (NGOs) are also active in this respect.

Farmers in rural and mountain areas need capacity building to upgrade their farming practices in a manner that would help them to develop practices including organic farming practices, to become more economically and environmentally sustainable.

The forestry sector in KR is not very well developed. The successive wars and drought events have severely affected the natural ecosystems. Natural forests are managed by the local communities in a very traditional management system. Some forests are protected by law, and guarded by the local "Peshmerga". The protection is limited to a series of interdictions (grazing, harvesting...) with no planning and management. Biological diversity has not been studied. Protected areas are not implemented. Planted forests are scattered in the landscape, mainly around villages and urban centres. They provide wood for construction and small industries. Local wood production in limited quantities is used by regional carpenters in furniture industry. It is therefore unlikely to see investments in the field of wood production, unless intensive forest plantations are implemented and developed in medium and high mountain areas. Even in the case of intensive forest plantations, the wood production in KRG would never be able to compete with other wood sources. The economic value of the forests and other wooded lands in KRG will mainly be dependent on the services (ecotourism, landscape, amenities, environmental functions...) and on the non-wood forest products (aromatic, medicinal and culinary plants).

Most of the agricultural activities are only undertaken on a part-time basis (either seasonal, or daily).

4.1.2 Tourism

Tourism in Kurdistan part of Iraq has been traditionally attractive to the people in south and middle part of Iraq as well as to the people of Arab neighbouring countries, however tourism activities has almost ceased from 1961 up to recent years because of the existing conflicts in the region, however after 2003 support to tourism activities have started through KRG by establishing the Ministry of Tourism, however, tourism and recreation are increasingly practiced in natural settings such as forests, protected areas, valleys, and mountain areas. Also, an increasing number of private or community-based initiatives provide eco-lodges and camping facilities and various forms of recreation.

Sustainable tourism practices are supported by the KRG and a few private sector initiatives, promoting locally made products, nature tours, etc. However it is of utmost importance to mention that the concept of sustainable tourism is not yet well understood at the decision-making level.

The Kurdistan Mountain Trail project, financed by the KRG, has succeeded in the implementation of mountain roads and lodges for trekking all across the country.

4.1.3 Industry

Industries in KR were mainly confined to cement, textile and cigarette industries, which were located in Sulaymaniyah and Erbil Governorates before the 1991. However, today three cement industries still exist, two in Sulaymaniyah and one in Dahuk, whereas cigarette and textile industries have closed down. In contrast many other industries are in developing stages such as steel industry in Erbil, fruit canning, and tomato purees, jams as well as oil refineries are under developed in the region. However, restricted areas within the cities are designed for industrial activities, such as garage and mechanical activities, car maintenance and other activities in each of the cities. Bottling of mineral water is wide spread in different localities within the region.

4.1.4 Social Services and Employment

Social services are rare. Medical services are available but very limited. Cultural centres and activities do not exist in the rural areas. Schools, mainly primary schools are available in certain areas and villages. They cover the basic needs of the very limited number of children. The universities and colleges are available in the major cities. Few recreation facilities (playfields, cafés...) are scattered in the different regions. Both private and public initiatives are contributing to the development and implementation of the basic social services.

Most people are looking for employment (civil servants) for stable incomes. For their economical survival, mountain people are proactive and practice more than one job at a time. This pluriactivity

is a key element in the resilience of the society to drought and other natural disasters affecting the agricultural production.

4.2 Policies in the Rural Livelihood Systems and their Impact on Water Availability

The KR region is currently undergoing rapid changes in all the sectors and at different levels. All the changes, at the national, regional and international levels are affecting the rural and mountainous regions, which were already severely affected in the past years.

All the changes and driving forces that have direct or indirect effects on mountain areas could be grouped into:

- *Demographic changes,*
- *Economic changes,*
- *Technological changes,*
- *Environmental concerns,*
- *Political and institutional changes,*
- *Internal driving forces to mountains,*
- *External driving forces, and*
- *Survival reactions and strategies*

4.2.1 Demographic Changes

According to the Ministry of Planning; 22% of the population lives in urban areas. The estimated total population growth rate is 3%. The urbanisation level increased from 65% in 1990 to 82% in 2009 and is expected to attain much more by 2025.

There is an intensive internal migration towards the cities (Erbil, Sulaymaniyah and Dahuk) and their suburbs. This exerts a big pressure, which in the absence of proper land use planning and adequate infrastructure, results in major environmental problems, and aggravates the effects of drought.

According to the Ministry of Planning about 80% of the resident populations, were displaced during the conflicts from 1961 to 1992. Economic and social considerations have played a role in determining the pace of return to the villages. Displacement was associated with large-scale destruction of villages, towns and housing units rendering immediate return impossible. More than

5,000 villages and towns were affected. Despite all the efforts undertaken at the different levels, a high proportion of the displaced population are not willing to return to the native villages. Lack of job opportunities, water scarcity and unavailability are among the major factors hindering the return to the villages. Several families who had returned were forced to leave again because of water unavailability and of lack of sustainable livelihood systems.

Population density at the governorates level reveals that highest pressure is put on city, followed by District and sub-districts. This highlights the rural migration towards urban centres.

During the years of war, post-war and until today, the KR has been and still is losing a large amount of the working population and of highly qualified professionals from all the sectors through emigration.

The high level of emigration will affect directly the mountain and rural areas by reducing the amount of the working population, but most importantly by changing the level of perceptions and values. Some people will change their perception of the services and values of the mountains and rural areas (including forests, landscapes, water resource) thus affecting the land use and the related activities.

The increase in the urbanisation level and the fact that a high proportion of the displaced population is not willing to return to the native villages, is directly affecting the agriculture and forestry sector and the sustainability of the rural areas. On one hand the increase in the urbanisation level will mean an increase in the urban extension, which will be at the expense of the peri-urban lands and of some orchards and agricultural fields. It also implies a higher demand on water in urban settings. On the other hand, the migration towards the cities and the abandonment of the villages and agricultural fields in rural areas, will lead to the destruction of the traditional livelihood systems, including water related systems, such as Kahrezs, natural springs and wells. However the level of urbanisation will also have a serious effect on the manpower and less people will be willing to work in agriculture and forestry related fields as they will be looking for better paid jobs, more adapted to the urban life and its requirements.

The increase of the urbanisation at the expense of the forests and agricultural fields in the lower mountain range will result in a reduction in the agricultural production and food security, and a higher dependence on imported food products. The shift to intensive agricultural production systems might be considered as an alternative solution, despite the environmental and water related problems it entails. Such an increase also means an increasing need to improve the urban environment, by providing more green spaces, and thus an increasing need of water resources.

4.2.2 Economic Changes

The KR economy is still struggling to recover from the war and conflicts that have devastated the country and affected all productive resources. Agriculture was severely affected through loss of

structures, resources and assets. The massive displacement of the populations moving into the KRG has resulted in an increase in urbanisation, which was not counter balanced by the development of neither new agricultural lands nor major agricultural projects on existing agricultural lands.

The economic and social pressures combined with the lack of employment in rural and mountain areas are also resulting in the displacement of the population, and in the high rate of emigration abroad of mostly young male people.

The recurrent drought events in Iraq are forcing herders from other regions to migrate to the KR looking for better pastures to feed their herds, which results in an increased pressure on the land and water resources and in the degradation of those resources.

Several projects and activities were and still are implemented by the different governmental and non-governmental agencies sectors aiming at providing water to the populations, along with other projects and activities aiming at the socio-economic development of the KR. However, co-ordination and or complementarities of all the efforts aiming at the provision of water and the socio-economic development and poverty alleviation ensuring the sustainable use of the natural resources, the sustainability of communities living in mountain and rural areas and the mainstreaming of drought issues in the programming process within the country (and the region) both at the national and local levels is still a major challenge.

High poverty levels in rural and peripheral areas have several implications on natural resources in general, mainly when it comes to meeting basic needs like water, food, housing and fuel wood.

4.2.3 Technological Changes

Technological changes affect the development of the mountain and rural areas, both directly and indirectly. Some of the current technological changes have contributed to the provision of water to some villages or families on a very short term and immediate basis. Long-term, these changes are increasing the severity of the water scarcity.

The most obvious of these changes is the easy access to underground water through illegal drilling of wells. This technology is allowing the villagers to drill wells and make use of the water that should normally be managed by the official authorities. While this immediate and easy access is allowing the local communities to receive some water in times of droughts, it is depleting the underground resources and prohibiting the access of other communities to water.

Dams are another example of the technological changes that are both negatively and positively affecting the availability of water. Building dams in some areas could dramatically increase the water availability by increasing the storage capacities. However, building dams on rivers and streams will negatively affect the water regime in the lower lands.

New technologies could be used for a better management of the land and water resources. Among the changes that are expected to affect the sector and contribute to the stabilisation of rural and mountain populations, while increasing the resilience of such populations to drought, we cite:

- *Development and implementation of early warning systems and weather stations networks,*
- *Improvement of the above ground and underground water storage capacities (dams, wells, recharges...),*
- *Sustainable irrigation techniques,*
- *Information and communication, facilitating the transmission of knowledge and relevant information,*
- *Remote sensing, geographical information systems and other computer aided decision making tools, improving the monitoring and assessment of the natural resources,*
- *Improvement in the agricultural production systems,*
- *Development of drought tolerant species and cultivars,*
- *Soil amendments like hydro-gels, increasing the level of survival of seedlings and reducing the water demand of some crops,*
- *Improvement of the food industries,*
- *Improvement in the sustainable forest and range management,*
- *Improvement in the forest and range products and industries,*
- *Development of new roads network to reduce the barriers caused by the remoteness,*
- *Improvement in the marketing and storage of agricultural and food products.*

4.2.4 Environmental Concerns

Although the concern on environmental issues is increasing, very little is being undertaken on the level of implementation of the environmental conventions and treaties. The issues of climate change and its consequences on the sustainability of the livelihood systems is a major concern at all the levels of the concerned stakeholders. Protected areas and nature reserves are established in a traditional manner, guarded by local police “Peshmerga”.

4.2.5 Political and Institutional Changes

The current political situation in the country and in the region being unstable and unpredictable, it is very difficult to analyse the effects it might have on the rural areas.

The recent changes in the KRG's Government structure, leading to the merging of the Ministry of Water with the Ministry of Agriculture, and to the transformation of the Ministry of Environment into an independent authority will certainly lead to some changes that will be reflected in the management of water and land resources.

A water strategy is currently being finalised. An agricultural strategy is developed and being implemented.

4.2.6 Internal Factors of Change

Severe constraints hinder the development of rural areas in KRG, the most important of which being the very limited budget allocated to the development of this sector, along with the crucial issue of water scarcity. This leads to an increased vulnerability of these areas to natural disasters, such as drought.

One of the most important challenges facing the mountain and rural areas in KRG is the conflict on land use and the urgent need to increase the water availability to meet the increasing needs of the population. The development of urbanisation and the need to increase the agricultural production can only be at the expense of the water availability. This challenge can only be faced with proper land and water use planning, involving the local communities and all concerned stakeholders. Another important challenge to be faced is the integration of the land and water policy and programme in the overall development programmes of the country.

The free trade and open markets policies are leading to a decrease of interest in the agricultural sector and therefore, an abandonment of the traditional land-use practices. While this could lead to an improvement of the agricultural production through the increase in irrigated agriculture, the decrease in rain-fed agriculture and the introduction of sustainable agricultural practices, it could however lead to the collapse of the rural landscape with all its components. One of the consequences would again be directly felt on the water sector, with a decrease in the water holding capacity of the soils and an increase in surface run-off.

This double edged sword will only be dealt with through appropriate legislation, awareness raising and sustainable management.

The encouragement of forest plantations offers a good opportunity for the protection of the forests and their soils, as it allows for the exploitation of these plantations at maturity, for fuel and industrial wood thus reducing the stress on the natural forests.

Until today, very little co-ordination exists between the ministries in charge of water and rural areas, namely the Ministry of Agriculture and Water Resources, the Environment Authority, the Ministry of Planning, the Ministry of Municipalities and the Ministry of Finance. The co-ordination among all the concerned institutions and the stronger collaboration with the civil society will have a great influence on the sustainable management, the protection and the conservation of land and water resources.

4.2.7 External Factors of Change

Human activities in mountain and rural regions causing desertification and land degradation and increasing the effects of drought in KRG are mainly:

- *Agricultural encroachment and cultivation of soils that are fragile or exposed to erosion by wind or water,*
- *Unsustainable forest and range practices,*
- *Non-sustainable agricultural practices,*
- *Poor irrigation practices and inefficient water use,*
- *Pollution (solid waste dumping, wastewater effluents, sewage systems).*

The factors of change for these activities are complex and varied. They include:

At the Local level

- *Recurrent drought events,*
- *Mismanagement of the land and water resources,*
- *Poverty and lack of basic security,*
- *Lack of awareness,*
- *Unsustainable land use practices,*
- *Inadequate extension service,*
- *Remoteness of mountain and rural regions and centres of production from market places and decision making centres,*

- *Lack of technical know-how,*
- *Difficulty of access to agricultural credit schemes,*
- *Inaccessibility,*
- *Fragility of the livelihood systems.*

At the Regional level

- *The different wars and their consequences including displacement, migration and lack of enforcement of regulations,*
- *Political instability/ transition phase,*
- *Absence of a comprehensive strategy for the sustainable use of land and water resources,*
- *Absence of a comprehensive strategy for mountains and rural areas development,*
- *Disabling land tenure system,*
- *Absence of land use planning,*
- *Absence of policies and plans for water, agriculture, forestry, rural development, and mountain related issues in general,*
- *Insufficient access to basic needs,*
- *Unsustainable livelihood systems.*

At the Institutional level

- *Centralised decision-making,*
- *Sectoral solutions for multidisciplinary problems,*
- *Weak inter-departmental and inter-ministerial co-ordination and co-operation, duplication of efforts, and overlap in the mandate of public institutions,*
- *Absence of regional structures for comprehensive land and water resources management,*
- *Weak institutions at the local level.*

At the Legislative level

- *Absence of a comprehensive legislative framework leading to reactive and inadequate legislation,*
- *Weak enforcement of existing legislation,*
- *Tribal or traditional legal system differing between villages.*

At the Macro level

- *Trans-boundary water problems,*
- *Unfavourable terms of trade,*
- *Unfair competition from subsidised imports,*
- *Effects of climate change/expected extreme weather events.*

4.2.8 Survival Reactions and Livelihood Systems

The combination of these factors of change with the environmental conditions leads to land degradation and desertification, and exacerbates the effects of drought, especially in mountain and rural areas because of their vulnerability. The consequences of desertification and drought, in addition to the effects of water unavailability, are extremely serious and often dramatic to the poor, especially in mountain and rural areas as desertification and drought reduce production and make it increasingly precarious. Affected populations will resort to survival reactions that will worsen the situation and prevent development or will simply leave their villages looking for better livelihood systems.

The most immediate and generally widespread of these survival reactions is to intensify over-exploitation of the most readily available natural resources, but at the cost of the sustainability of the resources. Water being the most critical factor in KRG, it is currently over-exploited in a very unsustainable manner. The second reaction is the increasing rural migration: this may simply involve men and young people leaving for a seasonal or longer-term job in other areas of the region, particularly the towns, or going to other countries; or the migration may take on the proportions of a population exodus in search of better living conditions. These survival reactions are often accompanied by breakdowns in the integrity of communities and sometimes families. When survival is difficult, people become withdrawn and sometimes strongly individualistic; this leads to ethnic, family or individual conflicts.

Examples on the first survival reaction in KRG, namely, the overexploitation of available natural resources, are many and varied including uncontrolled drilling of wells and uncontrolled use of water resources. This is leading to the increased level of water scarcity and unavailability, exacerbated by the recurrent drought events. The second survival reaction can clearly be noted by looking at the urban population and at the number of abandoned houses in the villages.

This resulted in land abandonment in mountain and rural areas, leading to the neglect of agricultural lands and soil and water conservation measures in many places. Moreover, this migration trend has put tremendous pressure on the existing urban infrastructure resulting in many cases in chaotic urban sprawl and a dramatic increase in water demand and water use in the cities. Migration trends are also aggravated by populations generating towards the KRG from other regions in Iraq.

4.3 Causes of Water Scarcity

Data on drought events, water resources, vulnerability and different issues related to drought and livelihood systems is scattered and often incomplete. Lack of data on drought events and their magnitude, on water unavailability and its causes are a major obstacle in understanding the nature of the problem. Consistent, accurate and reliable information is needed to describe the magnitude and urgency of the drought problem to decision makers and to make them prioritise the necessary measures. Information is also essential to draw the most appropriate strategies and policies.

Statistics on the causes of water unavailability do exist but are not complete. However, it is clear that if drought is a natural phenomenon, water scarcity and unavailability are often induced or aggravated by people. In a region where rainfall varies between 100 and 1,300 mm/year, the problem of water management is certainly more important than the problem of drought.

The current changes in the climatic conditions are translated by events of fluctuation of rainfall, the decrease in the number of rainy days and the shift in the season of rain and snow. However, the appropriate management of the water resources could decrease the impact of drought events on the livelihood systems.

4.4 Needs and Limitations

From the analysis of the latest drought events and the livelihood systems in the mountain and rural areas of KR, the following needs and limitations can be drawn:

- *Scattered responsibilities among different administrations and lack of a co-ordination mechanism among all concerned stakeholders, national and international organisations and UN agencies,*
- *A common database on drought, water resources, water availability, water needs and livelihood systems is still missing. Data, when it exists, is scattered, non-homogenous and difficult to process,*

- *Co-ordination with neighbouring countries is very limited,*
- *Research on climate changes, water resources and livelihood systems is weak,*
- *Due to the current situation of the country and the region, the successive war events, the massive migration and immigration movements and all the changes being witnessed, it is very difficult to analyse the effects of drought and the causes of water unavailability and to estimate the real burden posed on the economy and livelihood systems,*
- *An integrated approach is needed both in water resources planning and the sustainable management of the livelihood systems,*
- *Water is not addressed as the core and most vital element of the livelihoods and having links with all the other elements of the local economies,*
- *Public awareness on the importance of water conservation and management is not properly addressed,*
- *There is a lack of a clear management approach on water and drought issues. Drought events are treated as a natural disaster only and analysed as mere results of climatic changes,*
- *Sectoral policies (agricultural policy, tourism development, urban development, etc.), contribute to a non-sustainable process, which aggravates the problem of water scarcity and unavailability,*
- *Drought response is in most cases a reaction to a natural catastrophe, independently from the actual root causes and water management policies and practice,*
- *Absence of expertise to design and implement ground water recharge structures,*
- *Absence of expertise to determine the needs, demand and supply of water in the different sectors,*
- *Weak law enforcement to control illegal water exploitation*
- *Lack of human resources, administrative cadre, and equipment and tools in the concerned ministries,*

The major needs in terms of drought management and control are the following:

- *Institutional building,*
- *Vocational training,*
- *Early warning systems and preparedness plans, and*

- *Evaluation of the vulnerability of the local livelihoods.*

The needs could be answered through:

- *Capacity building programmes involving all concerned actors,*
- *Community participation (training and implementation),*
- *Early warning systems,*
- *Policy and legislation review,*
- *Institutional building,*
- *Provision of tools and equipment,*
- *Building drought resilient societies through the provision of water, the diversification of the economies, the availability of markets, access to funds,*
- *Implementing co-ordination mechanisms.*

4.5 Livelihood Systems in KR and Climate Change

It is not possible to understand the current drought impact and vulnerability of the local communities in KR without taking into account past and current anthropogenic activities, wars and land uses. The landscape has always been used by the local communities, which were using it and abusing it. Human intervention has been so strong that its impact is visible everywhere on the landscape and vegetation patterns. The current drought events are strongly affected by the severe human pressure and its resulting activities like burning, clearing, terracing, cultivating, and excessively using water resources and later abandonment of the lands because of wars, drought and unsustainable livelihoods.

The impact of the recent drought events and their increasing severity and intensity somehow reflect the recent socio-economic changes that are occurring in KRG and in the Middle East: successive wars, changes in traditional land-use and lifestyles, migration, destruction of the traditional water systems (kahrezs...), changes in agricultural practices, decreasing value of the agricultural products, remoteness of villages from urban centres and destruction of the traditional livelihood systems. Changes in the livelihood systems and in the land-use patterns that have occurred during the last few decades are parallel to the increasing impact of drought on the local communities. This trend is not observed in where livelihood systems are more diversified and resilient and where sustainable traditional land uses remain the major socio-economic system.

Although the main reason for the increase in the drought event and their severity is certainly caused by the climate changes that are currently witnessed, changes in livelihood systems should be considered as the main reason for the vulnerability of the local communities to these drought events. The climate changes that are predicted to occur in the near future are likely to induce increased drought events and to cause dramatic impacts on the local communities if the livelihood systems are not improved, empowered and assisted to become more resilient.

Efforts aiming at the adaptation to climate change, or the adaptation to drought caused by climate changes, should be oriented towards building a resilient society with sustainable livelihood systems and increasing the availability of the water resources.

4.6 Policies and Processes

4.6.1 Policies

The promotion of sustainable land and water development (in mountain and rural areas) can play an important role to benefit lowland and urban areas by ensuring adequate supplies of water, environmental stability, conservation of biodiversity, and rural-urban population balance. This requires integrated policy, planning and social learning processes.

Five main policy instruments should be integrated and co-ordinated because of their strong impact on the mountains and rural areas and on the sustainability of their livelihood systems. These instruments include:

- *General economic and social policies,*
- *Policies relating to agricultural and rural development,*
- *Policies relating to markets,*
- *Policies aimed at establishing a democratic and participatory process, and*
- *Policies designed specifically to influence natural resource use and protect the environment, including water related policies.*

The key principles of the strategies for the sustainable development of mountains and for the sustainable land and water management in mountains and rural areas should be:

- *People-centred,*
- *Reaching a consensus on long-term vision,*
- *Comprehensive and integrated,*

- *Targeted with clear budgetary priorities,*
- *Based on comprehensive and reliable analysis,*
- *Incorporating monitoring, learning and continuous improvement,*
- *Country-led and nationally (or regionally) owned,*
- *Based on high-level government commitment and influential lead institutions,*
- *Building on existing processes and strategies,*
- *Insuring effective participation at all levels,*
- *Linking national and local levels, and*
- *Developed and built on existing capacity.*

4.6.2 Main Processes

The above elements can be made operational through putting into place, on a continuous basis, four main processes:

Political Processes

Strong political commitment from the top leadership as well as from local authorities is required. There is a strong need for a central co-ordinating body and involvement of all ministries to build cross governmental support (along with the Ministry of Finance and the Ministry of Planning).

The commitment and engagement of the private sector and civil society will favor the sustainability of the different processes and will increase the resilience of the society to the different risks.

Participatory process

Both governmental and non-governmental groups should be involved in the designing of strategies, exchanging of information, decision-making, implementation of strategies.

Technical Process

Through this process the knowledge base should be developed, building on existing strategies, designing a system for harmonising key economic, social and environment related policies and carrying out the building of capacities on a continuous basis.

An important aspect of the technical processes is the crafting or amending of legislation so that it is reflective and supportive of policy. The crafting of quality legislation not only facilitates the

mustering of political support, but is also the key mechanism to ensure the implementation of policies.

Resource Mobilisation Process

Domestic and international resources should be made available. Mechanisms need to be developed for involving the international community in the process, while the country (region) remains in full ownership of the process.

Strategies should be financed from the recurrent budget of the government for a better political support and a stronger integration into national development policies and decision-making processes. Without such links, the strategy is likely to be dependent in external funding

As the availability of resources is limited, the establishment of key priorities is essential. The ability to resolve conflicts and build consensus in setting priorities is important in the resource mobilisation process.

4.7 Development Scenarios

The actual critical situation of the KRG is due to all of the stresses on the resources, mainly on the water resources and all the possible scenarios for the future of the region depend on the becoming of several factors conditioned by the complexity of the challenges linked to the area.

Different scenarios could be developed in order to better imagine the future and better organise the reactions in future drought events.

4.7.1 A Negative Scenario

A negative scenario could be based on the total collapse of the rural system with local communities not able to sustain themselves and migrating to urban areas.

The management and use of the resources would no longer be possible by the local communities. Rural areas would be deserted because of water un-availability and scarcity, poverty, lack of cultural and leisure activities, low-income generating jobs, lack of markets and the combination of marginality, fragility and inaccessibility.

The excessive drilling of wells and the lack of maintenance of all the water resources would lead to a drastic decrease in the water availability for irrigation and household uses.

Rain-fed agriculture would be dominant with all the risks of total loss of the crops during dry years.

The abandonment of the land would result in a decreased water holding capacity of the soil, thus leading to surface run-offs and eventual floods. Agriculture would be limited to certain regions and to certain rich and wealthy farmers, who would employ cheap foreign manpower.

A high pressure on the land caused by buildings maladapted to the sites, translating the need for urbanisation and modernisation, the uncontrolled mass tourism, the lack of authenticity and the almost not existing town planning and management, will certainly lead to the loss of identity of the land and the total devalorisation of the area.

Future drought events would have dramatic effects on the livelihood systems, on the agricultural production and on the ecosystems. Mass migration movements would be witnessed from the rural areas towards the urban centres and the major cities that would not be prepared to receive the moving population. A wide range of social, economical, health and environmental problems would arise.

After the onset of drought, people would no longer be ready to move back to their villages, which would lead to the collapse of the rural livelihood systems.

4.7.2 A Status quo

Another scenario would be based on the status quo, with unsustainable agricultural and irrigation practices being continued.

The effects of recurrent droughts are exacerbated by rain-fed agriculture, high-water demanding crops, lack of markets, water scarcity and un-availability (some villages are surrounded with water but have no water installations) and lack of co-ordination among the different policies and institutions.

The diversity of the landscapes and the diversity of the crops do not compensate for the problems linked to marginality, fragility and inaccessibility.

Industries, and mainly food industries are very limited, not cost-efficient and with no codes of practices and production standards. Traditional industries and crafts are disappearing.

Although the government is developing and implementing water and agricultural-related policies and strategies, and organisations are bringing different kinds of sectoral support, people are still suffering from the unavailability of water.

The issue of drought is not properly addressed in the different policies. The limited co-ordination among the different concerned institutions, within the institutions and between the international organisations is leading to a series of uncoordinated and sometimes contradictory responses.

The rural societies still depend on agriculture as the main source of income. The economic activities in the mountains and rural areas are not diversified enough to cover the needs in times of drought. The society is therefore very vulnerable to drought and other natural and man-made risks.

The government and the population depend heavily on external assistance and on water delivery in times of drought. Back and forth migration movements are witnessed during and after drought, with less people willing to go back to their villages, more people to feed in the cities, and a higher urban water consumption, leading to a lower water distribution to the villages, mountain and rural areas.

Traditional water systems are disappearing. Underground water is not being recharged and the resources are progressively depleted.

4.7.3 A Positive Scenario

A positive scenario offers an ideal prospective vision. It aims at solving the different problems in an integrated and strategic approach: the different water and land resources are properly managed; the traditional rural activities are strongly implemented; forest exploitation, range management and agro-forestry are revived, taking into account the multiple functions of the forests, rangelands and other wooded lands; the conflicts of use are reduced with the existence of proper planning and co-ordination mechanism; the local values are developed.

The development of a new form of tourism, the responsible tourism, allows for the creation of new jobs and for the valorisation of the landscape as soon as the situation is stabilised.

The youth are encouraged to stay and even to come back to the rural areas, thus contributing to their blooming and to their sustainable management. Women play a major role in the local economy.

The income generating activities are diversified. Rural societies do not only depend only on agriculture for their livelihoods.

The proper land and water management in the up-stream increases the water availability both down-stream and up-stream.

Both the government and the population are ready for eventual drought onsets. The livelihood systems are sustainable and able to survive periods of drought. The reactions of the government and international organisations are well planned.

This scenario supposes a participatory management of the land with all the concerned stakeholders and would lead to:

- *The sustainable management of the land and water resources,*
- *A strong co-ordination mechanism is developed among all the concerned stakeholders, before, during and after the drought onsets,*
- *The revival and valorisation of traditional rural activities and products,*
- *Multi-functional land-use,*
- *Reduced conflicts of use,*
- *The development of local values,*
- *The promotion of responsible tourism,*
- *The creation of new jobs,*
- *The respect and promotion of the cultural values, and*
- *And most of all the development of a society resilient to drought and other natural and man-made risks.*

4.7.4 Traditions and Continuity: The Mesopotamian Garden

The traditional integrated management of the landscape over centuries has allowed for the continuous and almost un-interrupted occupation of the space by the local populations. This traditional management has always consisted of the simultaneous use of the land for agriculture, grazing and forestry, despite the cyclic changes in climate and the seasonal variations in water availability. In the current scenarios of climate change and increasing drought events, the holistic management approach to the resources would increase the resilience of the society to drought.

- *The concept of the agro-sylvo-pastoral-system allows for the conservation of the Mesopotamian landscape and the heritage values,*
- *The traditional features of the landscape such as the kahrez enhance the heritage values and may contribute to a better resilience to drought,*
- *An organised and responsible tourism would give an added value to the mountain and rural regions by increasing the functional mosaic, and*
- *A resilient society to drought and other natural and man-made risks should be built upon the agro-sylvo-pastoral system with some industries, tourism, civil service jobs...etc.*

4.8 Community Involvement

Local populations have a low level of awareness concerning their attitude towards the sustainable management of land and water resources. They often dig wells in the wrong place and at the wrong time. This indicates their urgent need for water and their lack of awareness on the importance of the sustainable management of land and water resources, for the sustainability of their livelihood systems. It is important to understand the importance of sustainable land management for a better management and conservation of the water resources and for the sustainability of their livelihood systems. While the link between the sustainable management of land and water resources, poverty and land-use should be properly addressed, community participation is crucial at all levels of forest fire management.

Involving local communities in land and water management should be adopted to cover a large number of villages in the different governorates. This requires the full support of the regional governorates, the municipalities and eventually the concerned ministries. It is important to highlight the significant role of municipalities and local communities in the decision making process regarding the management of the land and water resources and in the sustainability of the livelihood systems.

4.9 A Common Approach for Drought Management and Sustainable Livelihood Systems

Different countries have different ways of organising drought management, water availability, and resilience of local communities to drought and sustainability of the livelihood systems.

Traditional drought management initiatives were limited to increasing water storage and distributing water during drought events. Livelihood systems were not addressed. Each organisation and agency was reacting in a sectoral approach.

It is necessary to implement a co-ordination mechanism with distributed roles and responsibilities and involving the Ministries of Agriculture and Water Resources, Planning, Municipalities, Environmental Authority, in addition to other ministries, International and UN agencies and NGOs.

The advantages of such a mechanism are:

- *Addressing livelihood systems,*
- *Adopting a holistic approach,*
- *Improvement of the effectiveness of detection and rapid response,*
- *Building the capacities at all levels, and*
- *Ability to use more personnel, expensive tools and high technology facilities.*

The main obstacles of such a mechanism are:

- *Co-ordination between the agencies is an absolute prerequisite,*
- *Different players usually represent different policies and different approaches, and*
- *Sustainable land and water management, drought management and sustainable livelihood systems is a complex issue that needs feedback among all stages and cannot be separated in pieces.*

Drought management cannot be dealt with as a separate component, on a sectoral level. It should be approached in the context of dry land management and sustainable livelihood systems, within the framework of a solid strategy involving all the concerned stakeholders and all the levels of interventions. What counts most is the policy under which the players operate and the co-ordination and complementarities of the different interventions.

4.10 Collaboration

National, regional and international organisations have reacted during the drought events, in their respective fields of expertise. Some have developed sectoral policies and strategies for drought management. Actions and projects are implemented. However a holistic strategic approach, a programme, addressing the drought, water scarcity and water unavailability in the livelihood context is still needed.

The issue of up-land low-land relationships and collaboration with regards to water management should be dealt with. Any action taken in KRG may be reflected in the lower lands. Any action taken by neighbouring countries is reflected in Iraq in general and in KRG in particular. The issue of trans-boundary co-operation and collaboration remains a crucial aspect to be emphasised, but cannot be addressed in this strategy.

An effective drought mitigation strategy involving all the concerned stakeholders, international organisations, UN agencies, national and regional organisations, local communities and grass-root organisations does not exist in KRG. This strategy should propose clear operational objectives and activities that address the issue of the drought-livelihood nexus with the identification of the organisations in charge of each activity.

4.11 A Two-Level Strategic Approach

The proposed strategy would be built on two levels. The first level is dealing with drought risk management and helping the government to be ready for eventual future drought events, to better organise the response and the aftermath. This level would be developed on the short term.

A second level would adopt a strategic framework approach that should be developed over several years, based on the 10-Years Strategy of the United Nations Convention to Combat Desertification, and addressing Desertification, Land Degradation and Drought, climate change scenarios and biological diversity.

The KRG has its own specific characteristics that define the way land and water resources should be managed and the way drought should be controlled. The strategy proposed by UNDP with its objectives and activities could be a promising arrangement that may be instrumental for intra- and inter-regional co-operation for drought mitigation and land and water resources management, for a better sustainability of the livelihood systems.

5. DROUGHT RISK MANAGEMENT STRATEGIES IN SHORT, MEDIUM AND LONG TERMS

The Drought Risk Management Strategy was prepared based on the different consultations, meetings, workshops and assessments undertaken in KRG. While addressing the sustainability of the livelihood systems and the principles of sustainable management of land and water resources, the strategy is built on the risk-management framework, known as the 5Rs:

1. Research, information and analysis; 2. Risk modification, including drought vulnerability reduction and prevention of water scarcity; 3. Readiness; 4. Response; 5. Recovery.

This strategy is meant to be developed during the first year as it aims at building the institutional and organisational capacities of all concerned stakeholders on the management of drought as a risk. At a later stage, the strategy could be moved down to the local level and implemented based on local action plans.

5.1 Aim of the Strategy

The main aim of the strategy is to reducing the impact of intense and frequent drought events and water unavailability and building the resilience of the livelihood systems through the sustainable management of land and water resources.

5.2 Operational Objectives

5.2.1 Research, Information and Analysis

Objectives

To support and promote the improvement, know-how sharing, monitoring and dissemination of knowledge on drought, land degradation, management of land and water resources, vegetation dynamics and other relevant topics among all relevant actors (science/ research, policy makers, land managers, grassroots groups), bridging science and traditional knowledge.

Administrations and Bodies in Charge

- *Ministries: Agriculture and Water Resources, Planning, Education, Municipalities, Environmental Authority,*
- *Research Institutions,*
- *Municipalities,*
- *NGOs and CBOs, and*
- *International and UN agencies.*

Time Frame

The time frame: All year round.

Activities

Activities should be undertaken in close collaboration among all concerned stakeholders:

- *Reinforce the existing science and technology networks, organisations and institutions/programmes working on drought, land and water management related issues (in capacity building, human and financial resources),.*
- *Develop knowledge-sharing systems, including traditional knowledge to support policy-makers and end-users, including through the identification and sharing of best practices and success stories,*
- *Encourage research and education in schools, universities and in vocational training in the fields related to drought prevention and control, and sustainable land and water management,*
- *Develop a baseline scenario based on the most robust data available on biophysical and socioeconomic trends and relevant scientific approaches gradually harmonised,*
- *Develop monitoring and vulnerability assessment systems (indicators to be measured, methodologies, databases) and set up systems for the collection of relevant data (qualitative and quantitative) on biophysical and socioeconomic trends in the KRG,*
- *Develop yearly danger indices based on weather conditions, cropping systems, livelihood systems, vegetation types and prevailing activities,*
- *Archive and report data and information to simulate drought trends and to monitor future drought events,*
- *Develop objectively verifiable indicators which can evaluate the success or failure of the drought strategy and the adoption of drought risk reduction means in all concerned sectoral policies,*
- *Improve knowledge on biophysical and socio-economic factors and on their interactions in affected areas to enable better decision-making,*
- *Improve knowledge of the interactions between climate change adaptation, drought mitigation and restoration of degraded land in affected areas to develop tools to assist decision-making,*

- *Disseminate information related to sustainable land and water management practices, sustainable livelihood systems, drought risk, legislation...etc,*
- *Valorise and maintain traditional management systems of water and natural resources (kahrezs, water use rights...etc), and*
- *Promoting the sustainable use of water resources at both urban and rural levels thus insuring the sustainability of the natural and man-made ecosystems.*

5.2.2 Risk Modification - Drought Vulnerability Reduction and Prevention of Water Scarcity

Objectives

To develop effective measures intending to reduce the vulnerability to drought, to increase ecological and social resilience to drought, and to prevent the water scarcity events that dramatically affect the sustainability of the livelihood systems.

Administrations and Bodies in Charge

- *Ministries: Agriculture and Water Resources, Environmental Authority, Municipalities, Justice, Information, Social affairs, Finance, Planning,*
- *Governorates,*
- *NGOs, CBOs,*
- *Media (Press, TV and Radio stations...etc), and*
- *International and UN agencies.*

Time Frame

The time frame: All year round.

Activities

Activities should be undertaken in close collaboration among all concerned stakeholders:

- *Provide the necessary requirements for the sustainability of the livelihood systems and the resilience of the communities to drought and water scarcity,*
- *Implement a co-ordination mechanism or a unit in charge of all the activities related to drought management,*

- *Develop and implement a drought susceptibility rating and mapping system at regional and municipality level,*
- *Identify opportunities and needs to allow land-owners/users to adopt the identified drought resilient land uses and management practices,*
- *Develop and explore opportunities (i.e. innovative management systems, economic incentives, etc) to help adopt drought resilient land uses and landscape patterns. Increase social and ecological resilience through a number of management practices,*
- *Promote the role of agricultural co-operatives in drought resilience and sustainable land and water use practices,*
- *Promote the role of women in the local economies,*
- *Create enabling environment for the youth to stay in their villages while contributing to the local development,*
- *Develop an inventory (mapping) of existing infrastructures and water bodies within the territory. The inventory should include illegal wells, unsustainable practices, springs, shallow wells, kahrezs...etc,*
- *Analyse the necessary changes of practices (depending on causes and social groups) to modify habits (behaviour) and improve resilience,*
- *Encourage agricultural education in rural areas,*
- *Raise awareness on sustainable land and water management and drought risk at all levels of population; awareness varies with population types (urban and rural; schools; universities, decision makers...etc). Engage civil society organisations (CSOs) and the scientific community in the KRG and in the country in the processes. Desertification/land degradation and drought are addressed in their advocacy, awareness-raising and education initiatives,*
- *Review legislations, including revision of current legislation and traditional laws; draw new laws; empower law enforcement authorities,*
- *Assess policy, institutional, financial and socio-economic drivers of desertification/land degradation and barriers to sustainable land management, and recommend appropriate measures to remove these barriers,*
- *Integrate sustainable land management and land degradation issues into development planning and relevant sectoral and investment plans and policies,*

- *Mainstream donors and UN agencies drought mitigation objectives, water management issues and sustainable land management interventions into their development co-operation programmes/projects in-line with their support to KRG sectoral and investment plans,*
- *Ensure that donor community and concerned UN agencies provide substantial, adequate, timely and predictable financial resources to support initiatives to reverse and prevent desertification/land degradation, mitigate the effects of drought and promote the sustainability of the livelihood systems,*
- *Ensure appropriate water adduction systems to all villages,*
- *Encourage sustainable irrigation practices and provide incentives for using them,*
- *Encourage water storage structures at the household and village levels,*
- *Implement water recharge systems for underground water tables,*
- *Implement, wherever necessary and possible, dams, micro dams, water pounds and other water harvesting structures,*
- *Implement necessary land management measures to prevent silting of the dams,*
- *Encourage the diversification of income generating activities at the household and village levels in order to increase the resilience of the livelihood systems in times of drought,*
- *Plant green belts and wind breaks to prevent wind and sand storms,*
- *Implement sustainable management practices for forests, other wooded lands and rangelands,*
- *Implement local development plans (at the “Nahia” level),*
- *Implement policies, legislations and management options in partnership with the local community groups and other members of the civil society, and*
- *Adopt and implement modern multi-disciplinary management tools combining protection, production, conservation, involvement of local populations, exploitation and traditional and modern uses.*

5.2.3 Readiness

Objectives

To undertake all possible provisions by individuals, communities and land and water management agencies to be prepared before a drought event occurs, improve interventions and their efficiency and monitor early signs of drought.

Administrations and Bodies in Charge

- *Ministries: Agriculture and Water Resources, Planning, Environment Authority, Municipalities,*
- *Office of Meteorology,*
- *NGOs, CBOs and private sector, and*
- *International and UN agencies.*

Time Frame

The time frame: All year round.

Activities

Activities should be undertaken in close collaboration among all concerned stakeholders:

- *Benefit from weather forecasts and weather monitoring systems for improving readiness,*
- *Conduct a proper distribution at the landscape level of water structures and conduct an inventory of current water resources which are available and desired future resources,*
- *Consider the establishment of multiple-use water structures and dams in order to increase the water availability for all the different uses,*
- *Set up a mechanism to educate and target the various land users groups of how to respond during periods of drought,*
- *Activate the role of municipalities located within drought sensitive areas to increase readiness,*
- *Keep all equipment and infrastructures functional and properly maintained,*
- *Provide necessary emergency water adduction systems (pumps, tankers...etc) to all concerned stakeholders (municipalities, governorates...etc),*
- *Keep strategic water stocks ready to be used in times of drought for the different uses,*
- *Promote the integrated investment frameworks for leveraging national, regional, bilateral and multilateral resources with a view to increasing the effectiveness and impact of interventions,*

- *Increase efforts to mobilise financial resources from national, regional and international financial institutions, facilities and funds, and*
- *Facilitate access to technology through adequate financing, effective economic and policy incentives and technical support.*

5.2.4 Response

Objectives

React in times of drought and water scarcity in order to avoid dramatic consequences such as massive migrations, increased poverty, diseases... and limit the effects of drought through the development of methods and techniques coupled with appropriate material.

Administrations and Bodies in Charge

- *Ministries: Agriculture and Water Resources, Municipalities, Planning, Army, Peshmergas,*
- *Governorates,*
- *NGOs, CBOs, and*
- *International and UN agencies; emergency and humanitarian programmes.*

Time Frame

The time frame: During periods of severe droughts and water scarcity.

Activities

Activities should be undertaken in close collaboration among all concerned stakeholders:

- *Empower and build the capacities of the concerned authorities for water distribution and humanitarian interventions,*
- *Train concerned stakeholders on measures to be taken at all levels during drought*
- *Increase readiness to manage migrating populations (within KRG and from other parts of Iraq to KRG) and to provide them with appropriate livelihood facilities,*
- *Develop an appropriate legal framework and empower the law enforcement agencies to better punish those using water resources in an unsustainable and illegal manner,*
- *Develop and implement an appropriate legal framework for the establishment of a co-ordination mechanism among all concerned stakeholders during periods of drought,*

- *Improve the role of municipalities and local governorates in drought management and intervention, and*
- *Provide necessary financial mechanisms from internal and external resources.*

5.2.5 Recovery, Post-Draught Management and Rehabilitation

Objectives

Provide support for individuals and communities in the immediate aftermath of the drought event and in the medium and longer term efforts for community and economic revival, and restore healthy and sustainable livelihood systems in order to increase social and environmental resilience against future drought events.

Administrations and Bodies in Charge

- *Ministries: Agriculture and Water Resources, Environment Authority, Planning, Municipalities,*
- *Local Governorates,*
- *NGOs, CBOs,*
- *Research institutions, and*
- *International and UN agencies.*

Time Frame

The time frame: All year round after each drought event.

Activities

Activities should be undertaken in close collaboration among all concerned stakeholders:

- *Restore the affected livelihood systems,*
- *Encourage the return of affected populations to their villages,*
- *Create job opportunities, and social services,*
- *Analyse the post-drought emergency needs of individuals and communities and establish a fund or financial mechanism which gives adequate support to them and encourages their return to their villages,*

- *Map drought affected areas and assess the impact of drought on the different communities, livelihood systems, vegetation types, animals...etc,*
- *Implement activities aiming at the reduction of soil erosion,*
- *Develop restoration/rehabilitation protocols and activities, clean dried wells and springs...etc, and*
- *Involve the local communities in the different activities related post-drought management identifying socio-economic opportunities to link restoration and local development.*

6. THE STRATEGY FOR THE SUSTAINABLE MANAGEMENT OF LAND AND WATER RESOURCES- MEDIUM AND LONG TERM

6.1 A Dry-Land Management Approach to Desertification, Land Degradation and Drought in the KR

Once the Drought Risk Management Strategy is developed and its implementation initiated with all concerned stakeholders, it would be important and necessary to develop and implement the long-term strategy for the Sustainable Management of Land and Water Resources. This strategic framework would contribute to increasing the resilience of both the population and ecosystems to drought, desertification and dry-land challenges.

Given the cross-cutting nature of desertification - meaning that it has implications on various different aspects of socio-economic development and environmental management - one of the approaches being increasingly used is that of Sustainable Land Management (SLM).

Among all the conventions and international tools and mechanisms, the UNCCD addresses best the problems of drought, dry-land management and sustainable livelihood systems. Answering the drought problem in KRG can only be through a multiple faceted approach, involving all concerned stakeholders and focusing on sustainable livelihood systems. Drilling wells, building dams and bringing water to the villages will only bring partial solutions to the problem which should be addressed holistically.

As Iraq has recently signed and ratified the UNCCD, it would be interesting to adopt the concepts and principles of this convention to address the drought problem in Iraq in general and in KR in particular. The adoption of the concepts, the development of an action programme in KR and the adaptation of the 10-Years Strategy of the UNCCD to the local conditions in KR could be used as a pilot initiative that could be replicated in the rest of Iraq and which would pave the way for the implementation of the Convention by the Government of Iraq.

The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, through effective action at all levels, supported by international co-operation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas.

6.2 The Proposed Strategy (Based on the 10-Years Strategy of the UNCCD)

The KRG strategy should focus on:

- *Shifting from a single-sector to a multiple-sector approach,*
- *Shifting from a project to a programme approach,*

- *Shifting from simple description of the problem to the analysis of trends (biophysical and socio-economic),*
- *Analysing legal and institutional frameworks,*
- *Describing and analysing all concerned stakeholders and their roles,*
- *Analysing the gaps identified at the national level, on issues related to Sustainable Land and Water Management and dry-lands,*
- *Addressing the identified gaps, mainly dealing with poverty alleviation and ecosystem management (Strategic objectives 1 and 2),*
- *Creating and empowering a national co-ordination body (or using any other relevant existing structure),*
- *Enforcing the collaboration with other UN agencies,*
- *Adopting a strategic approach involving indicators of achievement,*
- *Adopting a clear financial strategy, and*
- *Implementing pilot projects at the local level (at the Nahia level).*

In order to enhance the strengths and weaknesses of the strategy implementation process at the micro and macro levels, the following recommendations could be taken into consideration:

- *The staff, engineers, extension agents, and decision makers of the concerned government institutions should be strongly involved in the implementation of the strategy,*
- *Capacity building of actors to be involved should take place prior to the implementation,*
- *In order to reduce the overlapping of activities proposed and implemented by the different actors, and to increase the efficiency of such initiatives, committees and working groups could be established at the following levels:*

Regional Level: involving all the actors in a given region or Nahia and animated by a local authority (to be determined),

Ministry Level: involving all the experts in the line ministries working on issues related to land and water resources, and mountains and rural areas (from the different directorates), and

Decision Making Level: involving decision makers and experts from the different ministries, public and private organisations, national and international NGOs and UN organisations.

- *Before the implementation of the strategy, some pilot projects proposed by the local actors should be financed and implemented. This would strongly contribute to increase the confidence of the actors in this approach and reduce their level of disappointment from previous initiatives and approaches,*
- *In depth analysis of the concerned stakeholders in the different territories should be undertaken in order to identify the role that each partner could play in the development process,*
- *The strategy should be implemented through the co-ordination between all the concerned stakeholders and the appropriation of the approach by the concerned ministry and by the local actors, and*
- *The local actors should be better educated, sensitised and trained on the importance of the mountains, the threats, the vulnerabilities, the specificities, the opportunities and the challenges; and on the sustainable management of land and water resources.*

This proposed strategy should be further detailed and developed through a participatory process, involving a gap and a needs identification analysis. This process should be implemented over 12 to 18 months.

6.2.1 The Vision

The aim for the future is to reverse and prevent desertification/ land degradation and to mitigate the effects of drought in the KRG in order to support poverty reduction and environmental sustainability.

6.2.2 Strategic Objective I

To improve the living conditions of affected populations:

- *Improved and more diversified livelihood base,*
- *Generated income from sustainable land management, and*
- *Reduced environmental and socio-economic vulnerability to climate change, climate variability and drought.*

Indicators

- *Decrease in numbers of people negatively impacted by the processes of desertification/ land degradation and drought,*
- *Increase in the proportion of households living above the poverty line in affected areas, and*
- *Reduction in the proportion of the population below the minimum level of dietary energy consumption in affected areas.*

6.2.3 Strategic Objective IITo improve the condition of affected ecosystems

- *Enhanced land productivity and other ecosystem goods and services in a sustainable manner contributing to improved livelihoods, and*
- *Reduced vulnerability of affected ecosystems to climate change, climate variability and drought.*

Indicators

- *Reduction in the total area affected by desertification/ land degradation and drought,*
- *Increase in net primary productivity in affected areas.*

6.2.4 Strategic Objective IIITo generate global benefits through effective implementation of the drought mitigation strategy/ framework

- *Contribution to the conservation and sustainable use of biodiversity and the mitigation of climate change.*

Indicators

- *Increase in carbon stocks (soil and plant biomass) in KRG, and*
- *Areas of forest, agricultural, rangelands and aquatic ecosystems under sustainable management.*

6.2.5 Strategic Objective IVTo mobilise resources to support implementation of the drought mitigation strategy/framework through building effective partnerships between local, national and international actors:

- *Increased financial, technical and technological resources, and*

- *Enabling policy environments are improved.*

Indicators

- *Increase in the level and diversity of available funding*
- *Development policies and measures address desertification/ land degradation and mitigation of the effects of drought.*

6.2.6 Mission

To provide a framework to support the development and implementation of national and regional policies, programmes and measures to prevent, control and reverse desertification/ land degradation and mitigate the effects of drought through scientific and technological excellence, raising public awareness, standard setting, advocacy and resource mobilisation, thereby contributing to poverty reduction.

6.2.7 Operational Objectives

Operational objective 1: Advocacy, awareness raising and education

The objective is to actively influence relevant international, national and local processes and actors in adequately addressing desertification/ land degradation and drought-related issues.

- *Synergies with relevant planned and on-going projects and programmes at the national, regional and local levels,*
- *Desertification/land degradation and drought issues in KRG addressed in national and regional forums, including agricultural trade, climate change adaptation, biodiversity conservation and sustainable use, rural development, sustainable development and poverty reduction, and*
- *Civil society organisations (CSOs) and the scientific community in the KRG and in the country engaged as stakeholders in the processes and desertification/ land degradation and drought are addressed in their advocacy, awareness-raising and education initiatives.*

Operational objective 2: Policy framework

The objective is to support the creation of enabling environments for promoting solutions to combat desertification/ land degradation and mitigate the effects of drought.

- *Policy, institutional, financial and socio-economic drivers of desertification/ land degradation and barriers to sustainable land management are assessed, and appropriate measures to remove these barriers are recommended,*

- *A strategic document is prepared and supported by biophysical and socio-economic baseline information and included in integrated investment frameworks,*
- *Sustainable land management and land degradation issues are integrated into development planning and relevant sectoral and investment plans and policies,*
- *Donors and UN agencies mainstream drought mitigation objectives, water management issues and sustainable land management interventions into their development co-operation programmes/projects in line with their support to KRG sectoral and investment plans, and*
- *Mutually reinforcing measures among desertification/land degradation action programmes and biodiversity and climate change mitigation and adaptation are introduced or strengthened so as to enhance the impact of interventions.*

Operational objective 3: Science, technology and knowledge

The objective is to improve scientific and technical knowledge pertaining to desertification/land degradation and mitigation of the effects of drought.

- *National monitoring and vulnerability assessment on biophysical and socioeconomic trends in KRG,*
- *Baseline based on the most robust data available on biophysical and socioeconomic trends and relevant scientific approaches gradually harmonised,*
- *Knowledge on biophysical and socio-economic factors and on their interactions in affected areas improved to enable better decision-making,*
- *Knowledge of the interactions between climate change adaptation, drought mitigation and restoration of degraded land in affected areas improved to develop tools to assist decision-making,*
- *Effective knowledge-sharing systems, including traditional knowledge, are in place at regional, sub-regional and national levels to support policy-makers and end-users, including through the identification and sharing of best practices and success stories, and*
- *Science and technology networks and institutions relevant to desertification/land degradation and drought are strengthened and empowered to better support the implementation of the strategy.*

Operational objective 4: Capacity-building

The objective is to identify and address capacity-building needs to prevent and reverse desertification/land degradation and mitigate the effects of drought.

- *Engage in an assessment process to identify capacity needs for tackling desertification/land degradation and drought at the regional and local levels, and*
- *Implement the resulting action plans to develop the necessary capacity at the individual, institutional and systemic levels to tackle desertification/land degradation and drought issues at the regional and local levels.*

Operational objective 5: Financing and technology transfer

The objective is to mobilise and improve the targeting and co-ordination of national, regional, bilateral and multilateral financial and technological resources in order to increase their impact and effectiveness.

- *Integrated investment frameworks for leveraging national, regional, bilateral and multilateral resources with a view to increasing the effectiveness and impact of interventions,*
- *Donor community and concerned UN agencies provide substantial, adequate, timely and predictable financial resources to support initiatives to reverse and prevent desertification/land degradation and mitigate the effects of drought,*
- *KRG increases its efforts to mobilise financial resources from international financial institutions, facilities and funds, by promoting the drought/Sustainable Land Management (SLM) agenda within the governing bodies of these institutions,*
- *Innovative sources of finance and financing mechanisms are identified, including from the private sector, market-based mechanisms, trade, foundations and CSOs, and other financing mechanisms for climate change adaptation and mitigation, biodiversity conservation and sustainable use and for hunger and poverty reduction, and*

Access to technology is facilitated through adequate financing, effective economic and policy incentives and technical support, notably within the framework of South-South and North-South cooperation.

7. CONCLUSIONS

The sustainable management of land and water resources is essential for the sustainability of the livelihood systems and the resilience of the society, both in urban and in rural and mountain areas. It cannot be separated from the sustainable management of the mountain and rural areas.

Mountains and rural areas are sources of food, wood, non-wood forest products and rangelands for the rural and urban populations. They play a very important role in the development of the economy of the KR. Although the future cannot be predicted, with the way future generations will be looking at the mountain areas, it is assumed that the conservation of these important ecosystems and territories will contribute to the well being and food security of these future generations.

The analysis of six pilot villages, very representative of the complexity of the KRG region, and the different meetings and workshops undertaken during this project have allowed for a better understanding of the inter-linkages between mountains and rural areas and the sustainable management of land and water resources.

Kurdistan region of Iraq is mostly mountainous with a rich natural, social and economical diversity, where constraints like inaccessibility, marginality and fragility are hindering the development and where huge potentialities exist for sustainable development.

The sustainable management of mountains and rural areas along with the sustainable management of lands and water resources will increase the resilience of the populations to drought and other natural and man-made risks.

The development and implementation of a drought risk management strategy would strongly contribute to a better management of future events of drought, through research, risk modification, readiness, response and recovery.

The strategy for the sustainable management of land and water resources could be used as policy tool to enhance the integrated management of the mountain regions. This would result in the encouragement of the multiple functionalities of the rural space, which could lead to:

- *The reduction of migration from rural and mountain areas,*
- *The reduction in the abandonment of agricultural land,*
- *The sustainable management of forests, rangelands and other wooded lands,*
- *The mitigation of land degradation and desertification, along with the protection of land and soils,*

- *The encouragement of new initiatives and activities linked to mountains, like ecotourism and outdoor activities,*
- *The improvement of the livelihoods of the local populations,*
- *The preparation and implementation of integrated development projects based on a participatory approach and answering the needs of the local populations,*
- *A better implementation of the sectoral development strategies,*
- *The initiation and development of a rural development policy,*
- *The reimplementation of the traditional agro-sylvo-pastoral system as the main land use system, to which the small industries and ecotourism components could be added, thus contributing to the sustainability of the livelihoods in the mountain zones,*
- *The sound and progressive reintroduction of human activities into the abandoned villages where water and other vital elements would be available and sustainably managed,*
- *The adoption of a participatory approach in the decision making process for all issues related to the management and development of the lands and water resources,*
- *The preservation, promotion and valorisation of ecosystems of major interest: forests, riparian formations, particular ecotones...along with elements of the rural, historical, cultural and religious heritage and their integration into the management plans of the zones,*
- *The availability of water in a sustainable manner to all populations, both urban and rural, and*
- *The resilience of the society and the vulnerable groups, including youth, women and least favoured groups, to drought and other natural and man-made risks.*

The implementation of a sustainable land water strategy and other forms of policies (agricultural strategy, forest policy) will have a direct effect on the mitigation of drought and on the resilience of the mountain and rural communities.

Shortages of water and drought effects in the area are evident and the impacts vary according to the different territories. The rehabilitation of kahrezs and springs, the digging of wells and the building of new dams will certainly bring a solution on the short and the long term. However, the adoption of a programme approach, involving the sustainable management of the land and water

resources in mountains and rural areas will bring a more sustainable solution, and will strongly contribute to building a resilient society to drought and other natural and man-made risks.

The analysis of the interactions between the richness of the biodiversity and the landscape, the cultural and historical heritage of the territories has allowed for the identification of the strengths linked to their natural richness and the threats they are subject to. Studying the specific characters of the territories would mean first to understand the importance of the safeguard and the preservation of their unique cultural, natural, agricultural and religious patrimony, in a privileged environment, with an exceptionally rich biodiversity and a collective memory going beyond the limits of the region to those of the whole country.

The sustainable management of land and water resources and preservation and sustainable management of the mountain and urban territories do not only concern the local inhabitants and users, the visitors, the religious entities and the decision makers. It concerns all the future generations of Kurdistan and Iraq.

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