Impact of anthropogenic pressure on some selected wetlands of Mehsana district, North Gujarat

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***Abstract*: Wetlands are one of the most productive ecosystems of the earth, which occupy nearly 6.4% area of the earth's surface. Wetlands of Gujarat occupy 4.63% area out of total geographical area of the state, but unfortunately various activities like urbanization, embankment, culvert, industries, human settlement etc. is responsible for threats of wetlands. There were 15 selected wetlands covering 97.2 ha area as per Gram Panchayat, but presently 85.21 ha areas remains as a wetland due to various anthropogenic pressures. Conservation action should be taken by maintaining of water level in all season and opening of sluice gate during monsoon, regular monitoring of physicochemical parameters of wetlands, implied the protection laws & government initiatives, planning, managing and monitoring, pollution control, environmental education & awareness for the protection and conservation of wetlands.**

***Keywords*: Anthropogenic, Wetlands, Mehsana district**

I. Introduction

Wetlands are one of the most important productive ecosystems of the earth. The Ramsar convention defined wetlands as an "*area of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt including areas of marine water, the depth of which at low tide does not exceed 6m*" [1]. In other words, wetlands are defined as transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water [2]. Wetlands are estimated to occupy nearly 6.4% of the earth's surface, while India and Gujarat has 4.63% and 17.56% wetlands area out of total geographical area of the country and state respectively [3-4]. The wetlands are not only significant for biodiversity, but also it has great socio economic value to the local communities as well as providing food, fodder, fuel and water for domestic, irrigation, help in regulating hydrological regime, modify water quality and ground water discharge and recharge, recycle nutrients, support fisheries and a number of rare and endangered species of flora and fauna [5]. Unfortunately, in the recent scenario various activities like urbanization, embankment, culvert, industries, human settlement etc. are responsible for threats to wetlands.

II. Study area

Mehsana district is located between 20°07' and 24°43' North latitude and 68°10' and 74°29' East longitude with 9 taluka. Mehsana District is bordered by Banaskantha district in the north, Patan and Surendranagar districts in the west, Gandhinagar and Ahmedabad districts in the south and Sabarkantha district in the east. There were 15 wetlands selected from Mehsana, Unjha and Visnagar Taluka of Mehsana district, which comprising total 85.21 ha. Area.

Panchot talav, Virta talav, Gorad talav, Bamosana talav and Kharsada talav are located in Mehsana Taluka between 23° 37' N 72° 20' E , 23° 41' N 72° 18' E , 23° 41' N 72° 19' E, 23° 40' N 72° 25' E and 23° 42' N latitudes 72° 20' E longitudes respectively. Panchot, Virta, Gorad talav and Bamosana talav are seasonal wetlands with covering 7.55 ha., 7.59 ha., 3.04 ha. and 6.09 ha. Area respectively, while Kharsada talav is evergreen wetland with covering 3.51 ha. Area. Malai talav, Gam talav, Mem talav, Aithor and Navapura lake are located in Unjha taluka, of which only Aithor talav is seasonal wetland and water of Navapura lake is mainly used for irrigation purpose and discarded temple wastes in to the catchment area of the lake, while remaining talav are highly affected by anthropogenic activities like washing of buffaloes at Gam talav, discarded house garbage at Mem and Gam talav. Culled wetland area of Unjha taluka estimated is 27.09 ha, of which Malai talav covering 4.12 ha, Gam talav 5.27 ha, Mem talav 6.2 ha, Aithor talav 3.22 ha and Navapura lake covering 8.28 ha.

Bhandu pond, Sharifa, Navatalav, Narkodi talav and Jakhad talav were culled from Visnagar Taluka, of which Bhandu pond having most astronomically immense range i.e. 14.33 ha. Circumvented by agriculture land, railway line and fragmented due to construction of canal inside the pond. It is used for irrigation and supplying imbibing water to villages. Nava talav and Jakhad talav are seasonal wetlands, which covered 13.13 ha, and 0.68 ha. Respectively, while the reposes of others are evergreen. Sharifa talav and Narkodi talav were covering 1.22 ha. and 0.98 ha. Area, which is circumvented by temple, residential area and agriculture land respectively. Nava talav and Narkodi talav were facing grazing quandaries and fertilizer run off and entering water from agriculture land (Figure 1).

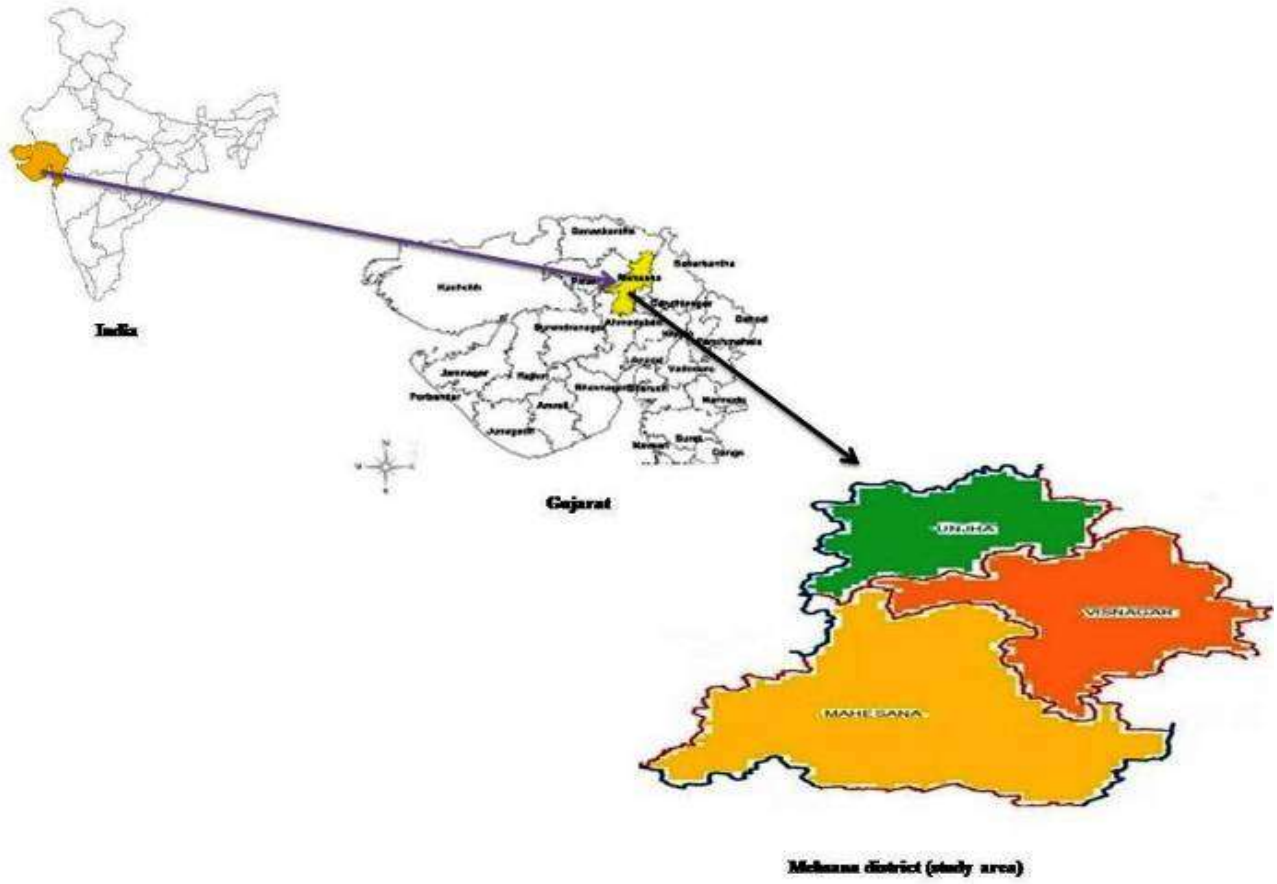

Figure 1: Selected study area of Mehsana district

III. Methodology

In order to understand the effect of anthropogenic pressure on wetlands, a field survey was conducted during the period of 2012-2014. Wetlands culled from Mehsana, Unjha and Visnagar taluka of Mehsana district, predicated on different activities carried out in each wetland. For that, comparative study of past and present conditions of wetlands has been carried out. For the past, data have been accumulated from Mehsana district Panchayat office and every gram Panchayat office of study wetland. Local people of that particular village near the tank were withal consulted. For the present, surveys have been made on conventional visit on seasonal substructure of culled wetlands and aerial photo was taken from Google earth pro. Threats are divided in to categories like Urbanization, Anthropogenic activities, Agriculture activities, Hydrological activities, Pollution, Introduced species [6].

IV. Results and Discussion

Urbanization

Under the developmental pressure of residential and commercial facilities were responsible for the destruction of wetlands and its circumventing area. There were total four wetlands namely Kharsada talav from Mehsana Taluka, Malai talav, Gam talav and Navapura lake from Unjha Taluka highly affected by urbanization. Constructed temple in or around the catchment area of wetlands has been observed at Kharsada talav, Navapura lake, Sharifa talav, which cause habitat destruction of culled wetlands and its circumventing area. Vegetation and catchment area were fragmented due to by constructing temple, school and commercial building at Gam talav, while the pristine area of Malai talav has been shrinking over the years in the form of construction activities like bunding, human settlement around the both talav.

Due to demand of resources such as energy, water, human settlement and commercial complex has been the possible impact on the local environment, vegetation, wetlands and its circumventing area at the recent time. Approximately 61 % of wetlands areas were losses due to urban and rural development since last 5-10 years in India. Aquatic environment has significantly suffered due to urbanization [7]. Urbanization is one of the reasons for species loss as well as direct impact on natural species diversity by decrementing and abstracting habitat with diversity and indirectly by incrementing fragmentation and isolating natural habitat [8-10]. (Figure 2A).

Agriculture activities

Narkodi talav was surrounded by agriculture land, so that farmer extent their agriculture farming in the catchment area of talav for remuneratively lucrative purpose. Water of Narkodi talav was additionally utilized for irrigation by farmers, which depletes water level rapidly and cause deleterious effect on the flora and fauna of Narkodi talav. Agriculture activities practiced by emigrant

individual withal contributed to vegetation changes. Perpetual utilization of fertilizers and pesticides may reach aquatic ecosystem by in the way of run-off from agricultural land, which may cause eutrophication of Narkodi talav and withal hazardous to living organism including human via the food chain. Nava talav of Visnagar Taluka was highly influenced by grazing. Animals like cows, buffaloes and goats are directly depend on plants for their survival. This activity can cause abstraction of plants and degradation of habitat at Nava talav. Intensive agricultural activities have caused conversion of wetlands in to agricultural land as well as degradation and eradication of wetlands. Wetlands are additionally affected by runoff of fertilizers and pesticides, use of water for irrigation and loss of wetland function due to agriculture activities [11] (Figure 2B).

Hydrological activities

Hydrological activity was observed only in one wetland namely Bhandu pond of Visnagar taluka. Bhandu pond was degraded due to construction of canal inside the pond, which diverse streams and withal divide pond. Impact of hydrological alternations is able to affect genes to ecosystems level of wetlands and its circumventing area [12]. It's additionally cause habitat fragmentation within dammed river and alters wetland flows by downstream habitat [13-14] (Figure 2C).

Anthropogenic activities

Higher population rate is the reason abaft the abundance of domestic and other garbage wastes. Sundry kinds of wastes were dumped in to the wetlands or its surrounding area of each wetlands of selected Taluka in Mehsana district. Plastic bags and other house hold were discarded by local people in the catchment area of Panchot talav of Mehsana Taluka. While during summer season talavs become dried up and more garbage wastes was to be dumped by local people.

Other sources of waste have withal been reported, namely temple waste being dumped inside or catchment area of Kharsada talav, Navapura lake and Sharifa talav of Mehsana, Unjha and Visnagar Taluka respectively. Bhandu pond was eradicated due to anthropogenic activities like construction of road and withal railway line visually perceived the surrounding area of pond, while abstraction of wetland soil was observed during summer season at Bamosana talav of Mehsana taluka. During summer, Gorad talav was totally dried up and alter in to the cricket ground due to the local people activities, which ravaged vegetation and soil structure of talav. Domestic waste and garbage were discarded inside the catchment area of Panchot talav and Mem talav of Mehsana and Unjha Taluka respectively (Figure 2D).

Introduced species

The present study reveals that selected wetlands were highly influential by introducing species in Mehsana district. *Eichhornia crassipes* (Mart.) Solms. Was major introduced species in Mem talav of Unjha Taluka, which covered most of the talav area because of domestic sewage waste discarded by local people. Bamosana talav and Gam talav are additionally influenced by *Eichhornia crassipes* (Mart.) Solms, which was highly dense as aquatic plant compared to other aquatic species in selected wetlands of Mehsana district. *Prosopis chilensis* (Molina) Stuntz. And *Ipomoea fistulosa Mart. Ex Choisy*. were highly distributed in to the most of the wetlands in Mehsana district. Wetlands were threatened by introducing species because the magnification of exotic species was very rapid from seedling to maturity commensurable to native wetland vegetation and also compete with native species for food, shelter or habitats including changes in species richness, nutrient cycling, hydrology, which was inimical for native species. Sharifa talav has *Lantana camara* Auct. Non L. var. *aculcata* (L.) Mold. As an introduced species. Introduced species can diminish the diversity of native flora by displacement of native species and by inhibiting the establishment of incipient individuals. Invasive species have broader tolerance limits, which abide extreme environmental conditions better than non-invasive species [15]. According to the efficient utilization of hypothesis, invasive species have more efficient by complete utilization of light and nutrient resources including an elongated growing season, morphological plasticity and withal higher photosynthetic rates than non invasive species (Figure 2E).

Pollution

Untreated sewage water was discarded by local people in to the Mem talav, which cause water pollution and damage to the water bodies. This untreated sewage has harmful effect on aquatic vegetation and also contaminated the ground water. Roughly 50 % of pesticides were falling down during spraying of pesticides onto crops, which enter by rain or irrigation waters in to wetland of Narkodi talav. Anthropogenic activities like washing of cloths and animals were observed in Panchot talav, Bhandu pond and Gam talav. Worship materials of temple are discarded in to the catchment area or in the water of Sharifa talav and Kharsada talav, which cause water pollution as well as soil pollution. Inappropriate discharge of polluted effluents from agriculture, industries and domestic sewage are the main reason behind the water pollution and wetland depletion, which is the major environmental issue in Asian countries [16] (Figure 2F).

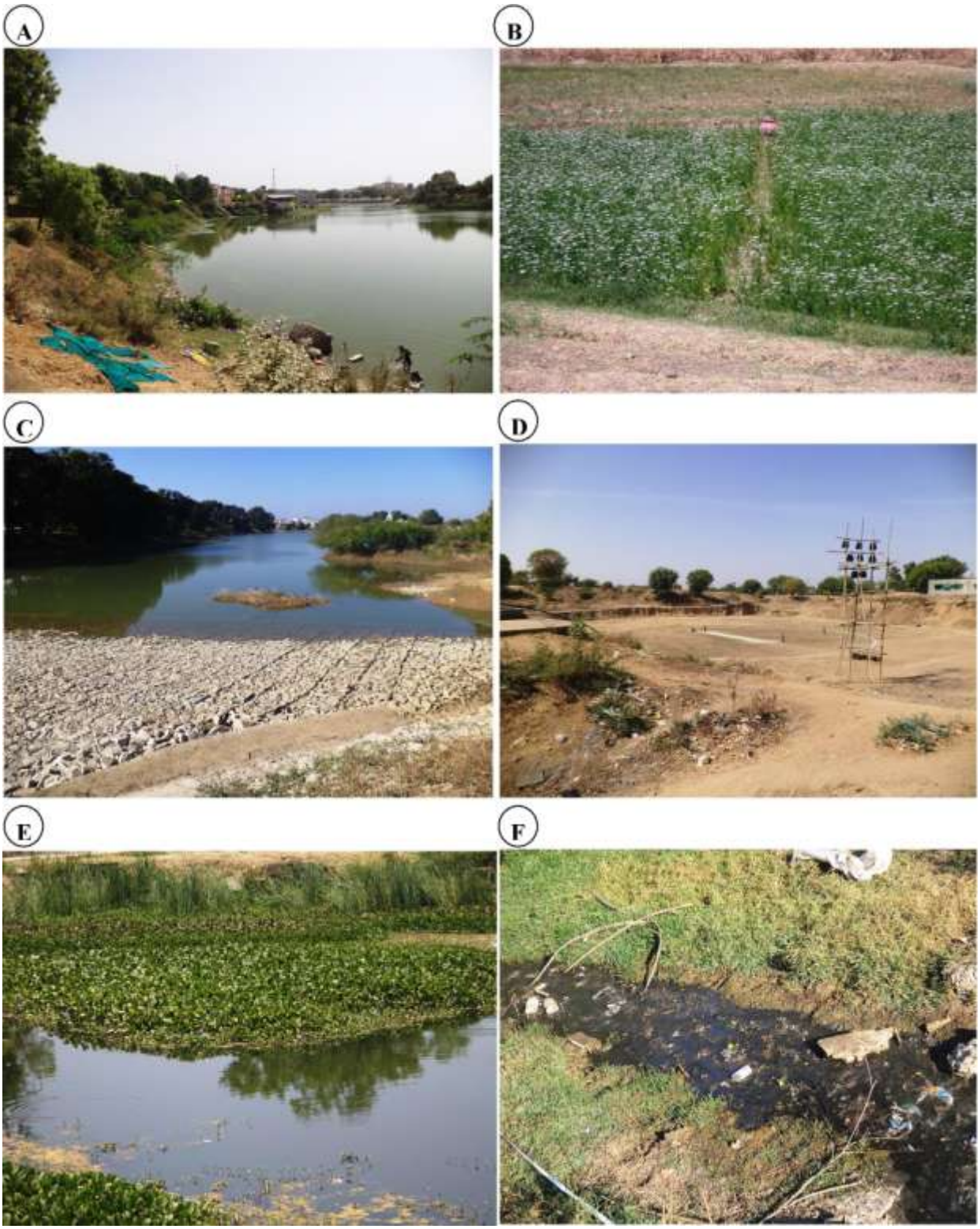

Figure 2: Anthropogenic effect on selected wetlands of Mehsana district. A) Urbanization. B) Agriculture activity: Farming in the catchment area of wetlands C) Hydrological activity: Construction of canal. D) Wetland alters in to cricket ground especially in summer season. E) Introduced species. F) Pollution: Untreated water discarded inside the wetlands.

Shrinking wetlands

Study of impact of anthropogenic pressure on selected wetlands of Mehsana district was show very interesting results. The area of wetlands were shrinking or destroyed due to anthropogenic pressure, which was listed out in following table 1. This table indicated that previous area of selected wetlands of Mehsana district was 97.2 ha. which is destroyed due to various anthropogenic activities therefore, now a days 85.21 ha. Was remained. Approximately, 7.49 ha. Areas of selected wetlands were destroyed by anthropogenic pressure.

Table 1: Comparative account of anthropogenic effect on size of wetlands in Mehsana district

Sr. No.	Taluka	Name of ponds	Area of Wetlands as per Gram panchayat (ha.)	Present area of Selected wetlands (ha.)
1	**Mehsana**	Panchot talav	8.51	7.55
		Virta talav	9.91	7.59
		Gorad talav	3.66	3.04
		Bamosana talav	6.4	6.09
		Kharasada talav	4.18	3.51
2	**Unjha**	Malai talav	4.26	4.12
		Gam talav	5.47	5.27
		Mem talav	7.25	6.2
		Aithor talav	3.31	3.22
		Nava pura lake	10.44	8.28
3	**Visnagar**	Bhandu pond	16.21	14.33
		Sharifa talav	1.38	1.22
		Nava talav	14.22	13.13
		Narkodi talav	1.06	0.98
		Jakhad talav	0.94	0.68
		Total area (ha.)	**97.2**	**85.21**

V. Conclusion

About facts fixate on the present status of wetlands concretely in Mehsana district of North Gujarat region. Data showed that day by day area of authentic wetlands was decrementing due to some anthropogenic pressure. Conservation action should be taken by maintaining of water level in all season and aperture of sluice gate during monsoon, customary monitoring of physicochemical parameters of wetlands, , implicatively insinuated the protection laws & regime initiatives, orchestrating, managing and monitoring, pollution control, environmental education & awareness for the protection and conservation of wetlands.

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