

## Assessing the Socio-Economic and Environmental Impacts of 2014 Drought in District Tharparkar, Sindh-Pakistan

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**Abstract:** Thar Desert constitutes the largest desert of Pakistan. It is the only densely populated desert in the world, whose inhabitants is attached to their location and is unwilling to migrate. In recent past, Thar has been struck three times by droughts, the most recent was of 2014 while, and the most severe was in 1992-2002, following which it was declared one of the food insecure regions of the world e.g. Yemen, Syrian Arab Republic, Sudan, Somalia, Iraq, Democratic Republic of the Congo, Central African Republic, Burundi, Afghanistan. Understanding people perception of drought can assist to identify barriers to and drivers of adaptation that later help to develop adaptation related policies. This study seeks to assess the present condition of Thar natives and to understand from the views of people that how much negative impact of drought has on their lives. Primary data were obtained through personal interviews from local people (N=251) during field survey which was conducted in July 2015. Natives indicated that drought is a natural phenomenon; it does affect their lives, but not to a significant level. Among the affected people, the poor who live in rural areas and depend directly on agriculture have been hit especially hard. The installation of a solar reverse osmosis (SRO) plant that serves District Tharparkar has resolved most of the water shortage issues. However, water quality remains an issue for villagers, dependent on well water that is saline or polluted. Human activities such as deforestation and use of non-renewable resources for fuel are increasing environmental degradation. There is a dire need to establish best medical centers other than urban sites of the district to improve health condition of the natives.

**Keywords:** Perception, drought, environment, impact, risk awareness, Tharparkar, Sindh.

### Introduction

Drought is a slow occurring natural hazard and is difficult to detect, but its effects can last for a long period of time with widespread damage, that result in substantial economic losses (IPCC, 2013). As compared to other socio-natural hazards, droughts are affecting more people in the world (Ashraf and Routray, 2013; FSIN, 2017). Drought causes serious effects e.g. financial losses for farmers, food scarcity, increased prices, rise in poverty, employment reduction, rural urban migration etc. (Ogalleh et al., 2012; Udmale et al., 2014). In Pakistan there are two reasons for considerable loss of human and animal lives in the form of drought. First is insufficient precipitation that is causing impacts on natural ecological ecosystem and human life (Chaudhry et al., 1997; Mazhar et al., 2015) and second is global change in climatic conditions, which result in hydrological droughts due to low stream flow and no recharge of water resources (Beran and Rodier, 1985). During the period of drought soil moisture decreases, resulting in saline and sodic soil, causing threat to food security along with socioeconomic conditions e.g. livestock and income loss and insufficient food availability which further leads to starvation accompanied with famine conditions, until mitigation measures are taken. Most part of Pakistan (particularly Sindh and Baluchistan) lies in arid to semi-arid climatic zone and is constantly under risk of drought. Due to increased temperature and low average annual rainfall, major deserts (Thar,

Thal, Cholistan, and Chagi-Kharan) of Pakistan are permanently vulnerable to drought. Drought has become a recurrent phenomenon in Pakistan particularly in Sindh due to growth in pollution and climatic changes (Atif and Mahboob, 2016; Bilal et al., 2017). The province of Sindh receives only 20% of the annual rains that mostly occurs in monsoon period from June to September. The annual average rainfall in Sindh is less than 300 mm; however winter rainfall is almost negligible (Hanif and Ramey, 2014). It was in 2014 when Tharparkar was vigorously struck by drought, causing devastation at a massive scale. 182 children under 5 and 149 adults (91 male and 58 female) deaths were reported accompanied with epidemics, dehydration, malnutrition and fever/malaria. Furthermore, 4,446 children and 3,910 adults were found suffered mainly by abdomen, diarrhea and fever/malaria due to unknown reason. 37,101 livestock deaths were recorded including sheep, goats and cows or big domestic animals in result of this disaster at Tharparkar District (TRDP, 2014; HANDS, 2014). Having deficit drinking water, natives had to dig wells and make use of brackish water (Jaggarta Organization, 2014). Sindh Relief Department declared Tharparkar as calamity affected area in February 2014. Lack of rain in 2013 and 2014 were responsible for drought whereas negligence of administration in providing facilities to the affected people and forecasting of calamity was also significant factors (Hassan and Murtaza, 2012). Information about severity of drought in Tharparkar has remained limited

in terms of extent and times due to lack of weather stations network in the area (Shah and Iqbal, 2016). The research presented in this paper is designed to ground truth the environmental and socioeconomic conditions in the Tharparkar district from June 2014 to June 2015. The study was based on primary data such as interviews and survey and secondary data from previously published papers, newspapers etc.

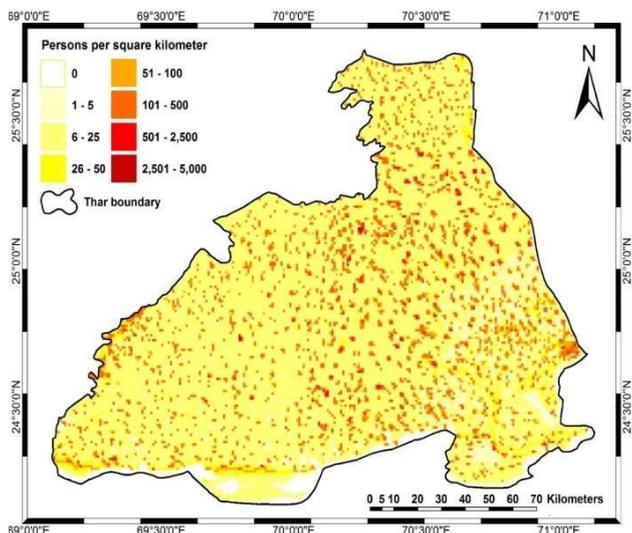


Fig. 1 Map showing spatial population distribution in district Tharparkar (Sindh) Pakistan, estimated by LandScan satellite (Adapted from Dobson et al., 2000).

### Study Area

Thar Desert is the 18<sup>th</sup> largest in world; it spans approximately over 320,000 km<sup>2</sup>. 85% area of Thar is in India, while 15% lies in Pakistan. District Tharparkar in Pakistan spread over approximately 20,000 km<sup>2</sup>, including parts of Umarmkot, Sanghar, Khairpur and Ghotki. The district Tharparkar is divided into six Talukas (tehsils) that are Dahli, Chachro, Mithi, Islamkot, Nagar Parkar and Diplo. It comprises 2400 villages, which are most backwards

areas of Pakistan and the natives are spending poor lives. It is the densely populated desert of the world with a population of about 1.5 million and population density of approx. 75 people per sq. km (PESA, 2014; Atif and Mahboob, 2016; Fig. 1). Tharparkar is one of the deprived areas of Pakistan in respect to education, health and social status. Being under-developed area Tharparkar natives adopt subsistence farming on small patches of land. They grow wheat, beans and chilies etc. for feeding their families. They also keep livestock and exchange the surplus crops with livestock in hard times. Thar soil is sandy loam; it has been an active flood plain of Indus River. Before partition the British Government declared it as calamity affected area due to shortage of precipitation and instructed the local government to keep wheat and rice in warehouses as a measure to face unpredicted famine. Thar district has a tropical desert climate with very low rainfall that mostly (87% of annual precipitation) occurs in monsoon season between June and September and varies between 50 to 300 mm (Beran and Rodier, 1985; Shaikh, 2003; Chaudhry, 2017). In summers days are extremely hot, but nights are cooler. April, May and June are the hottest months and December, January and February are the coldest months. The mean minimum and maximum temperature during winter is 9°C and 28°C respectively (PESA, 2014). Fig. 2 displays distribution of the average annual rainfall (mm) and temperature (°C) of Thar, for past 30 years, 1985-2014 (PMD, 2015). It can be noticed that the amount of average annual rainfall and temperature fluctuates tremendously. During 1985-87, 1991, 1995-96, 1999, 2000-2002, 2004-2005, 2007 and 2013-2014 mean rainfall dropped to most extremely low levels. These low levels of rainfall correlate with several meteorological drought incidents in Pakistan (Jaggarta Organization, 2014). Though having harsh climate it has diverse ecosystem. Among the natural vegetation, shrubs, herbs, thorny trees like acacia and cactus are very common.

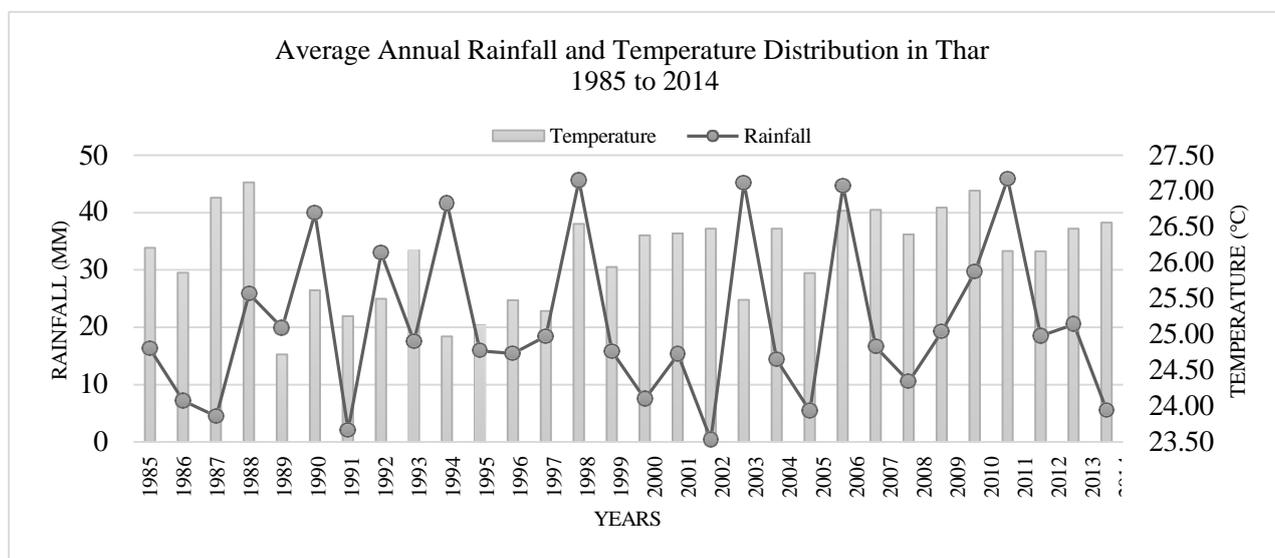


Fig. 2 Graph showing mean annual rainfall and temperature distribution of Thar, 1985-2014 (PMD, 2015).

## Materials and Methods

Foremost step was to gather information and facts about district Tharparkar from several sources, literature review, newspapers etc. Native's perception of risk play a vital role in making decisions for their survival. For drought management process, the public opinion is an essential factor in planning and implementation of mitigation measures. After getting insight to the district and its problems a questionnaire

selected on Google Earth, along the newly made highway and the passage of reverse osmosis plant. Personal interviews were taken from natives and the questionnaires were filled by the researcher after taking consent of the respondents and telling them the background of the study (Fig. 3). Furthermore, the questionnaire was also translated into Urdu language to make it easier to understand. Prior to the survey it was assumed that transport and lodging will be tough however it was easy to reach in Tharparkar. There are



Fig. 3 (a) Water collection pit at Karunjhar hills. (b) Well near Bhudeskar village. (d) Interrogating natives at Mithi. (e) Drought resistant cattle of Tharparkar. (f) Dried up land at suburbs of Islamkot. (g) Interviewing natives at Nagar temple.

regarding drought impacts was made. The questionnaire included questions related to effects of drought on lives of natives and how they face it. There were 55 questions in the questionnaire with three sections. The newly made road from Umerkot to Nagarparkar was the only easy accessible way to cover most of the locations. The locations were pre identified where the survey was to be conducted keeping in view the transport availability and road access. While for the identification of areas of interest the settlements were

several small hotels and lodging services available for tourism. The questionnaire results were processed in SPSS and graphs were prepared to reveal the facts and figures.

## Results and Discussion

The survey was conducted at different locations (cities and rural areas) in Tharparkar district. Total 251 people were interviewed regarding their perception about drought and its impacts upon them. Respondents

included only natives of Tharparkar with different religions, ages, races and walks of life. Tharparkar is one of the deprived districts with high poverty and low literacy rate. As per Sindh education ministry its literacy rate is 18.6 %. Among interrogated respondents mostly were illiterate as they could not afford education. Most of Tharparkar is inhabited by different races of Hindus. In Tharparkar 9 casts of Hindus were identified naming, Meghwal, Sameja, Rajpoot, Bheel, Kohli, Junejo, Vikia, Thakur and Rabari. Kohli and Bheel are considered as lower creeds and they are associated with labor works. Tharparkar

other. As per previous reports the natives have traditional ways to face drought. Either they migrate or they store food, fodder, legumes, water or such dry grains to fight hunger. But surprisingly only 16 of the natives from rural sides were of the opinion of storing. A few number of respondents told that they store food e.g. water, grain, hay, fodder, legume for drought period. During drought 78% of the total respondents eat only two meals a day. Gas, coal and tree's wood are the main sources of fuel. Generally people are in the view that they have medical facility available in the

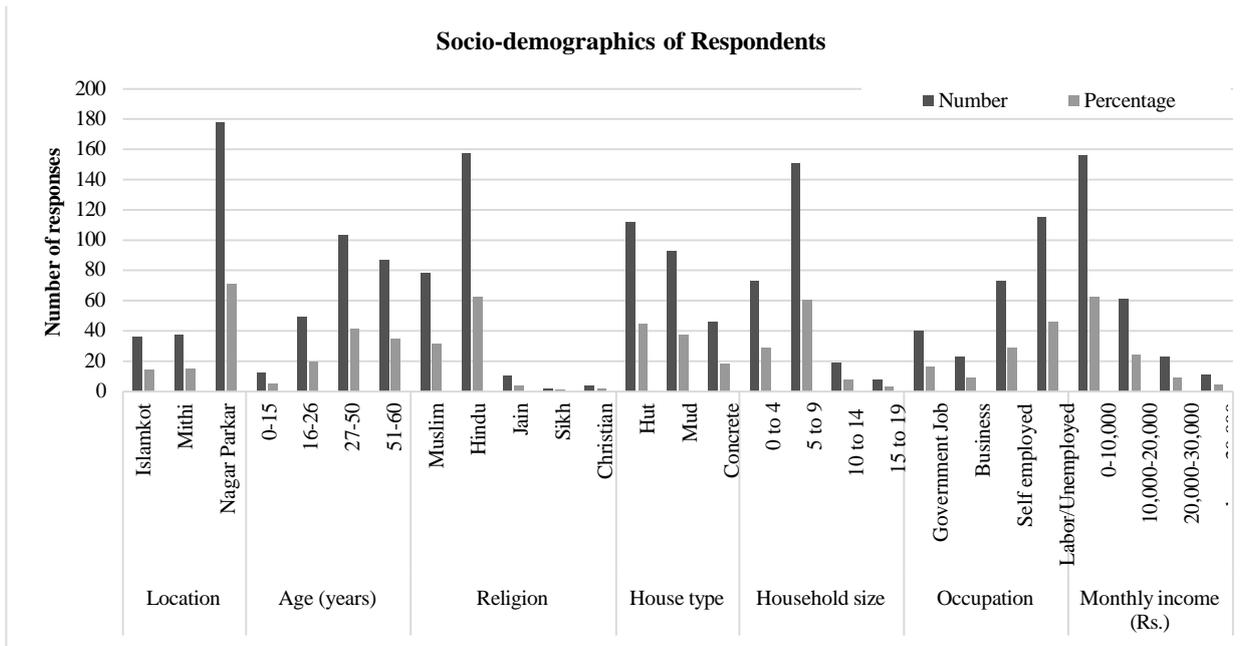


Fig. 4 Graph showing frequency distribution of location, age, religion, housing type, household size, occupation and monthly income of respondents.

district comprises of mostly poor people and their houses are made up of mud while people living in urban areas have concrete houses. The huts are made up of hay and raw wood. It covers a very less space and is enough for shelter from sun and rain. 112 respondents had hut houses while others had mud (93) and concrete (46) houses (Fig. 4).

The occupations of respondents were several, including education, health, industry, labor (construction worker, farm worker, domestic worker etc.), food, agriculture, business etc. Among the professions of natives a profession contrary to conservation was also witnessed in bulk. As people in remote areas do not have gas lines they use raw wood for fuel and 155 respondents responded that they cut trees for fuel and fodder.

Almost 98% respondents reported that drought is the common and natural phenomenon in Tharparkar which occurs once in 5 years. However, their lives are affected by drought every time. 90% respondents believed that drought is due to shortage of rainfall and/or water scarcity. There is no communication of drought to people and they mostly know it from each

in the District (Fig. 5).

Table 1. Depth of ground water at different places in Tharparkar (after Ahmad et al., 2004).

Place	Groundwater level (feet)
Islamkot	200 - 250
Mithi	150 - 200
Veravah	300
Nagar Parkar	250 - 300
Bhondisar	70

Most of the respondents believe that drought affects everyone. In case of drought occurrence its impact appears high. People migrate in the drought period and after that they come back to their native place. People believe that during drought it is difficult to them to find any job due to which their income get reduce. While, due to less availability of food and fodder the prices of commodities get higher. During drought most of the people cannot get the required food which also affects their feeding habit. Children education is not affected due to drought however due to malnutrition women get more affected and it also affects their fertility. Social issues like increase in domestic

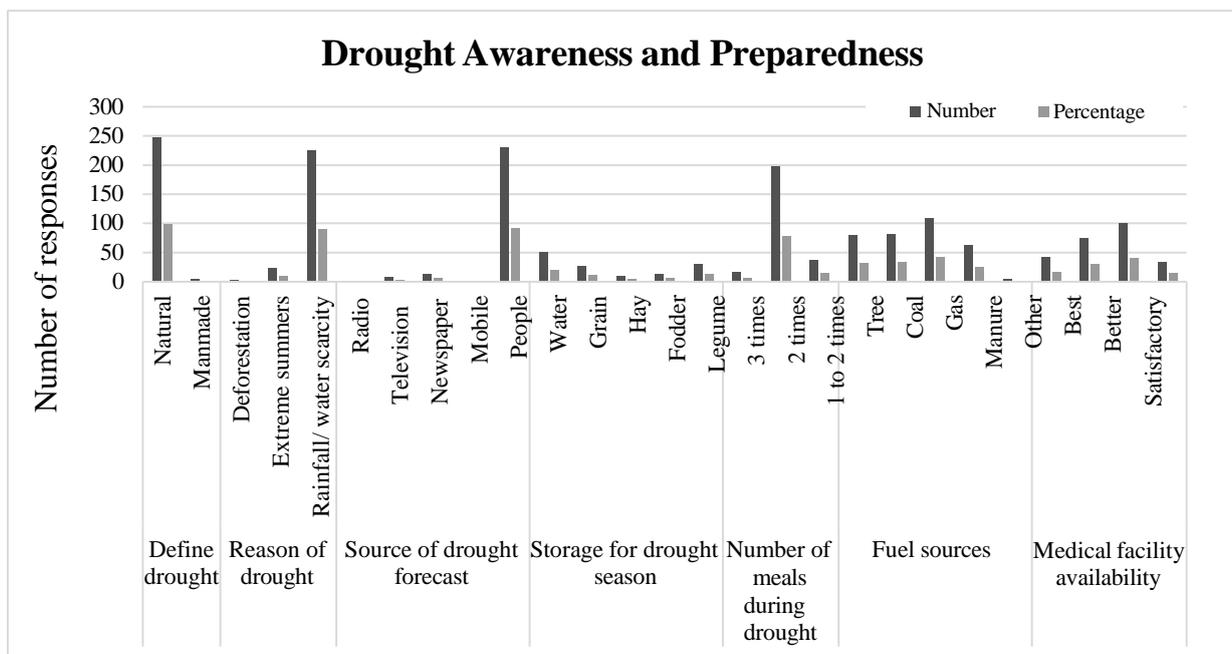


Fig. 5 Graph showing frequency distribution of responses related to people awareness of and preparedness for drought.

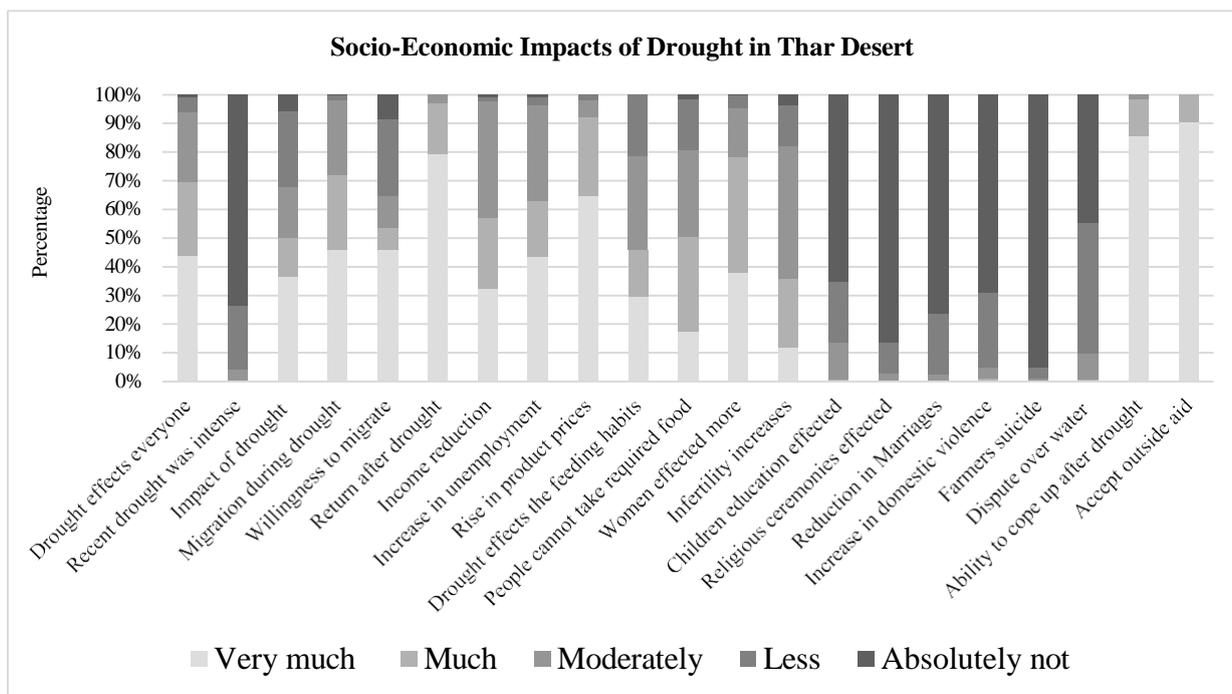


Fig. 6 Graph showing frequency distribution of responses related to socio-economic impacts of drought in District Tharparkar.

violence, reduction in religious ceremonies and marriages, rate of farmer’s suicide and dispute over water usually do not increase during drought. People are well capable to cope up after drought and they are willing to accept outside aid (Fig. 6). Tharparkar district has a reputation for being dry region where there is no sign of water, scarce rain and high temperature (Atif and Mahboob, 2016). The groundwater levels have decreased to a significant level (Ahmad et al., 2004; Table 1). Respondents informed that water quality mostly varies from sweet to saline and at some places water is below quality standards. Due to no and/or very few water availability

there are food scarcity and health issues (Chaudhry, 2017).

Sindh Government, of Pakistan established the Asia’s largest Solar Reverse Osmosis (SRO) plant in District, with eight million liters water per day to cope up water scarcity issue. Even after establishment of SRO plant, media and some other sources say that Tharparkar’s natives still face water scarcity. To unveil the water scarcity issue natives were asked about availability of water at their localities. 201 people admitted that they have easy access to water while 50 people among the respondents pointed to non-availability of water. The

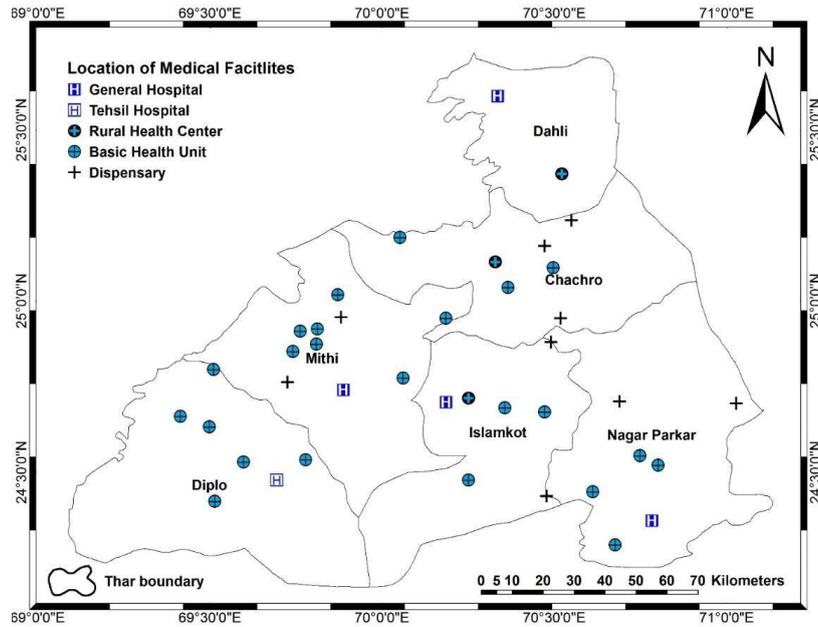


Fig. 7 Map showing location of medical facilities in Tharparkar District.

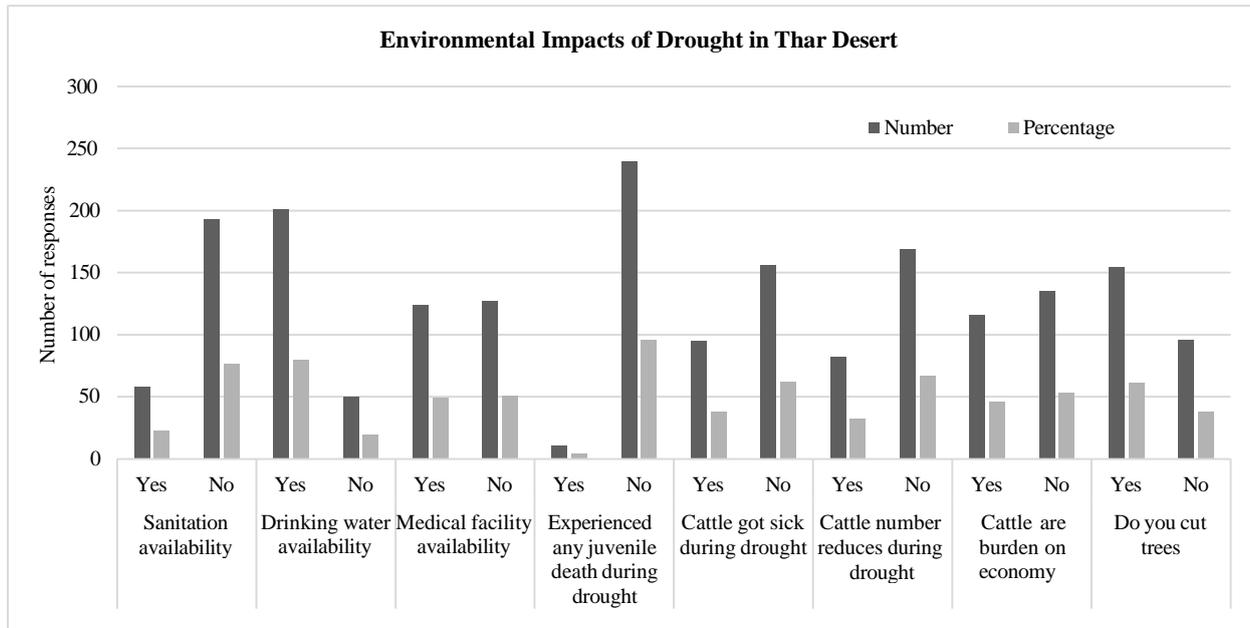


Fig. 8 Graph showing frequency distribution of responses related to environmental impacts of drought in District Tharparkar.

reason for non-availability of water includes remote distance from SRO plant, dried wells and no water source nearby. After the juvenile death case due to malnutrition in 2014, Tharparkar has been considered as a backward area with no proper medical facility while survey revealed that well operating hospitals of Mithi and Islamkot are frequently having patients from all over Tharparkar while small dispensaries are also spread at different places in district (Fig. 7).

In the remote areas due to no proper facility, traditional medical practices are offered by jogies (snake charmers), surrogates or Ayurveda medicine practitioners. There are 298 doctors in whole district. Which include general physicians, child specialists,

gynecologist etc. While there are 215 dispensaries which remain nonoperational due to lack of resources in remote areas. There is a big deficiency of doctors as Tharparkar is arid and has remote villages. In total, there are 140 health facility centers in district Tharparkar (TRF, 2012). These health facilities are enough for only 54% of the estimated 2013 population of Thar District (PESA, 2014). Only two veterinary hospitals are operating in the district. Most of the hospitals are present in Mithi. Mithi has well-equipped medical facilities which remains busy, especially in drought season as it is most affected by drought. Most of the patients rush towards Mithi hospital in the hour of need to obtain best treatment. In February 2015 only, 52 patients were admitted from all over

Tharparkar, 313 patients were treated in general wards and 687 cases of snake bites were noticed.

Among all, 124 claimed that they have access to medical facility whereas 127 had no access to medical facility and have to travel a lot for getting medical facility. Only 11 of the respondents have faced child deaths due to malnutrition; however they had one thing in common i.e. they are living in remote areas of district, which are very far from main hospitals.

It is very common to see people with cattle grazing profession at the study area. People keep goats, sheep, cows and camels. They shift the cattles before start of drought season. At normal times the cattle are raised by grazers or shepherds. 95 natives pointed to the issue that the cattle get sick during shifting. Different answers were seen in case of losing cattle in drought. Mostly people believe that cattle are lost due to drought either by disease or death by dehydration. Very few people declined the loss of cattle to drought. Natives who admit that cattle become burden on economy during drought were 116 while others declined the statement. 62 % respondents say that they cut trees for domestic purposes which also lead to environmental degradation (Fig. 8).

## Conclusion

Shortage of rainfall that onsets severe impacts on various regions of Pakistan consistent with variation in weather, soil texture, natural resources and prevailing environmental conditions, is held responsible to attract drought. Deficit of sustainable resources are the basic reasons for increasing substantial losses to human and animal life, damaging infrastructure and environmental conditions with decrease in economic growth and raising the poverty level of the common people. In 2014 drought in District Tharparkar was due to dryness and erratic rainfall, causing malnutrition and 167 deaths (Pasha et al., 2015; Shaluf et al., 2007). "According to Pakistan Meteorological Department Tharparkar drought of 2014 may be called as socio-economic disaster rather than simply drought because seasonal and annual rainfall was moderately below the climatic averages (Atif and Mahboob, 2016). It can be concluded from the survey results that drought does affect the lives of Tharparkar natives, but the effect has different magnitude. Though it is a natural phenomenon but people depending directly on agriculture and those who live in rural areas are affected more than others. Most of the deaths in 2014 were recorded in Mithi hospital due to non-availability of medical facilities at rural areas. Water is a big issue there but the after installment of SRO plant this challenge has been met to a significant level. Local people temporarily move to safe places before start of drought season in order to avoid adverse effects during drought and return after drought impacts are minimized. Cattles do become a burden on economy especially when people have to migrate in the season of drought. But the loss due to drought can be prevented if storage of water and

fodder for animals is performed. According to the study it can be summarized that drought of Tharparkar is a natural issue but the man related activities cannot be overlooked such as deforestation and use of non-renewable resources for fuel. There is a dire need to establish best medical centers other than urban sites of District. The regular monitoring of SRO plant is a good sign of local governance but the water availability for the remote areas must also be taken into account. DDMA (District Disaster Management Authority) carries out emergency response and relief activities in drought affected areas. Different NGOs /INGOs have focused their attention on providing emergency shelter, nutrition, protection, early recovery, education and other livelihood activities to poor and vulnerable communities. They provide funds and carries out relief activities for the affected people, to enable them to stand on their own. They also formulate community level groups in the affected areas to encourage the local representation and to work at the grass root level. Some of the active organizations include Thar deep Rural Development Program (TRDP), Sindh Rural Support Program (SRSP), Sindh Relief Department (SRD), National Commission for Human Development (NCHD), National Disaster Management Authority (NDMA), United Nation World Health Organization (WHO), The United Nations Children's Fund (UNICEF), Food and Agriculture Organization of the United Nations (FAO) etc. (UNOCHA, 2012).

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