International Journal of Academic Research and Development
ISSN: 2455-4197, Impact Factor: RJIF 5.22
www.academicsjournal.com
Volume 2; Issue 4; July 2017; Page No. 631-636

Drought Perceptions and Coping strategies

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Abstract
Drought is a way of life for the people of Jaisalmer district. However there exist sharp differences in how the drought is perceived by the people depending upon the location, caste and economic rank of the individuals. People have evolved traditional ways to predict monsoon and drought but the techniques of prediction are rapidly diminishing. The main water sources in Jaisalmer are Amar Sagar Lake, Gadisar Lake and Indira Gandhi Canal. In every household, water harvesting structures are constructed and people have developed unique coping strategies to combat droughts.

Keywords: human conception, drought perceptions, behavioral pattern, meteorological drought, rain water harvesting system

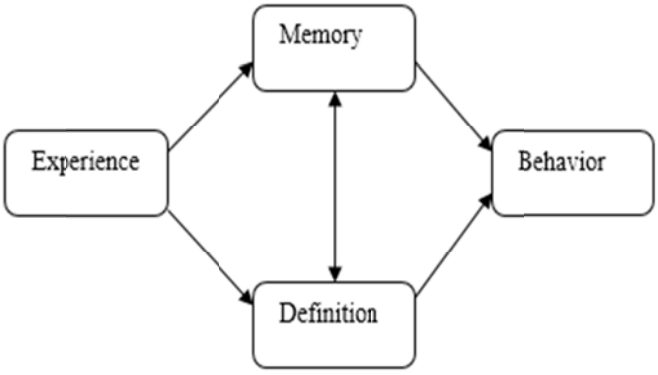
Introduction
Droughts are global common natural phenomena occurring in different parts of the world at different times of varied intensity. It is difficult to define droughts in terms of conditions of rainfall, temperature and soil, because drought is a human conception. Any comprehensive definition of drought must take into account the complexity of socio-cultural, economic and political organizations of society and consequent variations in the effects of lack of adequate rainfall in local setting.

Objectives
The objectives of study are as follows:
- To examine the perception of Droughts of the people in Jaisalmer
- To look at Access to water and strategies of the people to cope up with water scarcity

Methodology
Structured questionnaires were used for data gathering. Every person was asked the same set of questions. The type of responses was than measured according to the same set of criteria. All the possible responses were covered and presented in uniform manner. Bar graphs are used to draw comparisons by the data obtained from the field area. Line graphs are drawn to analyze spatial and temporal trends in rainfall. Pie charts are pinched to display various information. Transects are drained for the graphical presentation of historical facts in study space.

Study Area
Jaisalmer is located in the Thar Desert and receives scanty rainfall. The district has experienced frequent and severe spells of drought than any other region in India. Learning from adaptations employed by village communities of areas like, Jaisalmer can provide insights to design useful policies and public actions. The Household survey was performed in two villages namely Kanod and Ghuria. Kanod is inhabited mostly by Hindu population, located in Canal-irrigated zone where caste system is very predominant. On the other hand, Ghuria is Muslim population dominated located in Sam and consists of single banbarra caste belonging people.

Perceptions of Drought
The perception of drought varies from place to place depending on climatic conditions, water agricultural practices, and socio-economic activities. A drought is perceived in terms of needs of a given community. The perception of drought also varies across states and across society. People do not view drought in a simple way, there perception is complex and sometimes unpredictable.



Source: Prepared by researcher

Fig 1: Elements shaping the Perceptions of Droughts

People have a certain experience related to last time they witnessed droughts, which gets stored in their memories. Based on these memories people define droughts and develop certain behavioral patterns or acts in case of droughts. From the observations in Jaisalmer it was found that the common insight of people was that there is always drought in Jaisalmer. Drought is a normal way of life for the populaces. In Jaisalmer people do not perceive meteorological or hydrological drought. They perceive drought as agricultural drought or when their crops fail.

Correlation between drought perception and social status

Kanod Village

In Kanod, drought opinion was not alike for a caste groups. For higher caste groups (Bhramins, Rajputs) it was less severe in nature whereas, for lower castes it was a catastrophe which raids their livelihoods.

Higher castes have a greater access to water resources as compared to the lower castes. For example, there were water tankers with caste written on them. Lower not allowed to use water from community pond. Also price to buy water tankers was not same for all castes. High castes pay Rs 200/tanker whereas low castes pay Rs 500/tanker.

Correlation between drought perception and economic rank

Ghuria Viallge

Ghuria is inhabited mostly by Muslim population and the inhabitants of this village belong to same caste (Banbara). Therefore, no correlation can be made between drought perception and caste. However, a strong association was observed between Economic Position and drought sensitivity. People who are economically stronger have greater access to water resources against economically weaker sections. Therefore they are neither affected nor perceive drought of mild and moderate intensity, unlike the other groups.

People belonging to lower sections of economic hierarchy are affected intensely even by light intensity of droughts. People are so deserted that they do not have drinking water for themselves and their cattles. As Ghuria village is located in Sam Tehsil of western Rajasthan water availability is meager and water is a much prized possession. A water tanker (5000 litres) in Ghuria costs around Rs 1000-2000.

Jaisalmer City

The Urban dwellers perceive only hydrological drought, when in ponds, lakes, etc. falls below the statistical levels and water supply in the city is affected. They popular reaction was "kisne kaha ki jaisalmer main paani ki kami hai" (“who says there is water scarcity in Jaisalmer”). This is probably because people in the city are engaged in Secondary or tertiary activities, so they can afford costly and large quantity of water. Also they enjoy better supply of water daily by municipality.

Table 1: Perception of Drought

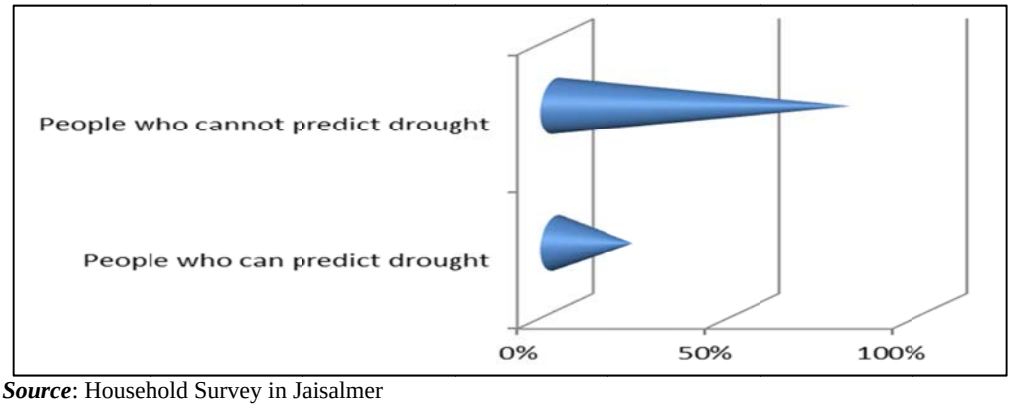
Perception of drought	Economic activity	Social status	Income	Degree of water scarcity
Major Problem	Primary activity	Lower caste	No to meager income	Acute (depend on public sources)
Minor Problem	Secondary activity	Lower caste	Variable and seasonal income	Moderate (depend on water tankers)
Not a Problem	Tertiary activity	Upper caste	Sufficient to high fixed income	No water scarcity

Source: Household Survey in Jaisalmer

Traditional ways of drought prediction

It is the community institutions with their long experience that have developed strategies to face droughts of different intensities and minimize the impact of drought. Traditionally droughts were predicted in the following ways-

1. No nesting of birds during rainy season.
2. Animals are restless.
3. Cattles urinate while sitting.
4. In evening, animals hide in bush at the time to return home.
5. Animals do not eat much.
6. Camels preferring to move individually, while moving in groups.
7. Possibility of community conflict.
8. Animals are not satisfied after eating sufficient amount of food.
9. Animals moan after milking.
0) Animals do not feed their young ones.



Source: Household Survey in Jaisalmer

Fig 2: Drought Predictions

Traditional ways of monsoon prediction

- Nomad predictions- Nomads know about the general course of events like wind directions, cloud formations, drying up of certain water structures on the basis of which they predict drought.

- In-migration of certain bird species- The in-migration of "Sona chidiya' is considered to be auspicious and as a sign for a good monsoon year.
- Cloud shapes- According to the people there would be no rain, if clouds are rough small and have the shapes of crows, monkeys, dead bodies.
- Date extent- People believe that if there is no rainfall from 15th July-15th August, than it would be a bad monsoon year.

Table 2: Monsoon Predictions

Monsoon prediction	Nomad predictions	In-migration of bird species	Cloud shapes	Date extent	Can't predict
People who use these ways (%)	1%	3%	5%	7%	84%

Source: Household survey in Jaisalmer

Access to water and coping with water scarcity

In Jaisalmer water is scarce as it is part of Thar Desert it is almost entirely a sandy region. There are no perennial rivers and natural lakes or ponds in Jaisalmer district, which is not surprising given the low amount of rainfall. A few seasonal streams appear on land outside the town during rainfall, when water accumulates in certain low lying areas, but the collected amount is low and drains into the sand very quickly. Water scarcity is a fact of life for millions of people. It restricts development, obstructs improvements in sanitation and health and causes extra hardships for women who have to travel long distances to fetch water as well as water dependent fodder and fuel. The various water structures of Jaisalmer are as follows-

Gadisar Lake

The Gadisar Lake in the city of Jaisalmer, was originally constructed as a water conservation tank, to fulfill the requirements of desert city, by the then Maharaja of Jaisalmer, Maharawal Gadsi Singh, around the year 1400 AD. Being of such vital importance, it is perhaps natural to find many shrines and temples dotting the surrounding of the lake. Once supplying water to entire state of Jaisalmer, now the lake is no longer used. Although the lake is no longer serving its historic purpose of supplying water to Jaisalmer, it still retains most of the rain water of the city. In winters birds migrate to the lake, due to its proximity to Bharatpur. Due to increased water demand for agriculture, the lake is increasingly threatened to dry out.

Amar Sagar

Amar Sagar Lake is situated next to the 17th century citadel-The Amar Singh Palace. The lake was built under the rule of then Maharaja of Jaisalmer, Maharawal Amar Singh.

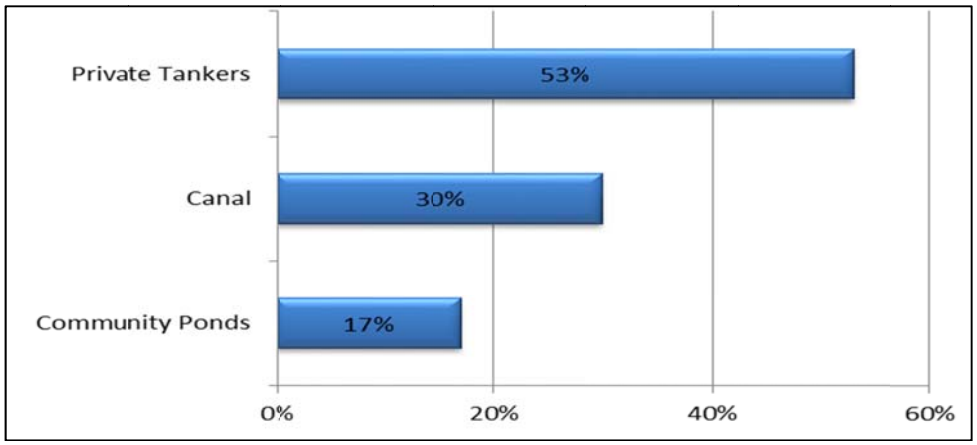
It is a water reservoir, with many *pag baoris*, which are now dried up due to increased demand of water. The area has several ponds and lakes with figureheads of a Lion, an Elephant and a Horse has been carved out in stone on a flat surface, which were originally used to measure the water level in the lake. The whole town used to know the amount of water collected and how long it will last. Based on water availability the use pattern was self-regulated by the society.

Indira Gandhi Canal

Started in 1965, Indira Gandhi Canal provides irrigation facilities to north-western region of Rajasthan. Irrigation facilities are available over an area of 6770 km^2 in Jaisalmer. Besides providing water for agriculture, the canal supplies drinking water to hundreds of people in far flung areas. Indira Gandhi Canal is a major step in reclaiming the Thar Desert and checking the desertification of fertile areas. This consists of planting shelter belts along roads and canals, blocks of plantation and sand dune stabilization.

Drinking water

Kanod village- The source of drinking water in Kanod village is Indira Gandhi Canal and water tankers (5000 liters) from Jaisalmer. There is community Tanka in village whose water is shared by all. There are different prices for water tankers with sweet water costing Rs 500 and brackish water costing Rs 200. There is no inter-caste sharing of water and all the water tankers have caste written on them. Access to water depends on social status. When enquired about quality of water supplied from Indira Gandhi Canal, people were dissatisfied as the water is contaminated and needs to be purified before drinking.

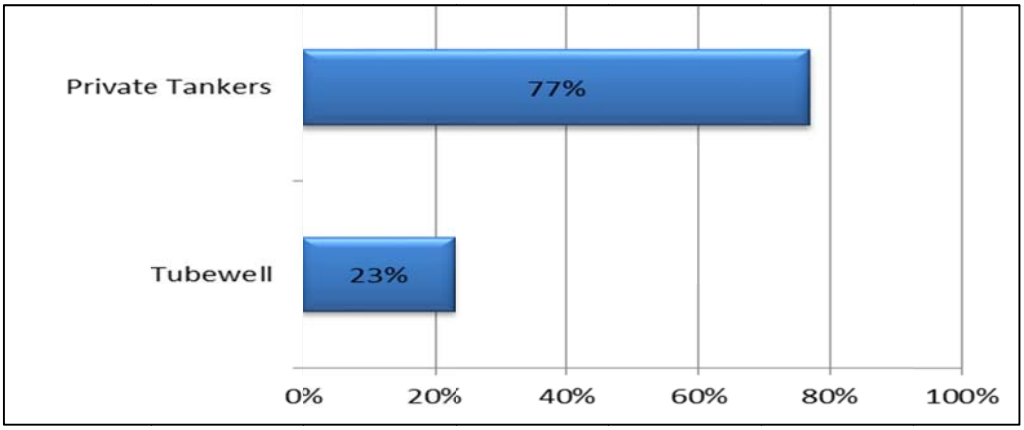


Source: Household survey in Jaisalmer

Fig 3: Sources of drinking water in Kanod Village

Ghuriya Village

The source of drinking water in Ghuriya are water tankers (5000 liters) from Jaisalmer and tube wells in Jaziya. There are different prices for water tankers with sweet water (Rs 2000) and brackish water (Rs 1000). Accessibility to drinking water is not dependent on social grade. Rather it depends on economic position of the household. There is no government built Tanka and no supply of water from Indira Gandhi Canal in the village.



Source: Household survey in Jaisalmer

Fig 4: Source of drinking water in Ghuria village

Jaisalmer City

The source of drinking water in Jaisalmer city is Indira Gandhi Canal whose water is supplied by municipality every day. There are taps in every house. The water is supplied for one hour in the morning. As most of the people in city are engaged in tertiary activities they have fixed income, therefore water accessibility is not a problem.

Water for domestic use

Kanod Village

Domestic activities which require water are bathing, cleaning, and washing clothes and utencils, watering plants and drinking water for animals. The source of water for domestic use in Kanod village is Indira Gandhi Canal and water tankers. The usage of water from tankers varies between 15 days to 1 month. The water required for domestic uses is stored in Tankas which are locked.

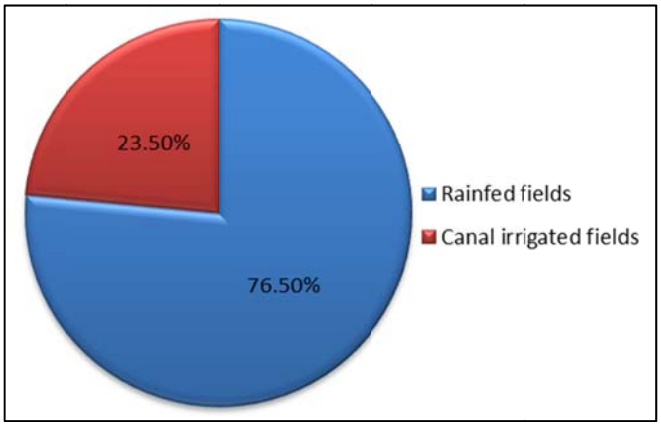
Ghuriya Village

The source of water for domestic use in Ghuriya Village is water tankers. *Jaisalmer City*- The source of water use for domestic use in city is Indira Gandhi Canal which is supplied by municipality.

Irrigation

Kanod village-

The source of water for irrigation in Kanod village is Indira Gandhi Canal. Wheat is grown in the fields because of greater water accessibility. People practice mixed farming to reduce the risk of crop failure. However, only few fields in the village are canal irrigated depending on the economic resources available with the people.



Source: Household survey in Jaisalmer

Fig 5: Irrigation in Kanod village

Ghuria village

There is no source of irrigation in a village. Crops are rain fed and villagers engage in agriculture only when there is good monsoon year. Canal water is not available in the village for irrigation. Therefore only less water intensive crops are grown. The following table gives a summary on water accessibility in Jaisalmer-

Table 3: Access to water in surveyed areas

Place	Source of Water	Number of days water used	Price of water
Jaisalmer city	Supplied by municipality	Water is supplied and used daily	Varying price
Kanod Village	Indira Gandhi Canal and private tankers	15-30 days/tanker	Rs200-500/tanker
Ghuria Village	Private water tanker	15-30 days/tanker	Rs1000-2000/tanker

Source: Household survey in Jaisalmer

Coping with water scarcity

The coping strategies to droughts vary across different agro-climatic regions and are evolved in the long inter-generational traditional knowledge and experiences of societies in those regions. The coping strategies to drought mostly involve mitigation or vulnerability reduction from direct and indirect impacts of drought. Rajasthan falls under very highly affected drought prone areas especially Jaisalmer. The principle of coping with water scarcity is water conservation. Following are the coping strategies used by the people to overcome water scarcity in Jaisalmer.

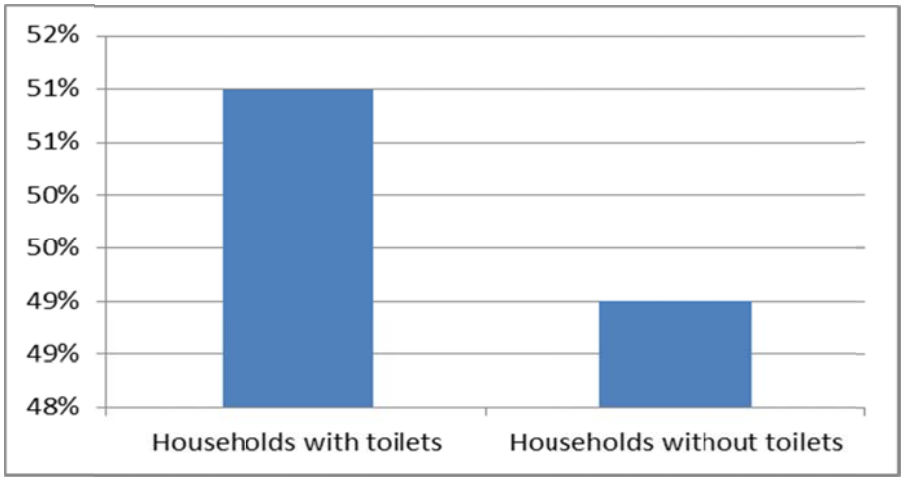
Rooftop harvesting system

Rooftop harvesting is practiced since long times. Almost every house has rooftop harvesting system in both villages and city to store rain water. It results in reduced water demand and saves money on pumping of underground water and treatment. If the water is hard rain water it improves water quality and saves cost on infrastructure required to store water. Rooftop rain water harvesting system is simple, cost-effective and easy to construct and maintain. It also improves groundwater level as there is less demand for underground water. Every surveyed household in both city and villages practiced rooftop rain water harvesting in Jaisalmer.

Drinking water management

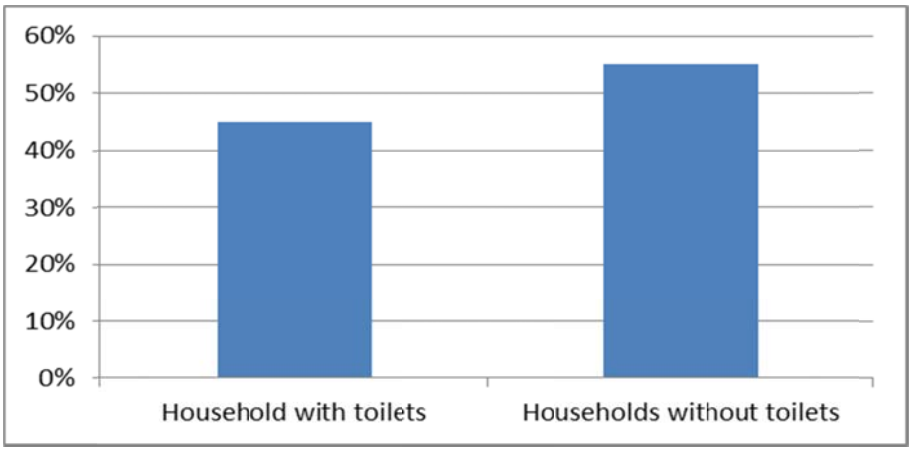
Water is Life. So it is a prized possession in Jaisalmer which faces acute dearth of water. Following are the ways seen to save water in Jaisalmer-

- There is no strict prevalence of '*Jhoota paani*' system (remainder of water). People even save small amount of water left by guests.
- Women in villages wash utensils with sand to save water.
- Guests are offered buttermilk or milk instead of water.
- People take bath once in a week during acute drought periods to save water.
- People have no toilets in their houses where there is acute scarcity of water.



Source: Household survey in Jaisalmer

Fig 6: Sanitation facilities in Kanod village



Source: Household survey in Jaisalmer

Fig 7: Sanitation facilities in Ghuria village

Water harvesting structures

The principle of Water Harvesting is to conserve rain water where it falls according to the local needs and geographical conditions. Water harvesting systems are used to meet domestic and irrigation needs of the people. Functionally, these systems have sustained communities through dry

months and sometimes even successfully passed the test of prolonged drought period. Rain is collected both below and on the surface depending on demand of water and local topography.

- ***Kuin*-**Rainwater penetrating down the earth is harnessed at two different places, firstly at sub- surface and groundwater. To avoid mixing of rain water with brackish water, 'kuin' (shallow well) are constructed. Kuin has small opening at the top and the size of pit gradually increases with depth, mostly above the gypsum layer, so ensures water is of good quality called 'Rejani'.
- ***Tanka*-** They are individually and community owned and are located within the boundary of the house, agricultural fields or village common property. These structures can meet not only partial water requirements of the household but also serve as water storage tank when rainwater is exhausted. In case of shortage of water people transport water from distance and fill these water storage structures to use it for longer periods.

Recycling and Reuse of water

Water is precious for the people of Jaisalmer. This can be checked by looking at Tankas of various households which are locked. Hence, people do not waste even small amount of water. Further water is recycled and reused in Jaisalmer. Water used for various domestic activities like bathing is collected and recycled by passing it through layers of clothes, which acts like a sieve. This recycled water is reused to wash clothes, watering plants or for drinking purposes of animals.

Pastoral livelihoods and coping with drought

The most common coping strategy of pastoral livelihoods in response to droughts are long distance movement of people along with livestock across boundaries, opening of dry season grazing lands, importation of feed/fodder and increased selling of livestock as well as increased search for alternative sources of food and cash. The table below presents the coping strategies of pastoralists in Jaisalmer-

Table 4: Coping strategies of pastoralists in Jaisalmer

Coping strategy	Drought conditions		
	Mild/average/acute		
Resource assessment	*		
Grazing reserves	*		*
Planning for improves use of water resources	*		
Maintain reserve grazing around water sources	*		
Collect feed or hay	*		
Move to areas away from regular grazing grounds	*		*
Search new grazing lands	*		
Sell/Slaughter of animals	*	*	*
Income diversification through petty trade, handicrafts etc.	*	*	*
Migration for relief trade	*		

Conclusion

Drought is a normal way of life for the people in Jaisalmer. They perceive drought only when their livelihoods are affected due crop failures. Perception of drought also changes on the basis of economic status, class, caste and religion. Also people use a variety of ways to predict drought and monsoon on the basis of animal behavior, wind direction and cloud formation. Water has been harvested in India since antiquity. Water harvesting systems are specific response to ecology and culture in which they have been evolved and satisfied certain local needs in an eco-friendly manner. People have invented numerous unique ways to cope up with water scarcity which are both simple and effective methods to reduce vulnerability of people have proved out to be very successful means in sustaining life of people in midst of the desert.

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