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Stubble Burning and Air Pollution in Punjab (A Sociological Exploration)

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Abstract

The world is experiencing many environmental alterations. Most of these changes are driven by human actions resulting into degradation in the environmental rubrics. A consistent need has been realized to check environmental degradation and depletion in environmental resources. Some major environmental issues affecting human life standards are water pollution; air pollution; deforestation; soil erosion; climatic changes and the changes in the rise in temperature and the like. Air pollution affects human life; especially physical as well as mental health. There are multiple factors behind increasing air pollution and decline in the Air Quality Index (AQI) of various regions. The present paper aims at understanding various reasons behind air pollution in the state of Punjab, India. The major focus of the present paper is the issue of the agricultural practice of 'Stubble/ Straw Burning; which is directly resulting into lowering of the air quality. The paper is based on primary as well secondary sources of data and information. An analytical follow up of 'farm fires incidents' features prominently in the work. The findings of the paper state that there is a need that the farmers with small holdings and also other farmers needs to be paid a viable amount to manage crop residue, that too 'in time' depending upon the factor of 'seasonality in cropping patterns'; so that the residues are not burnt in the farms openly without being regulated. In addition, there is a need to sensitize people on understanding that practices like stubble/ straw burning cause irreparable losses to the farmers themselves and their family and specially their coming generations in terms of their physical health. Further, it has been proposed that a law on agricultural practices is exclusively made so that is directly deals with practices resulting into threats to sustainability and people's right to live in healthy environment. Clarity in people's environmental perspective; law and its implementation is the object and need of the hour.

Introduction

Environment degradation in multiple forms has threatened human societies of the world in the recent decades. Man-made and natural disasters, deforestation, air pollution, noise pollution, contamination of drinking water, lowering of the water table in many states, drying up of the wetland, extinction of species and threat to bio-diversity, impact of environmental degradation on holistic health of people, and the like, are some such issues which have distressed life and existence. The adverse influence of environmental degradation in some cases has been irreparable. Punjab, a beautiful and agriculturally rich state of India, is not an exception. Punjab has been figuring on the international as well as national media for deterioration in the agricultural production and also practices. In context of agricultural productivity, factors which have affected the situation are lowering of the underground water table; climatic changes and changes in the temperature; decline in the soil fertility; deforestation; air pollution; water pollution and the like. Many of these factors have severely contributed in decreasing the agricultural productivity also; alongside changed the cropping pattern to the large extent. On the whole, commercial cropping has been adversely affected with these environmental changes. On the other hand, there are some agricultural practices which have led to serious loss to human life at large. These practices are excess use of pesticides and stubble/ straw burning. These two practices undertaken by agrarian community has done irreparable losses to human life. The fertilizers and pesticides flowing into water for farming fields pose a big threat to the existing flora and fauna of aquatic bodies and otherwise too. On the other hand, straw burning has been doing havoc to the air quality index of the state from many decades. In some instances, practices are undertaken for economic advantage or for saving money and the like; reflecting adequate intent and knowledge about the future repercussions; and in some cases, farmers are forced to adopt these practices. The present paper is an attempt to understand the situation regarding stubble/ straw burning in Punjab and understanding the connectivity between air pollution in the state with that of stubble burning in the region. Another major academic aim of the paper is to explore how people perceive these issues and what can be the workable and functional solutions to the existing situation.

Stubble Burning in Punjab

Stubble burning is not a novel issue in the State but has for sure risen in the last two decades. An article entitled "Why stubble burning in Punjab and Haryana has intensified in the last 10 years", published in *The Hindustan Times*, dated 28thOctober, 2018, very clearly mentions multiple reasons behind aggravating of the issue. This article mainly states that there are three main reasons those are relatively large size of landholdings of farmers in these states; the consequent high level of mechanization; and in case of Punjab, a water conservation law, that shortens the harvest window. Farmers having large size of landholdings can afford to use machines for specialized functions in the farms. According to the Census 2011, the average land-holding size in Punjab has gone up from 2.89 hectares (7.1 acres) in 1970-71 to 3.77 hectares (9.3 acres) in the year 2010-11; and this is much higher than the national average of 1.5 hectares (3.7 acres). In Haryana, it is 2.25 hectares (5.5 acres). When mechanized harvesters are used, it results in loose straw leading to additions in straw burning. This view has been backed up by Manpreet Singh, a farm engineering specialist at Punjab Agricultural University, Ludhiana as quoted in the article too. This 'over-capitalization' of farm mechanization is neither economically nor environmentally friendly. These harvesting machines are designed to shave of the grainy part of paddy resulting into leaving loose straw. Farmers find it convenient and cheaper to burn the left over loose straw. Hence in order to clear the field for future, that is in fact growing wheat, majority of farmers from Punjab and Haryana clear their farm fields by burning the straw in their own fields or nearby.

Further, the Punjab State's water-conservation law (2009) limits down the paddy window and locks dates; forbids farmers from sowing paddy before 10th May and transplanting it before10th June. This is though done to cut irrigation rounds to save the groundwater, because an 'early transplanting of rice can lead to an unsustainable extracting of groundwater'. This agricultural routine becomes a push factor for burning of the straw because farmers are stepping head to grow wheat after this; which one more profitable crop is for them. This narrowing of the window makes most of the farmers burn stubble altogether leading to excess air pollution and aggravating of many other environmental as well as health related issues. India has in the last few years experienced 'a never seen before' 'pollution vacations' happening in institutions and other offices due to excess smog, for which straw burning is one major reason.

Burning of the wheat and rice straw has affected air pollution levels in the state; has affected the health of people dwelling in the regions where this practice is bring carried on; and has also affected the soil fertility in the state.Earlier it was connected with wastage of nutrients mainly; but in the recent decades, it has worsened the air quality index of the regions. Adding to the adversities, in Punjab severe accidents have taken places as a result of burning straw/ stubble on running roadsides. An article entitled, 'Farm fire singes Punjab school bus: Two kids hurt" published in The Times of India, on 5thMay 2022 talks of the recent incident; where a school bus caught fire while crossing the area where crop remnants were being burnt. The burning of the straw in the region made the visibility very poor, making the bus overturned and the driver losing control over it.

The report entitled "The Status of Environment and related issues" published by the ENVIS Centre of Punjab states that a considerable change in cropping pattern has been noticed in Punjab's agriculture. The area under wheat crop and paddy increased significantly and the area under oilseeds, cereals, pulses, and maize had sharply decreased. This monoculture-cropping is resulting into excessive use and pressure on the available resources like water and soil and further is resulting into loss of floral cropping too. More so, when HYV are sown it results in higher use of fertilizers and pesticides and irrigation water for optimum growth and yield. This vicious circle of environmental and agricultural issues has had an adverse impact on the state's economy.

Air pollution was headline for all news agencies in the last few years and particularly in the last few months. The terror of smog recently experienced in Punjab, as never before, has made air pollution a subject of action and discussion. Schools were closed for few days, health got badly affected, asthma cases reportedly increased in the days and after the smog terror that occurred in Punjab and some other states in the last months of the last year. Stubble burning, excess use of private as well as public transportation modes, deforestation, lack of solid waste management; excessive emissions of toxic gases from industries and the like are said to be some of the main causes of air pollution that terrified the whole nation recently. The issue is not new to Indian administration; but the negligent attitude of both, government as well as people is more disturbing. The major reasons behind increasing air pollution include stubble burning in Punjab and also in neighboring states; presence of pollen due to green cover; population pressure;

increased vehicular density along with presence of diesel vehicles (Chandigarh Tribune, 2017). Another report by ENVIS (2018) states that major reason of pollution in clean city like Chandigarh is stubble burning in the neighboring areas. Deswal (2018) in his story entitled, "Crop fire alert to help curb stubble-burning" provides some shocking statistics. The Haryana Space Application Centre (HARSAC), HAU, Hisar, gathered some satellite images which revealed that 'paddy stubble in 2.08 lakh hectares was burnt by farmers during the last Kharif season ending December'. This has affected the communities and their living through increase in air pollution and also decreased soil fertility further affecting the agricultural production. Haryana, to deal with the crisis, took financial help from NABARD and gathered research assistance from HARSAC. The issue has taken a serious form. In Haryana the area (hectares) under stubble burning in 2014 was 1,68,900 which increased to 2,08,000 in the year 2017. The Tribune, December 9, through a story entitles, "NGT raps state for 'laxity' in curbing stubble fires", unearthed that the Punjab Government 'faced the wrath of the National Green Tribunal for not taking effective steps to provide financial assistance and infrastructural facilities to the farmers to encourage them not to burn agricultural residues in their fields'. The state government was passed an order by the Bench headed by Chairperson Justice Swatanter Kumar to curb the menace of stubble burning in the state, but the state government showed a 'lethargic approach'. This very story very well shows that both the state governments that is by BJP-Akali alliance as well as Congress ignored the issue of environmental pollution playing havoc with the health and wellbeing of the stakeholders that is the common people. The NGT Chief also stated 'don't play politics over pollution' as quoted by Banwait (The Tribune, 2017). He urged political parties to unite and solve the smog and pollution. The Chief also gave a blunt statement. "There is a lack of will among farmers to change their ways; it is not lack of awareness", and it is really tough to refute it. Banwait adds that nothing can be done until the governments of Punjab, Haryana and U.P. come together. The rigorous query put forth to the involved states by the NGT also included failure of state government in setting up of biomass plants and peletisation plats in state, inviting thermal power plants to use agricultural residues in the state, giving public advertisements to sensitize the farmers, making tie up with any company private or public, which can utilize the crop residues and the like. This little piece of information show that there are so many options in the hands of governance to curb stubble burning but nothings has been done 'unapologetically'. Same grievance of NGT is reflected in a story entitled "Produce farmers you helped manage stubble; NGT to State", published in the Tribune, 2017, October 12. The NGT directed the Punjab government to 'produce before it 21 farmers which it claimed to have helped by giving incentives and infrastructural facilities to prevent them from burning crop residue in a bid to check air pollution'. NGT showed anger by stating that for two years they waited for the Punjab government to show them plan for even a single district regarding curbing stubble burning but nothing has been done till now. Jain (2015) through her article entitled, "NGT says No to age-old practice of straw - burning", published in *The Hindu* on 5thNovember, 2015 stated crucial analysis. According to Jain, the farmers burn straw for two main reasons. One is to save time to shift from paddy to wheat cropping and other is they believe that burning straw kills pests and makes land more fertile. In November once again, this is time to shift to plantation of vegetables and wheat, for which again fields are cleared by burning stubble/straw. This chain of burning straw makes the atmosphere polluted and air quality index affected. Even NASA has shown many pictures of the northern states having fires during these agricultural shifts in the cropping patterns.

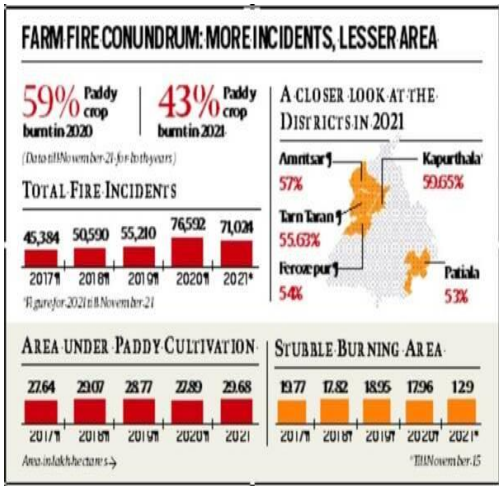
Bariana (2017) says that the Director (Agriculture) asked the Block level offices and agricultural development officers to make list of the names of the farmers erring in case of stubble burning and 'not' to forward it to any department for any beneficial schemes. Roshan Sankaria, Special Chief Secretary (Revenue) and Principle Secretary (Science and Technology) expressed his concern saying that in paddy harvesting season, 75 percent of the total volume of straw generated is burnt resulting in poor air quality and also organic loss to the soil. A Harvard Study using satellite data from NASA has found that about half of the pollution experienced in Delhi in the months of October and November in 2017 was caused by the agricultural fires. Nothing concrete has been done till now to crack down the environmentally hazardous practice of stubble burning in the nation (The Tribune, 2018). According to the report entitled, "State of Environment and related issues", prepared by the ENVIS Centre, Punjab also the major reasons noticed behind excess pollution in the state include, vehicular pollution (reported massive growth of vehicles that is

3,60,154 in 1981 to 90,64,476 in 2015-16); industrial emissions(high levels of RSPM recorded in industrial regions of the state);, agricultural pollution (burning of paddy straw in agricultural fields); and also domestic practices.

The matter is being taken so seriously that the climate change section of the Economic Survey strict enforcement of rules to check air pollution; suggests for heavy penalty for those burning crop waste in their fields and also giving incentives to the farmers opting for non-polluting methods (Sharma, 2018). The Central Pollution Control Board (CPCB) states that there are four main reasons for Delhi's worsening air quality, those are crop residue, biomass burning; vehicular emissions and re-distributed road dust; industries, power plants; and winter temperature inversion, humidity and absence of wind. Delhi is said to be turning into a 'deadly gas chamber'. If analysis is done there is no difference at all when it comes to causes behind increasing air pollution, but nothing concrete has been done on state levels to check the issue and the damages it results into. Small children are reportedly being admitted in local hospitals for asthmatic attacks, cough in youth, children and old aged persists for more than two-three months and all is simply attributed to climate changes, dry winters and changes in winter temperatures.

NGT has directed state governments several times to guide and educate farmers not to burn straw so casually, by the means of 'functional literacy campaigns' like 'nukkad nataks' and the like. Chaba (2021) authored an article entitled, "Year ending but no end to stubble burning Punjab burns 43% of total area under paddy till Nov 15", which has been published in *The Indian Express*, on 22nd November, 2021. This article makes it ocular that even after so many efforts being made on state as well as centre level, the situation related to the stubble burning has not ameliorated. The article states that six states have already burnt 53 to 60 percent area under rice cultivation by November 2021. In case of Punjab, it has burnt over 43 percent of the total area under rice cultivation by 15th November, 2021; making a total record of 71,024 fire incidents in the State. Punjab Pollution Control Board opines that 'paddy stubble burning area in Punjab, till November 15 was 12.9 hectares; amounting to 43 percent of the total rice area as per the Punjab Remote Sensing Centre (PRSC). Figure 1 shows data related to farm fires in some districts of Punjab over the last few years. The total number of the fire incidents has drastically increased from the year 2017 to the year 2021, that is from 45,384 to 71,024 cases. Amritsar, Kapurthala, Tarntaran, Ferozepur, Patiala are the districts having very high percentage stubble burning in the rice areas.

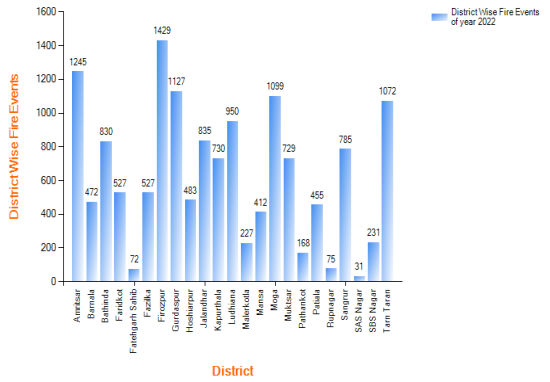
Figure 1 Farm Fire Incidents in Punjab



Source:https://indianexpress.com/article/cities/jalandhar/year-ending-but-no-end-to-stubble-burning-punjab-burns-43-of-total-area-under-paddy-till-nov-15-, 7634679/, visited on 22nd July, 2022 at 1:10 pm.

Further, Figure 2 shows district wise fire incident data of the year 2022 (from 1st April to 30th May). According to the Crop Residues Burning (CRB) Information and Management System, Punjab even in districts like Moga, Ludhiana, Jalandhar, Bathinda, Sangrur, and Muktsar also, the fire incidents have been on a very higher side of stats, other than the districts shown in figure 1. Rambani (2021) published an article entitled, "55 % of total stubble burning cases in Punjab this year reported in last five days in The Hindustan Times, 6th November, 2021. In this article the worrisome state of the Punjab's stubble burning cases has been depicted. By this date in 2021, there had been 23,465 farm fire cases reported in Punjab; with 3, 032 cases of farm fires on the Diwali Day itself. As reported, many farmers with small holdings either explored neither ex-situ (away) nor in0situ (onsite) handling of stubble. The incentive is lesser and even not provided in many cases; and farmers cannot spend excess money due to the high cost of the machinery used to clear their fields.

Figure 2
District wise Rabi Stat of year 2022 (1st April to 30th May)



Source:http://202.164.39.166/residue/Districtwise.aspx, visited on 22nd July, 2022 at 1: 18 pm.

The in-situ management of stubble aims at controlling air pollution resulting out of stubble burning in the states by providing financial assistance to the farmers for undertaking crop management machinery and equipments. In situ management of crop residue also aims at preventing loss of nutrients and soil microorganisms caused by burning of the stubble. On the other hand the ex-situ management of crop residue includes biomass power plants and biofuel project to manage the crop residue without resulting in excessive air pollution. Stubble burning is a very serious issue, since it leads to heavy disease burden by polluting air of the region. The report entitled, "State of India's Environment 2021", published by the Down to Earth and Centre for Science and Environment in the year 2021 states that there have been 41,090 deaths in Punjab, which are attributable to air pollution. This constitutes 18.8 percent of the total fatalities in the year 2019 Gagandeep (2021). Major reasons behind air pollution are excess private as well as public transportation; industrial emissions; crackers in Diwali season; deforestation; inadequate and inefficient waste treatment; and stubble/straw burning. In case of Punjab, stubble burning is attributed a high portion of responsibility for polluting the air. Figure 3 also shows the scene of Stubble burning in the state with more statistics. The table has been compiled on the basis of the data by the Punjab Remote Sensing Centre (PRSC), the number of the farm fire incidents in Punjab by the second week of May, 2022 is alarming. In total, 13, 558 farm fire incidents had taken place already on 11th May having Amritsar on highest level with 1,195 recorded cases, followed by Barnala; Bathinda; Faridkot; Fatehgarh Sahib and other. The district wise data shows that except cities like Mohali and Ropar, the situation is threatening in other places. Stubble burning amounts to higher releasing pollutants and smoke which has led to uncountable cases of respiratory diseases in the state in the recent years. Education and awareness are the only keys to controlling straw burning by farmers and their following the guidelines given by NGT on managing the farm residues.

Many studies have linked stubble burning and air pollution. The Report on Kew Verdicts: A Report on Key Judgments by NGT in 2020, complied by National Green Tribunal (NGT) also strongly state that stubble burning is one of the main reasons behind lowering of the Air Quality Index (AQI). The report mentioning data presented through the National Ambient Air Quality Standards being monitored by the Central Pollution Control Board (CPCB), poor air quality is one of the main reasons behind many deaths and diseases. Further, the NGT after having reports from all states; the concerned ministries consolidated the reports given by CPCB and issued directions on 21-08-2020. These directions included establishing 'Public Grievances Redressal Portals'; check on stubble burning and bursting pollution; execution of action plans for noise pollution control; finalizing Emergency Response System; pushing 'afforestation drives' in different cities and the like. The situation to worry about is that even after taking so many steps through state level as well as central level administration, the needed change is not noticeable.

Figure 3 District wise Farm Fires in Punjab (Punjab Remore Sensing Centre, Ludhiana)

DISTRICT-WISE FARM FIRES (SOURCE: PRSC, LUDHIANA)

Amritsar	1,195	Hoshiarpur	456	Pathankot	150
Barnala	465	Jalandhar	625	Patiala	419
Bathinda	819	Kapurthala	643	Ropar	53
Faridkot	502	Ludhiana	816	Sangrur	764
Fatehgarh Sahib	59	Malerkotla	207	Mohali	27
Fazilka	513	Mansa	405	Nawanshahr	155
Ferozepur	1,397	Moga	1,075	Tarn Taran	1,043
Gurdaspur	1,090	Muktsar	680	Total	13,558

Source:https://www.tribuneindia.com/news/ludhiana/city-turns-most-polluted-in-state-as-stubble-burning-continues-394448, visited on 26th July, 2022 at 11:04 am.

Punjab once known to be a healthy and happy state of India now suffers big threats. The degrading health of its people, farmers' suicide, fertility issues, rise in the number of patients of stress and depression and the like are such facts which have their potent genesis in degrading natural environment. The two main pillars of environmental protection are (i) Sensitivity in people about the role of the natural environment in their lives and, (ii) their understanding that

protecting environment if their basic duty as citizens, and these two things may help state and the people themselves too to a large extent. Along with this, there is a need to know the role being played by the government in sensitizing people; in managing the ongoing environmental crises; and in compensating the losses occurring to the natural environment. One of the objectives shall also be to understand how conceptually the dwellers of this state perceive the ecological threats; specially air pollution. Keeping in view the scope of the present study the following objectives have been aimed at.

Air Pollution in Punjab: Empirical Observations

Air pollution is a global issue referring to discourses on sustainability, human health and wellbeing. Polluted air results into irreparable losses to mankind in terms disease burden and has been listed as a serious cause behind infections, respiratory ailments and even cancer also. Punjab is one such state which is in trap of this environmental issue for many years. Earlier only PM10 was calculated and now the PM2.5 levels are also calculated. According to both the parameters, the air quality index of the state is worrisome and administratively challenging. On 11th May, Ludhiana has been declared the most polluted city of the state on the basis of the concentration of the Particulate Matter, popularly known as PM 2.5. The concentration of PM2.5 in the city is '15.7 times above the World Health Organization's annual air quality guidance value'. Ludhiana having AQI 163 is listed under 'unhealthy' category too (Jain, 2022). With little passage of time, it improved to 10.3 times above the WHO's air quality guideline value, but still the situation doesn't put the dweller and administrators out of worry.

The paper shall now shift the discourse to empirical study conducted on understanding the impact of environmental degradation on various communities of Punjab. The following part of the paper is an extract from a study encapsulating multiple aspects of Punjab's Environment and the impact of environmental degradation on life. For the present study three districts from the State of Punjab have been chosen; those are (i)Jalandhar (Doaba region); (ii) Ludhiana District (Malwa region); and (iii) Amritsar District (Majha region). These three districts of the State have experienced noticeable environmental changes in the recent year and also featured on multiple discourses and debates on environmental degradation in the nation. Further, 'Gender' and 'Rural-urban dichotomy' have been taken as the bases for making the sample categories under the 'Quota Sampling Method'. The sample constitutes of 900 persons out of which 225 will be rural women; 225 rural men; 225 urban women and 225 urban men. In all Quota Sampling has been done in which there are four categories of the respondents from the sample, those are (i) urban males, (ii) urban females, (iii) rural males, (iv) rural females. Seventy-five persons each category from each district, making it total of 300 respondents from each city have been taken. Survey method has been used. Data has been collected using Interview schedule and Questionnaire.

Under this study mentioned therein, the sample has been asked about multiple aspects of environmental degradation. People in Punjab themselves in large number realize that one of the most ardent form of environmental degradation in the state is air pollution. On being asked, in what all forms environmental degradation has taken place in Punjab, the majority of the respondents (33 percent of the sample) from the sample opine that the most noticeable form of environmental degradation in the state of air pollution (Table 1).These respondents express that the worst form of environmental pollution is air pollution; which has affected all the sections of society. They say that due to degrading quality of the air people inhale, diseases are on rise. They add that they have no alternative to inhaling the polluted air. Many of these respondents reported that their family members suffer from multiple health issues like asthma, breathlessness and the like due to the severe air pollution and their expenses on medical treatment has increased much more than they used to do in the past, say some years back. Health of the people is facing the biggest threat, and once it is affected least can check the loss. Changing climatic and environmental conditions are affecting the physical as well mental health of people and this has becomes the need of the hour to work upon mechanisms to control/check such losses occurring to mankind. According to some of the respondents from this response category, all the governments in the state have been facing this challenge but failed to control air pollution. A few respondents also talk of stubble burning as a major cause of air pollution. On the whole air pollution for a bulk of respondents is a major environmental issue which has affected the life of people of the state of Punjab and other states too. Many of them related air pollution with the issue of transportation and stubble burning in the region too. According to other respondents, other forms in which environmental degradation

has taken place in their region include deforestation (22.3 percent); rise in temperature (26.4 percent); soil erosion (11.7 percent); noise pollution (26.5 percent); water pollution (27.6 percent); depleting ground water (32.8 percent) and the like. Most of the respondents from the sample are aware that the environmental degradation, especially inform of air and water pollution has resulted into adding the number of stomach infections, liver related disorders, lungs related disorders and the like.

It is very important to refer the study entitled 'Ground Water Year book Punjab and Chandigarh (UT) 2015-2016', undertaken by the Central Ground Water Board, Ministry of Water Resources. This report in 2016 also elaborated the serious condition regarding water contamination and depletion of ground water in Punjab. This study collected water samples from 21 districts and then gave the results after complete chemical analysis of those samples of water. According to the report, the ground water in the southern and southwestern parts of the state including Bhatinda, Faridkot, Ferozepur, and Muktsar districts is dominantly saline and 'not suitable drinking purpose'. Further, saline patches have also been found in water sample taken from Mansa, Moga, Sangrur and SAS Nagar districts; and the water from Muktsar, Mansa,Ludhiana, Ropar and Sangrur has nitrate above 100 mg/l.

Out of the total sample strength, there are 375 persons respondents composing 41.6 percent of the total sample say that environmental degradation has not taken place in one particular form. For them all the given options mentioned therein are to be encapsulated in the response. For them, almost all units of the natural environment have been damaged. The loss to the natural environment has been irreparable. Many people from Ludhiana themselves express that their city has been the most affected in terms of environmental pollution and degradation. A very small number of respondents that is only 5.7 percent of the total sample responded under 'cannot comment'. Smallest number of respondents falling under this response category shows that the people of the three cities have a good insight to the environmental issues of their area.

Table 1 Forms of Environmental Degradation

District	Options	City								Total	
		Urban				Rural					
		Male		Female		Male		Female			
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	% age
Jalandhar	Deforestation	9	12.0%	22	29.3%	9	12.0%	14	18.9%	54	18.0
	Rise in temperature	15	20.0%	27	36.0%	24	32.0%	24	32.4%	90	30.0
	Soil Erosion	2	2.7%	9	12.0%	8	10.7%	6	8.1%	25	8.3
	Air pollution	15	20.0%	25	33.3%	20	26.7%	22	29.7%	82	27.3
	Noise pollution	10	13.3%	25	33.3%	12	16.0%	15	20.3%	62	20.0
	Water pollution	10	13.3%	25	33.3%	21	28.0%	18	24.3%	74	24.6
	Depleting Ground water	9	12.0%	18	24.0%	31	41.3%	26	35.1%	84	28.0
	Scanty rain	3	4.0%	15	20.0%	15	20.0%	10	13.5%	43	14.3
	All above	35	46.7%	18	24.0%	30	40.0%	17	23.0%	100	33.3
	Cannot comment	9	12.0%	6	8.0%	12	16.0%	17	23.0%	44	14.6
Amritsar	Deforestation	15	20.0%	17	22.7%	27	36.0%	0	0.0%	59	19.6
	Rise in temperature	24	32.0%	23	30.7%	20	26.7%	0	0.0%	67	22.3
	Soil Erosion	4	5.3%	4	5.3%	26	34.7%	0	0.0%	34	11.3
	Air pollution	25	33.3%	31	41.3%	43	57.3%	0	0.0%	99	33.0
	Noise pollution	18	24.0%	24	32.0%	43	57.3%	0	0.0%	85	28.3
	Water pollution	22	29.3%	18	24.0%	41	54.7%	0	0.0%	81	27.0
	Depleting Ground water	17	22.7%	13	17.3%	40	53.3%	34	45.3%	104	34.6
	Scanty rain	7	9.3%	0	0.0%	6	8.0%	9	12.0%	22	7.3
	All above	24	32.0%	27	36.0%	31	41.3%	39	52.0%	121	40.3
	Cannot comment	3	4.0%	0	0.0%	1	1.3%	2	2.7%	6	2.0
Ludhiana	Deforestation	24	32.0%	23	30.7%	19	25.3%	22	29.3%	88	29.3
	Rise in temperature	23	30.7%	22	29.3%	16	21.3%	20	26.7%	81	27.0
	Soil Erosion	12	16.0%	15	20.0%	7	9.3%	13	17.3%	47	15.6
	Air pollution	30	40.0%	33	44.0%	25	33.3%	28	37.3%	116	38.6
	Noise pollution	23	30.7%	28	37.3%	21	28.0%	20	26.7%	92	30.6
	Water pollution	25	33.3%	28	37.3%	21	28.0%	20	26.7%	94	31.3
	Depleting Ground water	27	36.0%	33	44.0%	23	30.7%	25	33.3%	108	36.0
	Scanty rain	19	25.3%	15	20.0%	5	6.7%	18	24.0%	57	19.0
	All above	32	42.7%	40	53.3%	38	50.7%	44	58.7%	154	51.3
	Cannot comment	0	0.0%	0	0.0%	2	2.7%	0	0.0%	2	0.6

Moving ahead to the discourse, Table 2 presents what people from Punjab think about the factors behind environmental degradation that took place in their region. Diverse responses have been received under this part of discussion. Illiteracy is believed to be the biggest reason behind environmental degradation by the 33.0 percent respondents (297 out of the total 900 persons). According to them illiterate people have no idea as to what the indispensability of a healthy natural environment in their life is and what is the need of maintaining and protecting the environment. Some respondents in this group even say that the irreparable loss to environment has been caused by illiterate people and their ignorance about environmental issues. Until one is educated about the same, one cannot estimate the consequences of environmental degradation on physical and mental health of people;their economic stability and the like.Many persons in this response category link illiteracy and ignorance has led to higher number of incidents of stubble burning and farm fires in the state. According to them, if farmers are educated, they will understand that how burning straw/stubble affect people's health and the air quality in the region, in which people breathe in.Other factors stated by the respondents are weak deterrence against environmental crimes and offences (19.4 percent); and urbanization (24.8 percent).Further, a group comprising of 31.3 percent of the total sample (282 out of 900 respondents) say that not just one or two rather there are many factors which are the factors behind environmental degradation. For them the natural

environment has been damaged due to all the reasons like population pressure, illiteracy and ignorance among people, lack of community as well as administrative will, lack of awareness of the environmental rights and laws and the ineffective implementation of those laws also, industrialization, urbanization, political instability, lack of focus on environmental sustainability and also weak deterrence against environmental crimes and offences. Few respondents from this category mention that environmental damages can be curtailed only with a vigil public and government. Stubble burning contributes a lot to air pollution and this can be checked if laws are strictly implemented; and if awareness about the related laws can be spread on a higher scale in common people.

Table 2 Main Factors behind the Environmental Degradation

District	Options	City								Total	
		Urban				Rural					
		Male		Female		Male		Female			
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	% age
Jalandhar	Population	22	29.3%	24	32.0%	11	14.7%	17	22.7%	74	24.6
	Illiteracy	16	21.3%	20	26.7%	16	21.3%	14	18.7%	66	22.0
	Ignorance	18	24.0%	13	17.3%	15	20.0%	15	20.0%	61	20.3
	Lack of community will	9	12.0%	27	36.0%	15	20.0%	13	17.3%	64	21.3
	Lack of administrative will	8	10.7%	13	17.3%	13	17.3%	17	22.7%	51	17.0
	Lack of awareness of the environmental rights and laws	22	29.3%	20	26.7%	15	20.0%	23	30.7%	80	26.6
	Ineffective implementation of the environmental laws	24	32.0%	8	10.7%	24	32.0%	13	17.3%	69	23.0
	Weak deterrence against environmental crimes and offences	20	26.7%	16	21.3%	8	10.7%	10	13.3%	54	18.0
	Industrialization	8	10.7%	16	21.3%	4	5.3%	16	21.3%	44	14.6
	Urbanization	25	33.3%	26	34.7%	19	25.3%	12	16.0%	82	27.3
	Political Instability	20	26.7%	12	16.0%	13	17.3%	10	13.3%	55	18.3
	Lack of focus on environmental sustainability	8	10.7%	25	33.3%	8	10.7%	17	22.7%	38	12.6
	All the above	26	34.7%	24	32.0%	38	50.7%	25	33.3%	113	37.6
Amritsar	Population	21	28.0%	27	36.0%	16	21.3%	5	6.8%	69	23.0
	Illiteracy	14	18.7%	20	26.7%	48	64.0%	28	37.8%	110	36.6
	Ignorance	20	26.7%	24	32.0%	8	10.7%	11	14.9%	63	21.0
	Lack of community will	14	18.7%	18	24.0%	0	0.0%	12	16.2%	44	14.6
	Lack of administrative will	12	16.0%	17	22.7%	1	1.3%	19	25.7%	49	16.3
	Lack of awareness of the environmental rights and laws	23	30.7%	13	17.3%	1	1.3%	10	13.3%	47	15.6
	Ineffective implementation of the environmental laws	19	25.3%	15	20.0%	19	25.3%	24	32.4%	77	25.6
	Weak deterrence against environmental crimes and offences	8	10.7%	8	10.7%	28	37.3%	18	24.3%	62	20.6
	Industrialization	6	8.0%	12	16.0%	2	2.7%	20	26.7%	40	13.3
	Urbanization	13	17.3%	16	21.3%	2	2.7%	19	25.3%	50	16.6
	Political Instability	8	10.7%	6	8.0%	27	36.0%	16	21.6%	57	19.0
	Lack of focus on environmental sustainability	15	20.0%	5	6.7%	3	4.0%	0	0.0%	23	7.6
	All the above	20	26.7%	18	24.0%	11	14.7%	26	35.1%	75	25.0
Ludhiana	Population	21	28.0%	24	32.0%	16	21.6%	15	20.3%	76	25.3
	Illiteracy	17	22.7%	39	52.0%	24	32.4%	41	55.4%	121	40.3
	Ignorance	16	21.3%	19	25.3%	18	24.3%	12	16.2%	65	21.6
	Lack of community will	5	6.7%	18	24.0%	5	6.8%	7	9.5%	35	11.6
	Lack of administrative will	14	18.7%	19	25.3%	14	18.9%	9	12.0%	56	18.6
	Lack of awareness of the environmental rights and laws	15	20.0%	1	1.3%	19	25.7%	2	2.7%	37	12.3
	Ineffective implementation of the environmental laws	10	13.3%	5	6.7%	16	21.6%	5	6.8%	36	12.0
	Weak deterrence against environmental crimes and offences	9	12.0%	26	34.7%	17	23.0%	7	9.5%	59	19.6
	Industrialization	19	25.3%	1	1.3%	9	12.2%	1	1.3%	30	10.0
	Urbanization	21	28.0%	28	37.3%	15	20.3%	28	37.8%	92	30.6
	Political Instability	10	13.3%	9	12.0%	16	21.6%	8	10.7%	43	14.3
	Lack of focus on environmental sustainability	8	10.7%	1	1.3%	10	13.5%	2	2.7%	21	7.0
	All the above	36	48.0%	19	25.3%	21	28.4%	18	24.3%	94	31.3

Conclusion

Stubble burning and air pollution cannot be separated conceptually as well as contextually. Farm fires act as a catalyst for aggravating air pollution and for lowering the air quality index of many states, and Punjab as well. Studies undertaken by many national as well as international organizations and institutions have proven that in order to improve air quality index, controlling farm fires can be a very progressive step. But for this aim to be achieved there is a need to focus on education; functional literacy; increasing awareness about environmental laws, rights and duties; strict governance and a socially responsible public. Seasonality in agricultural practices is nothing disturbing; however there is a need to bring about responsibility while shifting in cropping patterns. This responsibility cannot be completely derived from common people; for this, the role play of governmental as well as non-governmental bodies is equally required. The ambit of the present study shall be expanded in other cities of Punjab in the near future. As of now, this is an adequate understanding that stubble burning and air pollution are correlated socially as well as economically. On one side farmers having small size landholdings are not able to afford the latest technology to burn left over straw; on the other hand either the government does not pay any amount to farmers to manage crop residue or the amount proposed to be paid is not adequate. Judicial intervention has also been marked by the Supreme Court of India to manage the issue of farm fires and to help small farmers. But this needs a rigorous care and monitoring. On the whole this is suggested that there must be an independent legislation on agricultural/ farm practices; which shall be able to effectively govern the issue like straw burning; water pollution; soil erosion; deforestation and other environmental issues cropping up and aggravating due to irresponsible civic approach. Above all, there is need of sincere, unbiased and strict action from the government to curb practices like stubble burning; which shall for sure help in checking air pollution in the state to a large extent.

Today environment is a global concern. Many studies done on environmental and the related themes show that almost all the nations are performing their best to protect environment and to create a global mechanism for managing the losses occurring due to the environmental degradation. The nature of losses and impact driven by environmental degradation has far reaching effects. Local region/s, nations and then the whole world, nothing is spared when it comes to decline in the environmental fervor and fabric.

Notes

- The Punjab State Council for Science and Technology (PSCST) has published a Report entitled 'State of Environment Report, Punjab-2014'. This report focuses on six environmental parameters including water, air, forests, agriculture, biodiversity and energy. The document makes an attempt to analyze the environmental condition of the state and also puts forth remedial measures to check the losses occurring due to environmental damages and degradation.
- The Department of Environment, Chandigarh Administration published a Report entitled, 'The State of Environment' in the year 2018. The Reportcan be retrieved from https://chandigarhenvis.gov.in/sites/default/files/pdffiles/1.pdf. The document deals with air, water, energy, land use and its degeneration; and waste management and sanitation. The report highlightsthe vision of Chandigarhadministration with regards to the environment and its protection. Crucial data base on Punjab's environment is a prominent feature of the report.

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