CONDUCTING VULNERABILITY ASSESSMENTS AND FORMULATE STRATEGIES FOR ADAPTIVE PLANNING IN HARDOI DISTRICT OF UTTAR PRADESH

GUIDANCE DOCUMENT

Conducting Vulnerability assessments and formulate strategies for Adaptive planning in Hardoi district of Uttar Pradesh

GUIDANCE DOCUMENT

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Contents

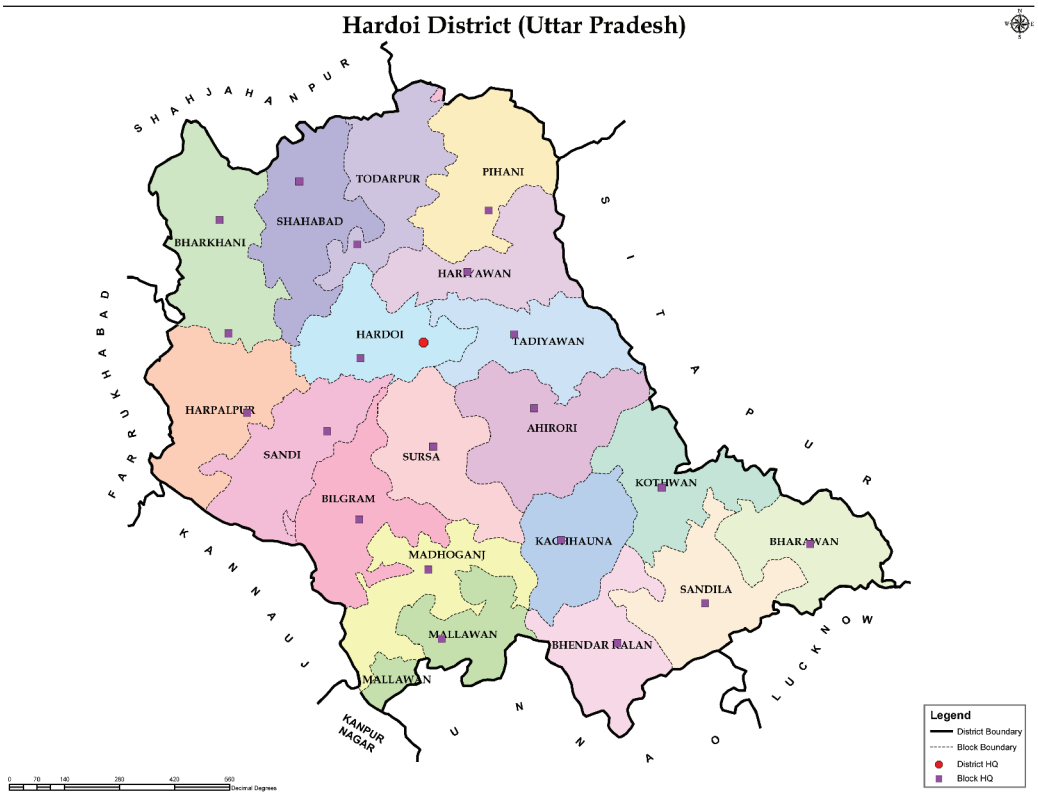
Introduction

The Guidance Document is meant to be understood in conjunction with the Training Manual for Vulnerability Assessment and Adaptive Planning. The need for these documents is driven by the observation that although communities experience and understand the impacts of changes in climate taking place in their immediate surroundings and also to a great extent have succeeded in finding quick solutions by adopting several autonomous adaptive strategies, mechanisms and practices, these actions and many more potential activities for adaptation and mitigation are not reflected in the Decentralized district plans. Further it has been identified that this is mainly for the reason that the planning process in many districts does not follow the Planning Commission guidelines and the capacities of stakeholders to plan are weak. The Guidance Document and the Training Manual seek to fill this gap.

The Guidance Document is not a solution but a document which will aid the stakeholders in finding appropriate solutions in collaboration with communities to issues which they face. The Guidance Document is not the last word and is intended to be and should be adapted as per the needs at specific locations.

Hardoi, the district

District Hardoi is situated at 26^{0}53' to 27^{0}46' north latitude and 79^{0}41' to 80^{0}46' east longitude in the state of Uttar Pradesh in northern part of India. On its north, it touches Shahjahanbad and Lakhimpur Kheri district, on its south Lucknow city and Unnao and its western border touches Kanpur city and Farrulkhabad district. Gomti river flows along Hardoi's eastern border separating it from Sitapur district.



Hardoi district covers a total geographical area of 5987 km[2], with a length of 126 km from northwest to southeast and width of 75 km from east to west. The river Ganges and several of its tributaries viz., Ramganga, Deoha or Garra, Sukheta, Sai, Baitha and Gumtithe crisscross the district.

Agro climatically, Hardoi is located in mid plain zone-IV, a major crop producing zone in the Indo-gangetic plains of Central Uttar Pradesh[1]. The district has an agriculture based economy. Sugarcane, paddy, wheat, pulses, oilseeds and vegetables are the main field crops. Mango and guava are also widely grown here due to favourable climatic conditions. U.P. Government has identified Hardoi as one of the district included amongst the two agro ecological zones (AEZs) established for promotion of mango and potato[2]. U.P. Horticulture Cooperative Marketing Federation is organizing horticulture producers as user-groups/SHGs/Primary Societies for facilitating marketing of perishable produce in these zones. Sugarcane is the main cash crop of the area.

The chief exports of the district are grain, sugar, hide, tobacco and saltpetere[3]. Hardoi town has a wood carving industry, saltpetre works and an export trade in grain. A number of sugar mills have come up in the district in the past few years corresponding to an increase in area under sugarcane cultivation[4]. Recently, in an attempt to boost the leather industry in Hardoi, government has approved setting up a mega leather cluster at Sandila[5]. This leather park is to be developed over 300 acres and is estimated to provide employment to 1,000 people. Also, the government is planning to set up a thermal power plant of 2x660 MW capacity and a steel processing unit at Hardoi[6].

Hardoi is one of the disadvantaged districts of Uttar Pradesh, with Ministry of Panchayati Raj naming it as one of the country's 250 most backward district (out of a total of 640)[7], in year 2006. With 66% of its population coming under the BPL (below poverty line) economic category, it is one of the 34 districts of Uttar Pradesh currently receiving grants under the Backward Regions Grant Fund Programme (BRGF)[8].

Administrative Set Up

Hardoi is part of Lucknow administrative division. It is divided into five tehsils viz., Hardoi, Shahabad, Sawayajpur, Bilgram and Sandila. From developmental point of view, these tehsils consist of 19 blocks, 191 Nyay panchayat, 1101 gram sabha and 1983 revenue villages (1883 of them are inhabited)[9]. The district has seven nagar palika parishads (municipality) and six nagar panchayats (city council).

Developmental blocks of Hardoi district include Sursa, Sandila, Bilgram, Shahbad, Ahirori, Behender, Madhoganj, Bharkani, Bawan, Ballawan, Mallawan, Tonderpur, Haryawan, Kottawan, Sandi, Pihani, Tandiyawa, Kachauna and Harpalpur.

[1] Report available at: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[2] For details please refer to: http://shm.up.nic.in/save/AAP-SHM-UP-2010-11.pdf
[3] Please see: http://empowerpoor.org/districtdetail.asp?district=73#
[4] Please refer to: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[5] Media report available at: http://www.hindustantimes.com/India-news/UttarPradesh/UP-to-develop-two-mega-leather-clusters-in-Hardoi-and-Kanpur/Article1-936150.aspx
[6] Media report at: http://www.financialexpress.com/news/up-help-sought-for-land-allotment-to-industrial-projects/848940/
[7] Based on information available at: Ministry of Panchayati Raj (September 8, 2009). "A Note on the Backward Regions Grant Fund Programme". National Institute of Rural Development. http://www.nird.org.in/brgf/doc/brgf_BackgroundNote.pdf
[8] PACS hardoi district data

Land use pattern

Agriculture is the most dominant land use in the district while pastures and forests form a non-significant land use category.

Table 1: Area (1,000 ha) under different land use types in Hardoi

Area reported for land utilization (2006-2007)	All forest types	Land under non-agricultural use	Total rainfed area	Permanent pastures	Miscellaneous tree crops/groves	Current fallow	Other fallow	Net sown area	Net area sown more than once	Net irrigated area	Gross cropped area
599	9	52	58	5	13	45	25	421	248	364	670

Data sourced from Statistical Dairy Abstract 2008 U.P. [10]

Forest cover

In 2008, total forest cover accounted for 2.08% of the total area of Hardoi district (5,986 sq km)[11]. Moderately dense forests spread over 7 sq km while open forests formed the major forest type with an extent of 118 sq km. Hardoi has a large number of wetlands (156) and the area under wetlands (17,577 ha) is fourth largest in Uttar Pradesh[12].

Table 2: Forest cover data of Hardoi District (Source: District Statistical Handbook, 2009)

	Forest Cover (2000-2001) (hec)	Forest Cover (2004-05) (hec)	Forest Cover (2009-2010) (hec)
Ahirori	222	220	452
Bawan	229	230	462
Behendar	1023	915	1147
Bharawan	43	73	306
Bharkhani	9	25	258
Bilgram	1291	1083	1315
Hariyawan	258	242	474
Harpalpur	975	950	1182
Kachauna	1112	925	1157
Kothawan	0	0	0
Madhoganj	1564	1065	1297
Mallawan	314	305	537
Pihani	315	305	537
Sandi	124	125	357
Sandila	2105	1625	1857
Shahabad	190	185	417
Sursa	77	85	317
Tandiyawan	289	282	514
Todarpur	307	310	542

[9] Information taken from: http://agriculture.up.nic.in/
[10] Based on data available at: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh
[11] Report available at: http://gangapedia.iitk.ac.in/sites/default/files/issue-18(2).pdf
[12] Based on information available at: http://upenvis.nic.in/Database/Bio-Diversity_837.aspx

Common property resources

Among various common property resources, wasteland covered an area of 31 ha, pastures 4.8 ha, orchards and village woodlot 13 ha, forests 9 ha while village ponds and tanks occupied a small area of 0.95 ha[13].

Agriculture

Agriculture is carried out over 3,98,045 ha of land while 18,111 ha is uncultivated largely because of sodic character of soils and other reasons. Cropping intensity in the district is 142%, with rabi, kharif and zaid crops grown annually in the area. Major crops cultivated in the district include wheat, rice, sugarcane, maize, potato, vegetables and pulses. Groundnut used to be an important kharif crop in the area but due to erratic rainfall and absence of irrigation facilities, area under this crop is showing a decline whereas area under sugarcane cultivation has expanded in response to high establishment rate of sugar mills in the district. Fruit and agro forestry based farming systems are adopted largely by resource rich farmers and river bed farming system are operated by poor and landless farmers[15].

Table 3: Area, production and productivity of major crops grown in the district

Crop	Crop Area (ha)	Production (Qtl)	Productivity (Qtl/ha)
Rice	1,47,130	3,45,53,700	23
Wheat	3,12,973	8,21,88,600	26
Maize	4,6920	82,04,300	17
Jwar	9,371	8,98,400	10
Bajra	4,328	4,64,300	11
Barley	3,082	4,91,300	16
Urd/Mung	22,986	13,062	12
Groundnut	5,244	6,17,700	12
Arhar	2,427	1,83,700	8
Til	10,707	2,50,500	2
Sunflower	924	1,81,600	20
Mushroom	12,579	19,63,000	7
Sugarcane	25,856	13,05,10,700	504
Potato	9,835	1,98,68,700	202
Gram	1,521	1,42,800	9
Pea	1,180	1,06,800	9
Total oilseed	**29,475**	**30,13,700**	**7**
Total pulses	**41,806**	**27,90,000**	**7**
Total cereals	**5,65,653**	**12,68,00,900**	**23**

Table 2: gives the area, production and productivity of major crops grown in the district

[13] Based on data available at: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh
[14] Please see: http://www.indianngos.com/districts/hardoi.asp
[15] Please see: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf

Farmers depend on agriculture for their own subsistence and seldom have produce to sell in the market. Their decisions on the agricultural inputs are influenced by the process followed by the large farmers in the village or by market. They are deprived of correct information on time thus forbidding the scope of improvisation in the farming practices.

Area under cultivation: In terms of area under cultivation, wheat and rice were two most dominant crops of the area, followed by maize, sugarcane, urd/moong and til, each of which occupied an area of >10000 ha. Other important crops are listed in Table 3.

When clubbed together, area under cereals was about four times of that under oilseeds and five times of that under pulses.

Crop productivity: Sugarcane and potato were the most productive crops with a productivity value of 505 qtl/ha and 202 qtl/ha, respectively. Wheat and rice were the most significant cereals crops with respective productivity of 26 and 23 qtl/ha followed by maize (17 qtl/ ha), barley (16 qtl/ha) and bajra (11 qtl/ha). Important oilseeds in terms of productivity were sunflower (20 qtl/ha) and groundnut (12 qtl/ha). Amongst pulses, urd/ moong had a productivity of 12 qtl/ha. Rest of the crops had a productivity of less than 10 qtl/ha.

On an average, cereals had more than three times higher productivity when compared to pulses and oilseeds.

Cropping sequence: Paddy - wheat, maize - wheat, maize - potato, rice - mustard, maize-potato- vegetable, groundnut - barley vegetable being the most frequently practised cropping sequences.

Table 4: Irrigation status and average yield of major crops cultivated in Hardoi in year 2008.

Crop	Area under cultivation (%)		Average district yield (qtl/ha)	Average State yield (qtl/ha)
	Irrigated	Rainfed		
Rice	1,56,627	840	20.32	18.70
Wheat	3,09,218	72	30	27.72
Maize	857	51,508	13.29	13.43
Bajra	1	4,472	14.94	14.76
Jowar	3	9,417	10.74	10.04
Pulses	6,891	30,927	6.25	7.35
Oilseeds	9,550	18,243	5.94	7.7
Sugarcane	37,916	52	528	598
Potato	9,241	Nil	155	220

Data sourced from Statistical Dairy Abstract 2008. U.P.[16]

Rice, wheat, potato and sugarcane were grown almost completely under irrigated conditions. On the other hand, jowar, bajra, maize and a major proportion of pulses (83%) and oilseeds (67%) were grown under rainfed condition

[16] Based on information available at: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh

Productivity of rice and wheat in the district was higher than the state average while yield of other cereals *viz*., maize, jowar and bajra were comparable to average yields in Uttar Pradesh. However, other crops were less productive in Hardoi as compared to that in Uttar Pradesh as a whole. Yield of pulses was 14% lower than that of oilseeds 22% lower, sugarcane 11% lower and potato 30% lower than the state average.

Horticulture[17]

Climatic conditions in Hardoi are favourable for guava and mango production.

Table 5: Area, production and productivity of major horticultural plants grown in the district

Crop	Crop Area (ha)	Production (Qtl)	Productivity (Qtl/ha)
Onions	621	-	-
Vegetables	16,371	-	-
Mango	6,599	17,810	2.69
Guava	341	3,571	10.47
Papaya	3	66	22
Garlic	115	461	0.61
Cucumber	450	-	-

Vegetables followed by mango occupy most of the area under horticultural plants. Papaya and guava were the most productive in terms of yield per unit area. Garlic, onion, vegetable, pea for green pods and watermelon, cucumber and cucurbits are the component of farming system which provides highest net returns[18].

Agroclimatic Conditions

1. Classification

The Indo-Gangetic Plain Region is divided into 4 major agroclimatic regions (ACR). Hardoi is located in Middle Gangetic Plain Region ACR-IV, a major crop producing region in Central Uttar Pradesh[19].

Indian Council of Agricultural Research, in order to develop strategic infrastructure and to promote research and development, divided whole of India into 120 agroclimatic zones (ACZ). Based on this classification, Hardoi falls in the ACZ- UP6 of ACR-V, a zone liberally sourced by Ganges and Yamuna and their tributaries (presented in 29 sourced from Ghosh, 1991). This zone has an annual rainfall of 800-1,200 mm and soils are alluvial, medium to heavy textured but easily ploughable. These agroclimatic conditions make it favourable for rice and wheat production.

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[17] Based on: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[18] Please see: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[19] Report available online at: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf

2. Climate,[20,21]

Climate ranges from moist sub-humid to dry sub-humid and the region receives an average rainfall of 863 mm. Hardoi experiences a minimum temperature of 5.5^{0}c and a maximum of 45.0^{0}c annually.

3. Soil and edaphic Characters[22]

Soil type in the area is alluvial in nature with texture varying from sandy loam, loam to clay loam soils.

An area of 1,03,492 ha in the district has sandy loam soils which are neutral to mildly alkaline, have a fair water holding capacity and are fertilizer responsive and 95,539 ha has loamy soils with good water holding capacity, are calcareous in nature and display a positive response to nitrogen fertilization. However, a total of 1,99,022 ha has low land clay loam which are strongly alkaline with a predominance of water soluble salts, are poor in soil organic matter and respond to fertilizer only following soil and water reclamation[23].

Poor soil and water management practices, especially in the command area of major irrigation canals have exacerbated the problem of soil sodicity and salinity in several regions of Uttar Pradesh[24]. In absence of proper irrigation management, soil quality has deteriorated in many areas in Hardoi leading to fall in crop productivity, even making some areas uncultivable[25]. Several projects have been implemented in the district for reclamation of sodic soils, important amongst them being the World Bank supported Uttar Pradesh Sodic Lands Reclamation Project (1996-2001) launched by Uttar Pradesh Government[26]. However, in several areas of Hardoi, reclaimed soils are showing signs of secondary salinity, a reversal into sodic soils due to increase in water table[27].

Agro ecological situation (AES)

Based on soil type and topography, Hardoi district has been classified into four AES as presented in Table 1[28]. AES I covers 50% of the total cultivated area in the district and all major crops are grown here. Soils in this area vary from loam, silty loam, clay loam to silty clay loam. AES II with predominantly sandy loam soils occupies 24% of the cultivated land. Jowar, wheat, barley, groundnut, pea, mustard and sunflower are the major crops grown in this zone. AES III occupying an area of 19 % has loamy sand soils. Arhar, jwar, bajara, urd, sunflower, pea and potato are the important crops cultivated here. AES IV, most degraded edaphically of the four situations, with sodic soils (3%) and wasteland (4%) covers an area of 7% and rice, wheat, gram, berseem, mustard and jwar are the major crops grown here.

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[20] Taken from: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[21] Based on: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh
[22] Based on: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[23] Study available at: http://www.jstor.org/discover/10.2307/4394183?uid=3738256&uid=2&uid=4&sid=21101183946943
[24] Research available at: http://www.nieindia.org/bulletin/bull-PDF/V15/B15-69.pdf
[25] Sourced from: http://indiawaterweek.water.tallyfox.com/filefield-private/files/9384/field_document_plus/5613
[26] World Bank study available at: http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/F38852496D88189785256EB40077E578/$file/ppar_29124_india.pdf
[27] Report at: http://www.ecoinsee.org/T.S.%20II%20A%5Cnayak_land.pdf
[28] Based on: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf

Table 6: Agro-ecological situations in Hardoi district

AES	Cultivated area (% of total)	Major crops cultivated	Soil type
AES I	50%	All major crops grown here	Varies from loam, silty loam, clay loam to silty clay loam
AES II	24%	Jwar, wheat, barley, groundnut, pea, mustard and sunflower	Sandy loam soils
AES III	19%	Arhar, jwar, bajara, urd, sunflower, pea and potato	Loamy sand soils
AES IV	7%	Rice, wheat, gram, berseem, mustard and jwar	Sodic soils (3%) and wasteland (4%)

Livestock and poultry

According to 2008-2009 KVK data, crossbred cattle population was estimated at 5,71,519 whereas indigenous cattle count was 5,29,988. Buffalo population numbered at 3,91,740, sheep at 60,615, goat at 3,27,230, pig at 48,325 and poultry at 1,31,092 individuals. Fishery production was estimated to be 2,950 kg/ha. The resource rich farmers, on an average, keep graded buffalo but poor people keep desi buffaloes and 5-6 goats.

Irrigation Status and Sources

Irrigation in Hardoi is made possible by a network of canal system and tubewells. Sharda canal is the main source of water to the district. Hardoi and Lucknow branches of Sharda Canal feed the canal system of Hardoi. Hardoi branch of Sharda canal became functional in 1928 and has a length of 36.80 km while the subsidiary Hardoi feeder branch with a length of 21.55 km became functional in 1957. Based on slab of irrigation, the district falls in slab 2 category which is accorded to areas with 80-90% irrigation. Net irrigated area in Hardoi is 86.29% which is higher than the average net irrigated area in Uttar Pradesh (80.40%)[31].

Table 7: Area under irrigation in Hardoi District as compared to state average

Area covered	Uttar Pradesh	Hardoi
Gross cultivated area (ha)	2,54,40,000	6,69,525
Net cultivated area (ha)	1,65,89,000	4,21,532
Gross irrigated area (ha)	1,93,54,000	5,44,644
Net irrigated area (ha)	1,33,83,000	3,63,743
Gross irrigated area (%)	76.08	81.35
Net irrigated area (%)	80.40	86.29

Data is based on 2009-2010 estimates.[32]

[29] Available online at: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[30] Report on Sharda Canal available at: http://pilibhit.nic.in/discover.htm
[31] Data available at: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh
[32] Numbers based on website: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh

Irrigation Source

Table 8 : Source of irrigation and irrigated area (1000 ha)

	Canal	Bore wells	Tanks	Others
Hardoi	63.128	299.648	0.959	0.008
Uttar Pradesh	2,613.665	10,488.588	149.666	61.732

Data sourced from Annual Plan 2009-2010.[33]

Major source of irrigation in Hardoi was bore wells which accounted for 82% of total irrigation in the district as against 71% of total irrigation in U.P. Canal irrigation accounted for 17% of irrigation in Hardoi which was slightly lower than the state average (20%). Tanks and other sources of irrigation were not significant in the district (1%) although in U.P. they accounted for of 9% of total irrigation.

In 1996 total length of canals running through the district was 1,660 km and there were 1,592 running tubewells in the area. Irrigated area under kharif crop was 48,300 ha and that under rabi, 44,350 ha[34].

Canal irrigation system in Hardoi remains highly inefficient, with heavy siltation and lack of maintenance reducing the capacity of major as well as minor canals[35]. Inequitable distribution of irrigation water makes the marginal farmers, which constitute a majority of the cultivators, increasingly dependant on rain. Absence of livelihood security has resulted in migration of these poor farmers to cities, often for a period of six months when rainfall is sparse.

To discourage migration and to encourage water conservation, government has launched various schemes in Hardoi district like National Rural Employment Guarantee Act (NREGA) and National Food for Work (FW) scheme. NREGA stipulates that the focus of work to be carried out should be related to water conservation and harvesting and include activities construction and desilting of canals, desilting and renovation of traditional water storage structures. Afforestation and improvement of rural connectivity were the other foci.

However, in absence of proper implementation and effective monitoring, work related to water conservation accounted for only 12% of that undertaken under NREGA while 85% of the work as related to road construction in Hardoi, according to Union Ministry of rural Development. Many minor canals continue to remain dry, major canals have reduced capacity[37].

Poor management of canals leading to unreliable delivery of water to the farmer and private ownership of tubewells, independent of government regulation, has led to an increase in number of tubewells in Hardoi. As a

[33] Numbers based on website: http://dolr.nic.in/dolr/downloads/spsp/SPSP_UttarPradesh
[34] Data obtained from: "District Census 2011". Census2011.co.in. 2011. http://www.census2011.co.in/district.php. Retrieved 2011-09-30.
[35] Media report at: http://www.hindu.com/2006/12/13/stories/2006121312910400.htm
[36] Critique on NREGS at: http://www.indiaenvironmentportal.org.in/news/rural-employment-guarantee-scheme-does-not-work-envisaged
[37] Based on information at: http://www.indiatogether.org/2006/feb/gov-hardoi.htm

result, ground water depletion has emerged as a major concern in the area. A significant decline of ground water level by 4m, falling at the rate of 20 cm per year has been recorded in the district during 1981-2000 period[38].

Table 9: Details of Operational Areas/Villages (2008-2009)[39]

S. No.	Taluk	Name of block	Name of villages	Major crops and enterprises	Major problems identified
1.	Hardoi	Sursa	Kashrawan, Brirahimpur, Saraiya, Malihamau, Bhadaicha, Semra, Bahadurpur	Rice, Wheat, Mustard, Ladyfinger, Gram, Pea	Lack of improved variety /HYV, improper use of fertilizer, no seed treat
2.	Hardoi	Bawan	Bawan, Barkhera, Jagdishpur, Khetui, Sadhai Behta	Wheat, Gram, Colocasia, Tomato	Lack of improved variety /HYV, improper use of fertilizer, no seed treatment
3.	Ahirori	Ahirori	Kheraili, Lalpur, Belaha, Rudali	Urd, Moong, Mustard, Pea, Gram	Lack of improved variety /HYV, improper use of fertilizer
4.	Bilgram	Bilgram, Tadiyanwa	Ganipur, Gadarianpurva ,Sadila ,Dhabha, Kundarauli	Mustard, Pea, Maize	Lack of improved variety /HYV, improper use of fertilizer
5.	Sandila, Shahbad	Behandar, Kachunna, Shahbad	Dahimpur, Behlolepur, Gaushganj, Udharanpur,	Pea, Wheat, Gram,	Lack of improved variety /HYV, improper use

Socio-economic profile

1. Demographics

According to the 2011 census[40], Hardoi district has a population of 4,091,380. Thus it is the 51st most populated district in the country out of the total of 640. Hardoi's population constitutes about 2% of the total population of UP. The district has a population density of 683 inhabitants per square kilometre. Its population has grown at a rate of 20% over the decade 2001-2011. Hardoi has a sex ratio of 856 females for every 1,000 males sex while the child (0-6 years) sex ratio is 914 girls every 1000 boys. Children form about 16 % of the total population of the district. It has a literacy rate of 68.89% with 77% of males being literate as compared to 59% of women.

[38] Analysis available at: http://www.unouniverse.com/pages/water/Data/Water_Resource_Indian_States.htm
[39] Report available at: http://zpdk.org.in/sites/default/files/districtprofile(2-2-10).pdf
[40] Document available at: http://www.census2011.co.in/news/678-hardoi-census-2011-highlights.html

Table 10 : Demograhics and socio-economic indicators as compared to the state average

	Hardoi	UP
Total population	40,91,380	19,95,81,000
Population density (ind./km2)	683	828
Men	22,04,264	104,596,000
Women	18,87,116	9,49,85,000
Sex ratio (females/100 males)	856	908
Children (under 6 years age)as % of total population	16	15
Average literacy (%)	69	70
Male literacy (%)	77	79
Female literacy (%)	59	59
Rural population (%)	88	78
Urban population (%)	12	22
Schedule Castes (%)	31	20
Schedule tribes (%)	0.01	0.10
Infant mortality rate (per 1000): Urban	77	44
Infant mortality rate (per 1000): Rural	80	62
Population BPL (%)	66	30
Villages connected to pucca road	54	55

Data presented in the preceding table indicates that Hardoi district is primarily rural in character with a higher rural population than the state average. Sex ratio is lower in Hardoi than that in the state. Schedule caste individuals constitute a higher proportion while schedule tribes account for a lower proportion of total population than the average in Uttar Pradesh. Infant mortality rates in the district are much higher than the state average, both among rural as well as urban population. Population belonging to BPL category is more than double the state average.

Literacy rates and access of villages to pucca road in the district reflect the average values estimated for Uttar Pradesh.

2. Indicators of human development

Human Development Indicators have become an important measure of overall well being of a population. According to the definition of HD, the most basic choices that people ought to enjoy are ability to lead long and healthy life, ability to acquire knowledge and to be able to have a decent standard of living. In 1991, UNDP evolved the Human Development Index (HDI), which takes into account four basic dimensions of human development: productivity, equity, sustainability and empowerment. Thus status of a population with regard to health, education and livelihood, gender issues and issues related to natural resource base are all reflective of state of human development.

Hardoi district reflects chronic deprivation in multidimensional parameters viz., average female literacy, schooling, infant mortality, agricultural productivity and infrastructure[41]. According to Human Development Report, 2006, districts were categorized based on HDI as high (>0.60), med (0.55-0.59), low (0.50-0.54) and very low (<0.50). Hardoi falls into the low class with an HDI of 0.51, much lower than the average HDI of Uttar Pradesh (0.57)[42].

The district scored poorly on most of human development indicators, ranking at 517 on the human development index out of 569 districts of India as presented in 8/ National Commission on Population: District wise Indicators (1998-1999 estimates). Infant mortality rate was 80 per 1000 individuals and girls marrying below 18 years of age 44%. Less than 50% children underwent complete immunization. Only about 50% habitations had access to safe drinking water. Village connectivity was poor with about 46% villages not connected to pucca roads.

Table 11: Land holding pattern in Hardoi

Type of farmer/percentage of households				
	Large (>10 ha land)	Small (1-2 ha land)	Marginal (> 1 ha land)	Landless
Hardoi	63.128	299.648	0.959	0.008
Uttar Pradesh	2,613.665	10,488.588	149.666	61.732

All data has been sourced from Board of Revenue U.P., 2001 Census.

Land holdings are concentrated in a small population of rich farmers in Hardoi. Marginal farmers, who have been described as those who cannot meet their livelihood needs from the land constitute a very high proportion of the population in the district and their percentage is higher in Hardoi as compared to the state average.

Social inequity and failure of Government schemes

Many target-specific development programmes have been initiated in Hardoi through district development agencies such as RSVY (Rashtriya Sam Vikas Yojna), NFW (National Food for Work) and NREGS (National Rural Employment Gaurantee Scheme)[43].

Lack of political will, administrative indifference and absence of transparency in delivery mechanism of developmental programmes of the government has resulted in failure of various schemes in addressing the issues confronting this backward district.

Rural society in Hardoi is a highly inequitable community due to a deeply entrenched caste system. Government reforms that aimed at strengthening democratic institutions which can disperse power amongst the backward

[41] Report available at: http://www.chronicpoverty.org/uploads/publication_files/CPRC-IIPA_9.pdf

[42] Report available online at: http://planning.up.nic.in/Annual%20Plan%202010-11%20for%20website/Volume%20-%20I%20(%20Part-II)/ Chapter-4.prn.pdf

[43] Report online at: http://www.environmentportal.in/files/Intra-Regional%20Disparities%20Inequality%20and%20Poverty.pdf

have been suppressed. The lower caste show low participation in decision making, have small landholding size, a lower BMI (body mass index) and a lower representation at the schooling stage[44]. Welfare funds are diverted towards the higher castes and possession of ration card for access to PDS is skewed in favour of higher castes. Women belonging to lower castes have less access to health services and BPL status is accrued more to individuals belonging to higher castes.

Schemes like NREGA and NFW which were launched to provide livelihood to poor and marginal farmers and to simultaneously regenerate the district's agriculture through better water management have been a failure. Diversion of funds to road building which benefits a nexus of contractors, government officials and rich, high caste farmers has resulted in not only a lack of improvement in irrigation status or water harvesting but has actually led to many marginal farmers losing their land to road construction[45]. There is reluctance on issuing job cards to women and there are discrepancies in maintenance of muster roles.

An Overview of Planning Process at the State Level in Uttar Pradesh

The Department of Planning in the Uttar Pradesh government is primarily responsible for making a development plan for the state, to initiate and undertake necessary exercises for this purpose and oversee and take an over-all view of the implementation of the plan, without diluting in any manner the role of different departments of the state government in the formulation and implementation of their respective plans[46].

Planning process in Uttar Pradesh takes into account intra-state variations in the level, potential and problems of development of different regions. For ensuring optimal use of available resources the State Plan is formulated through a series of interactive & multi-level exercises and integrating it with regional, district and block level strategies. From the operational point of view, the state government of Uttar Pradesh considers a plan to be a compilation of inter-related programmes/ projects/ schemes aimed at yielding the desired results through spatial convergence and appropriate temporal sequencing. In Uttar Pradesh plan formulation is preceded by systematic analysis, survey and investigation of major issues, relevance of alternatives and application of new approaches, with an aim of preventing sub-optimal use of sizeable resources and loss of valuable resources and time. The Uttar Pradesh government considers the following work components as essential for planning:

- keeping a watch on economic trends, demand projections, development and utilization of capacities, especially the production trends, policies, incentives and disincentives and regulatory mechanisms relevant to the country as a whole;
- assisting development departments and lower level planning and development agencies in decision making by projecting trends, identifying constraints, undertaking economic analysis for formulating a policy frame-work and listing priorities from time to time;

[44] Research study available at: http://dyson.cornell.edu/special_programs/AFSNRM/Pew/bellagio/papers/hoffetal.pdf
[45] Based on information at http://www.indiaenvironmentportal.org.in/news/rural-employment-guarantee-scheme-does-not-work-envisaged and http://www.indiatogether.org/2006/feb/gov-hardoi.htm
[46] Please see: http://planning.up.nic.in/

- monitoring, concurrent appraisal and evaluation of individual projects/programmes/schemes.
- assessing institutional and organizational potentials and constraints, specially from the point of view of delivery of services and resources to the poorer and unorganized sections of society;
- conducting diagnostic/explanatory studies and pre-testing new technologies as well as new programmes through pilot projects;
- facilitating formulation and appraisal of projects;
- developing techniques and procedures for the continuous monitoring of intra-state imbalances and providing methodological and logistic support for planning at the regional, district and block levels;
- organizing training of officers concerned with programme implementation and regional planning.
- networking with various organization, financial institutions and experts and social scientists.

For the purpose of effective planning the Department of Planning in Uttar Pradesh is divided organized into the following nine units:

1. Economics & Statistics Division
2. Evaluation Division
3. Planning & Research and Action Division
4. Training Division
5. Project Formulation & Appraisal Division
6. Perspective Planning Division
7. Man Power Planning Division
8. Monitoring & Cost Management Division
9. Area Planning Division[48]

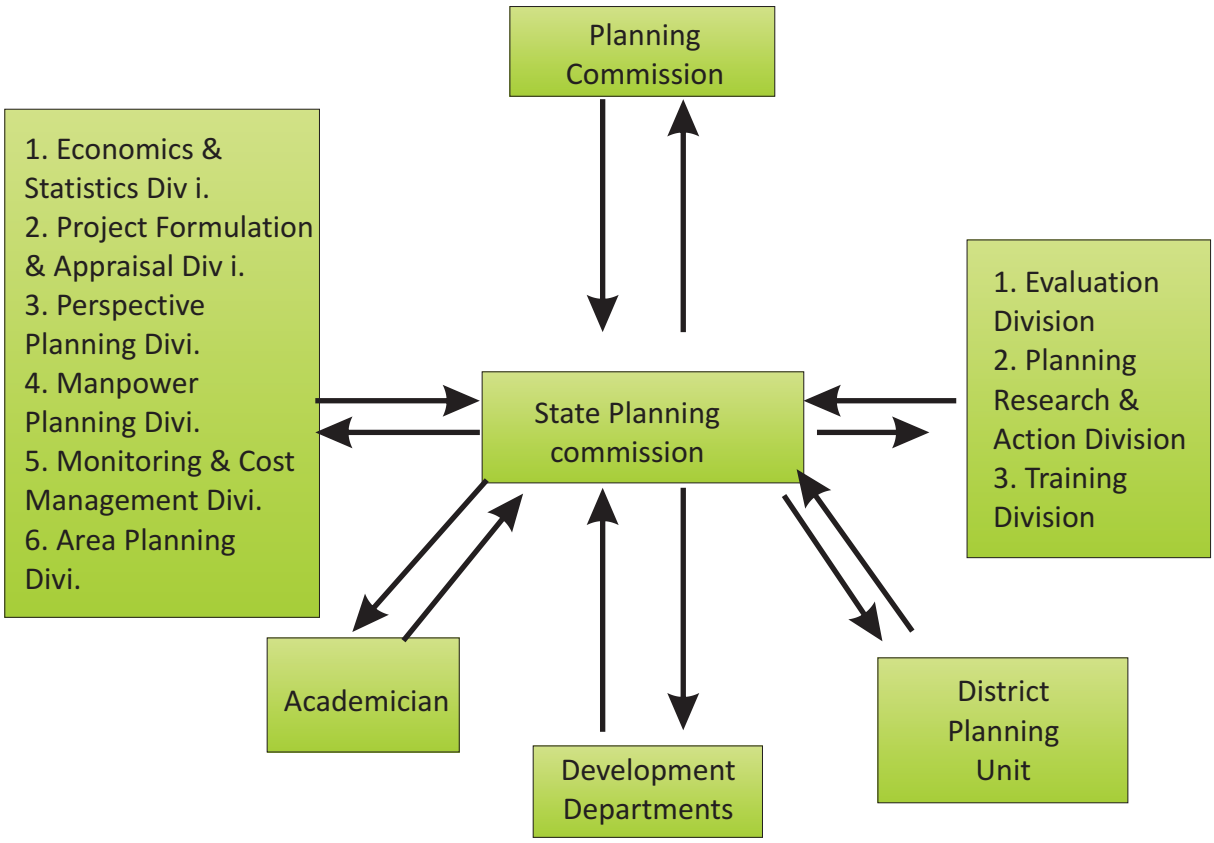
The Uttar Pradesh State Planning Commission is an apex body of the State which was established in 1972 on the advice of National Planning Commission under the chairmanship of Chief Minister. The State Planning Commission also has Deputy Chairman and official and non-official members from various disciplines nominated by the State Government[49].

[47] Available online at: http://planning.up.nic.in/about_planning/about_planning1.htm

[48] For details please refer to: http://planning.up.nic.in/State_planning_institute.htm

[49] Please see: http://planning.up.nic.in/spc/spc_main.htm

Figure 1: State Planning Commission and its interactions with various other institutions[50]



The Uttar Pradesh State Planning Commission carries out the following works:

1. Formulation of Five Year Plans and Annual Plans.
2. To obtain approval of Planning Commission after finalization of sectoral outlays.
3. Submission of adjustment proposals for revision of outlay at the end of each financial year.
4. Allocation of finalization of annual plan proposals by allocating approved outlays to development departments.
5. Monthly meetings with development departments to review the financial and physical progress of the annual plan.
6. Coordination of Centrally Sponsored Schemes and correspondence with development departments/Central Planning Commission/Central Ministries.
7. Coordination of Prime Minister Gramodaya Yojana/Border Area Development Programme.

[50] Taken from: http://planning.up.nic.in/spc/spc_main.htm

8. Works related to Finance Commission.
9. Preparation of guidelines for formulation of district plans and allocation of outlays to districts.
10. Scrutiny and finalization of district plans.
11. Allocation of district share outlay for Poorvanchal Vikas Nidhi and Bundelkhand Vikas Nidhi.
12. Scrutiny and finalization of proposals of the district funds from State share of Nidhis.

U.P. State Land Use Board (SLUB) is the Apex Body under the Chairmanship of Hon'ble Chief Minister at the State level not only to provide policy direction and coordination to all the concerned departments and agencies but also to ensure follow up action emerging from the National Land Use Policy and the deliberations of the National bodies such as National Land Use and Wasteland Development Council (NLWC), NLCB & NWDB. U.P. SLUB has a clear charter of its main objective and functions. This envisages assessment of land resources, providing direction for policy planning, coordination, taking an overview and assigning interse priorities for land use changes, particularly diversion of good agricultural lands, development of wastelands and marginal lands for alternate uses and promoting integrated scientific planning. The Board also reviews programme implementation, promotes building of the data base and utilise the same for integrated and perspective planning. And to conserve and manage land resources the Board also plays an effective role by planned and systematic awareness programme[51].

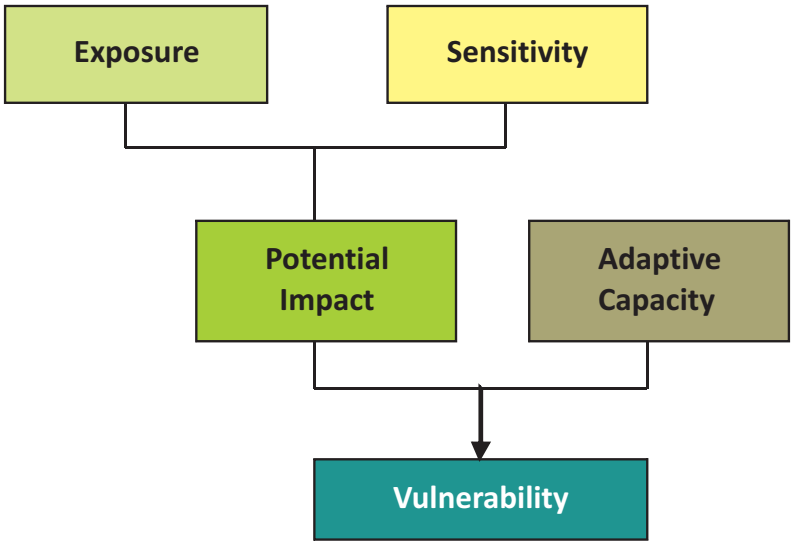
The Uttar Pradesh State Government has followed the 73rd and 74th Constitutional Amendment Acts (CAAs) that give district, municipal and village level institutions of governance the status of local self-governments with powers of taxation and a share of State revenues, and the explicit responsibility of providing services that directly aid economic growth and social welfare. Under these amendments District Planning Committees have been established whose role is to (i) consolidate the participatory plans prepared by Panchayats and Municipalities at different levels, and (ii) prepare a draft district plan on the basis of plans prepared by different rural and urban local governments (Panchayats and Municipalities)[52].

Approaches to Vulnerability Assessment and Adaptive Planning

Approaches to Vulnerability Assessment

Vulnerability is best defined as an aggregate measure of human and/or natural welfare that integrated environment, social, economic and political exposure to a range of potential harmful perturbations. Vulnerability is a multilayered and multidimensional space defined by the determinate, political, economic and institutional capabilities of people in specific places at specific times (Bohle, 1994).

[51] Please see: http://planning.up.nic.in/landuseboard/lub_main.htm
[52] Directive available at: http://planning.up.nic.in/district_plan/dplan2.pdf



Adaptation is the adjustment in human and/or natural systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (UNFCCC Resource Guide, 2008)[53].

Two main types of adaptation are:

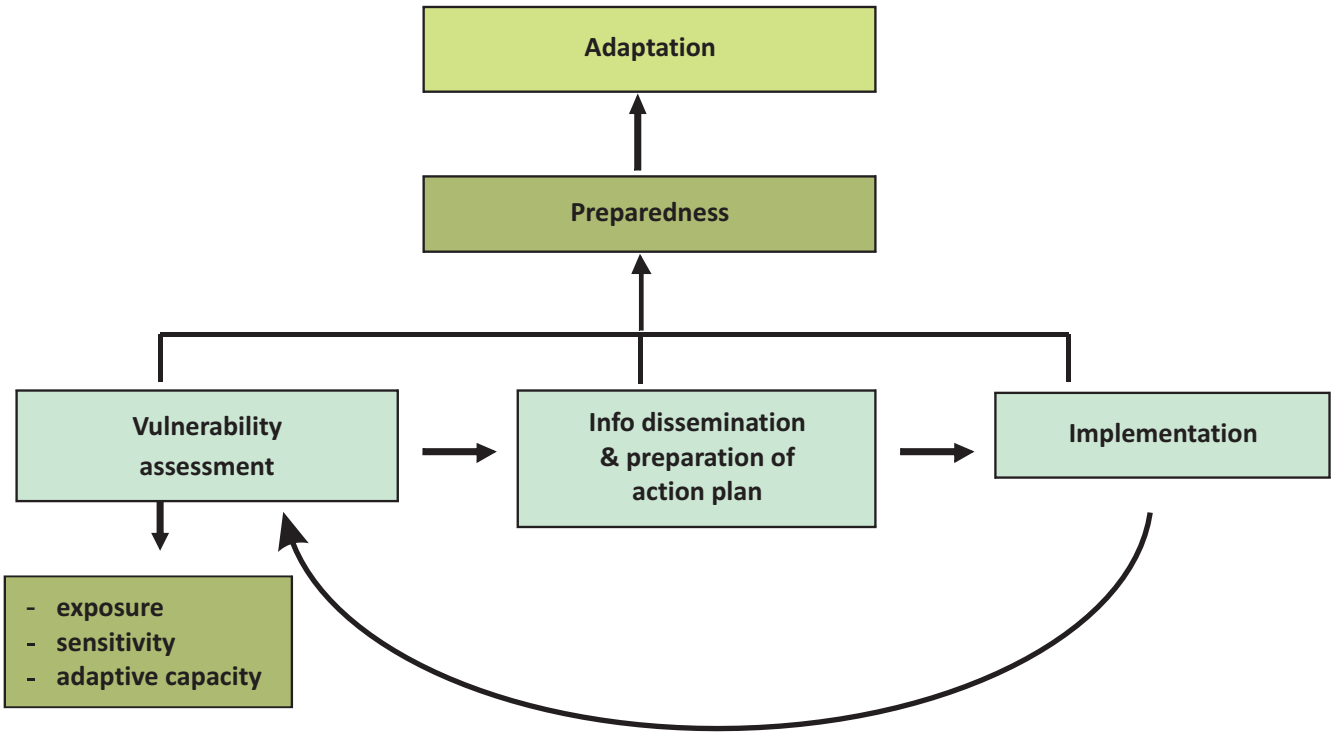
1. Autonomous adaptation: It is the one which a society or an individual undergoes in response to changing conditions without the intervention of external agencies. As such there are no distinct technical, economic or social adaptation measures and any adaptation measure will include all these three aspects to it. Its is the reaction of, for example, a farmer or a group of farmers to changing precipitation patterns, in that s/he/they change crops or use different harvest and planting/sowing dates. Change of crop includes technical, social as well economic aspects to it and all are interrelated.
2. Planned adaptation: Planned adaptation measures are conscious policy options or response strategies, often multi-sectoral in nature, aimed at altering the adaptive capacity of the system or facilitating specific adaptations. It is the one which a society undergoes in response to changing conditions with the intervention of external agencies, usually state or national governments. For example, deliberate crops selection and distribution strategies across different agroclimatic zones, substitution of new crops for old ones and resource substitution induced by scarcity (Easterling 1996).

To adapt to climate change induced impacts, one should know the vulnerability of target group. In order to reduce vulnerability preparation of knowledge products and action plan is required. Implementation of the adaptation action plan will result in preparedness. Whereas implementation of the adaptation action plan will be done by developmental or state agencies preparedness is the output among the target community. However, since human knowledge as well as ground realities change with time there is a need of monitoring and evaluation of adaptation plan.

[53] Available online at: http://unfccc.int/resource/docs/publications/08_resource_guide2.pdf

A diagram showing interlinkages between vulnerability and adaptation is given below in the figure - .

Figure 2 : Vulnerability and Adaptation Interlink

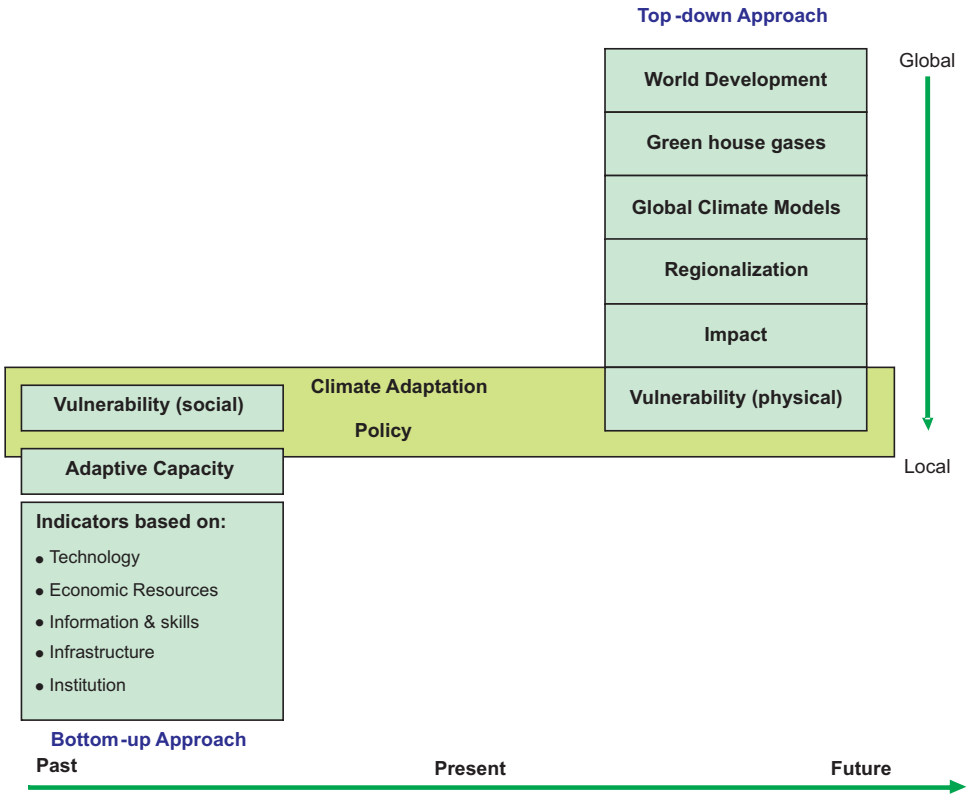


Source: Development Alternatives

A diverse set of vulnerability assessment frameworks exist. Broadly these vulnerability assessment frameworks may be classified as first generation, second generation, top-down and bottom-up, depending on the criteria used.

- First generation frameworks focus more on understanding how significant the impacts of climate change will be in order to direct mitigation efforts.
- Second generation frameworks focus on more holistic impact assessments within adaptation decision-making contexts.
- Top-down frameworks were designed to mainly to help understand the potential long-term impacts of climate change (using global, national or regional models).
- Bottom-up frameworks, were designed to focus on adaptation and involve stakeholders primarily at the local level. Since uncertainties will always be present in climate change predications it is important to help build the resilience of the community also local initiatives have higher potential to succeed as compared to regional or national because local initiatives originated keeping in mind the locally prevailing conditions.

Figure3 : Features of top-down and bottom-up approaches to assessing vulnerability and adaptation



Source: UNFCCC Resource Guide, 2008

The ultimate aim of both approaches is to find out the vulnerability of the target group. The top-down approach relates more to the climatic aspects such as precipitation, temperature etc. whereas the bottom-up approach deals with social resilience to face the climatic impacts. The climatic impacts themselves are related to a degree of uncertainty and even though improvements are taking place the uncertainty can never be avoided. Therefore there is a need to identify the adaptive capacity and vulnerability of the target group.

However, it is important to note that approaches to vulnerability assessment are evolving rapidly, with more recent work focused on blending merits of both first- and second-generation approaches, and bottom-up and top-down approaches. For example, greater emphasis is being placed on socio-economic scenarios, stakeholder participation and strengthening adaptive capacity.

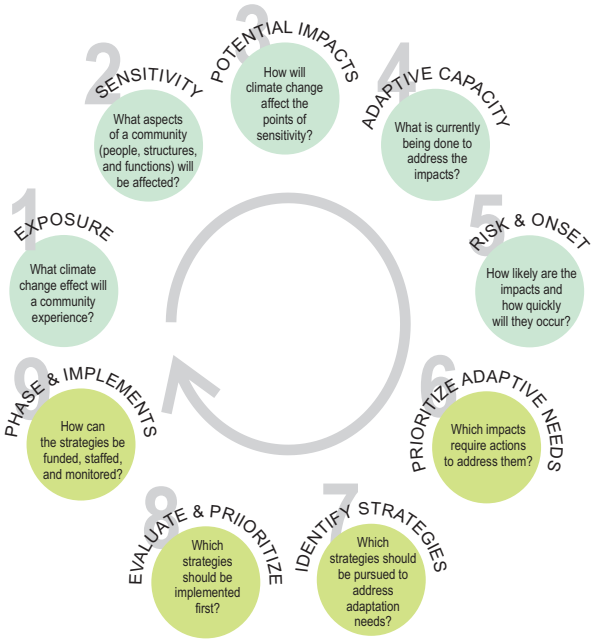
Approaches to Adaptive Planning

According to a study published by The Center for Climate and Energy Solutions some of the common elements in the methodology for planning adaption to climate change impacts includes: (a) recognizing that many adaptation efforts must happen at local and regional levels, (b) identifying key vulnerabilities in terms of exposure, sensitivity and adaptive capacity, (c) involving all key stakeholders, (d) setting priorities for action based on projected and

observed impacts based on criteria of magnitude, timing, persistence/ reversibility, likelihood/certainty, importance, equity, (e) choosing adaptation options based on a careful assessment of efficacy, risks, and costs. The range of options includes no-regret, profit/ opportunity, "win-win", low-regret, avoiding unsustainable investments, averting catastrophic risk[54].

Another interesting document on adaptation planning is that produced by the Government of United States providing implementing instructions to be used by Federal agencies of the United States in climate change adaptation planning. Instructs state that the head of each agency shall establish a climate change adaptation policy, enhance understanding of the ways in which the climate is changing, apply understanding of climate change to agency mission and operations, develop, prioritize and implement actions and lastly evaluate and Learn[55].

The state government of the US state of California has developed a document presenting the basis for climate change adaptation planning and introduces a step-by-step process for local and regional climate vulnerability assessment and adaptation strategy development. The document considers the development of strategies to address climate change impacts as following a sequence of following steps: (1) assessing exposure to climate change impacts; (2) assessing community sensitivity to the exposure; (3) assessing potential impacts; (4) evaluating existing community capacity to adapt to anticipated impacts; (5) evaluating risk and onset, meaning the certainty of the projections and speed at which they may occur; (6) setting priorities for adaptation needs; (7) identifying strategies; (8) evaluating and setting priorities for strategies; and (9) establishing phasing and implementation[56].



***Adaptation planning development process, California State Government.*[57]**

[54] Report available online at: http://www.c2es.org/docUploads/climate101-adaptation.pdf
[55] Document available online here: http://www.whitehouse.gov/sites/default/files/microsites/ceq/adaptation_final_implementing_instructions_3_3.pdf
[56] For details see: http://resources.ca.gov/climate_adaptation/docs/1APG_Planning_for_Adaptive_Communities.pdf

Vulnerability Profile of the Communities

Based on review of literature the following issues have been identified for further consideration:

Exposure

The temperature data analysed in the Ganga Basian study done by WWF[58], for a 10 years' period gave trends of temperature increase more towards the western UP part. It was found in the consultation that year 2010 was a drought year in the district. Also evident from the 10 years' rainfall data average is that there has been reduction in the rainfall in the month of July and August

Soils

Soil erosion and saline/sodic soils are a common problem in the district and is linked to inefficient water management and natural predisposition of the region.

Water

Major issues linked to water management include

- Dependency of majority of farmers on erratic rainfall
- Poor water management practices
- Inefficient irrigation system
- Ground water depletion

Socio-economic

Inequity, inequitable distribution of resources and access to developmental intervention and benefits are certain socioeconomic issues faced. Marginal farmers, constitute major population. Annual six monthly migration of farmers to cities in search of alternative livelihood depresses agricultural status of the district.

Agriculture

- Fruit and agro forestry based farming is practiced only by rich farmers while majority of farmers practice riverbed farming
- Recent expansion in area under sugarcane due to increase in number of sugar mills at the expense of traditionally cultivated crops/ diverse systems
- Decrease in area under groundnut cultivation due to erratic rainfall and lack of irrigation facilities

Administrative

Inefficiency in implementation of government schemes and low institutional capacities of the administration impedes proper execution of interventions aimed at better soil and water management, provision of livelihood security to farmers, poverty alleviation and socio-economic development.

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[57] Page 15 of following report: http://resources.ca.gov/climate_adaptation/docs/1APG_Planning_for_Adaptive_Communities.pdf

[58] Mohan, Divya, Sinha, S., 2011. *Facing the Facts: Ganga Basin ' s Vulnerability to Climate Change*,

Vulnerability Assesment

In order to identify geographic locations which are higher in vulnerability IPCC's Livelihood Vulnerability Index (LVI) approach was used. LVI takes into consideration the exposure, sensitivity and adaptive capacity of a location. LVI was calculated for various development blocks of Hardoi district. Below is a ranking of the blocks with the most vulnerable block being ranked one.

For assessment of vulnerability, climate data was used along with the primary information. The climate data was used to understand the variability of criteria and the long term trend of parameters. For the purpose of conducting vulnerability assessment indices were computed for all 19 blocks under study. The following equations were derived to calculate vulnerability of the districts:

Indicators Index (Ix) = [Ib - I (min)] / [I(max) - I (min)]

Profile (P) = (Σni=1 Ixi) / n

Component (C) = [(Σn i=1 WPiPi) / (Σni=1 W Pi)]

Vulnerability Index = (E-A) X Sensitivity

Various indicators were selected for developing the profile. The vulnerability profile is in the range of -1 to +1 showing low to high vulnerability. The vulnerability assessments for the 19 blocks were performed using the Livelihood Vulnerability Index (LVI) methodology (incorporating the IPCC vulnerability framework. 150 households from 5 blocks Kachauna, Sursa, Sandila, Ahrori, Harpalpur were conducted at the block level to contextualize the climate induced impacts on agriculture. To conduct the socio-economic vulnerability assessment a detailed questionnaire was developed to obtain the primary information. The questionnaire revolved around the social capital, economic status and natural ecosystems to understand the affect of the climate change impacts on the livelihood systems of the region. Focused group discussions were conducted with the farmer community to understand the current vulnerabilities and information gaps.

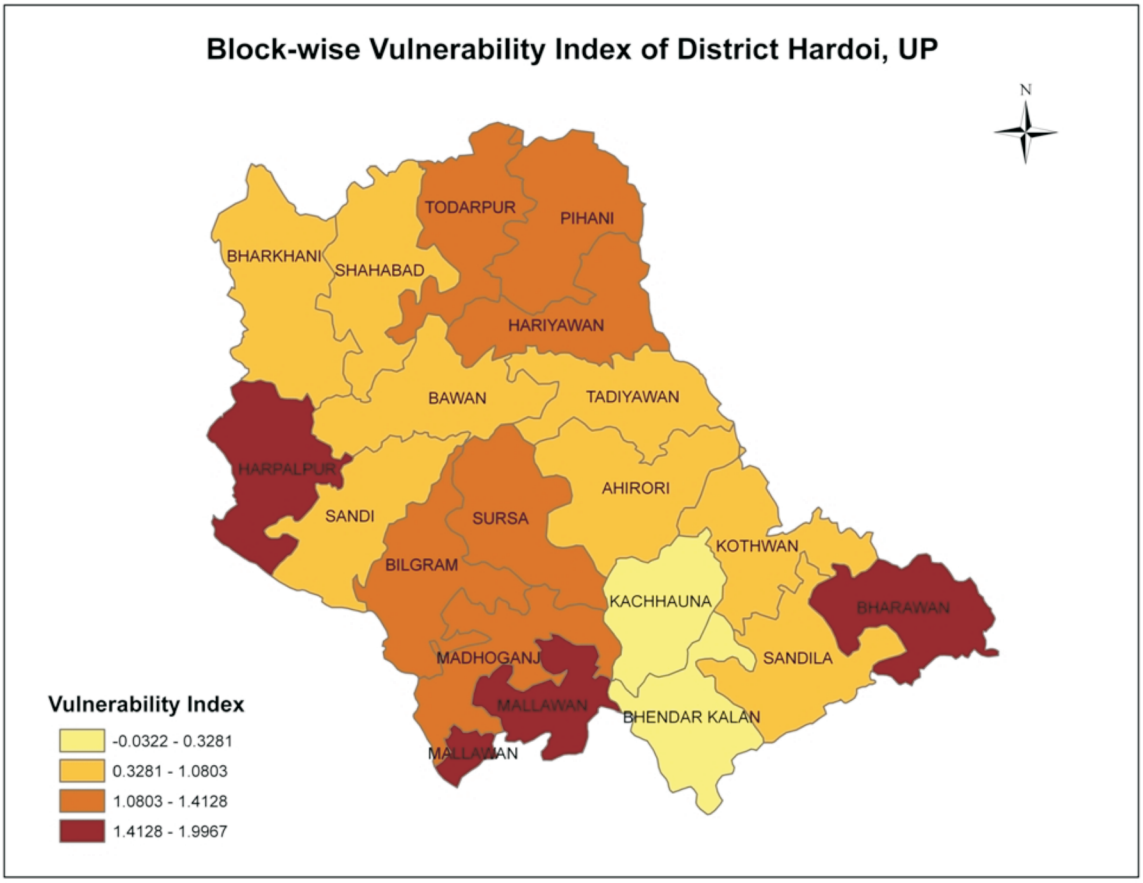
Table 12: Selected Indicators for the Livelihood Vulnerability index

Exposure		Temperature
		Rainfall
Sensitivity	Ecosystem	Land-Man Ratio
		Forest Cover
	Demographics	Sex Ratio
		Population Density
		%Agriculture Work Force
	Agriculture	Irrigation Intensity
		Cropping Intensity
		Net Area Sown (hectares)
		Barren land avaliable for agriculture
		Land Not Available for Agriculture
		Land other than agricultural land
Adaptive Capacity	Socio economic	Literacy Rate
		Number of health care centers per lac
		Number of villages with drinking water access

Table 13: Livelihood Vulnerability Index of the different block of Hardoi District

Name of Block	LVI	Rank
Mallawan	1.996708	1
Bharawan	1.61286	2
Harpalpur	1.548966	3
Todarpur	1.412817	4
Sursa	1.39003	5
Madhoganj	1.32472	6
Hariyawan	1.277784	7
Pihani	1.216355	8
Bilgram	1.146185	9
Bharkhani	1.080341	10
Ahirori	1.074573	11
Shahabad	1.031585	12
Kothawan	0.967873	13
Sandi	0.949394	14
Bawan	0.866378	15
Sandila	0.841015	16
Tandiyawan	0.810277	17
Kachauna	0.328113	18
Behendar	-0.03221	19

Figure: Vulnerability Index at Block level for Hardoi District



Adaptive capacity is defined low for the district due to the poor ranking it has on the social indicators such as literacy rate, access to safe drinking water and other factors which add onto the social stability in terms of development.

Almost all the farmers in the region have not availed crop insurance scheme. There is a general lack of awareness among the community due to illiteracy and lack of support services which could have enabled them through information. NREGA is also not widely availed in the district. There is a shift in the livelihood patterns with most migrating to cities for better opportunities (unskilled laborers). People perceive the shift as better opportunities for financial stability rather depend on agriculture. Radios are there for communication but due to illiteracy farmers fail to understand the information priority.

Evidence of Provisions for Adaptive Planning in Programmes and Policies

The vision and proposed road amp for UP's Twelfth Five Year Plan can be summarised as under:

- Sustainable Growth with inclusion
- Reduction in inter-district and intra-district disparities.
- Enhance public investment and create conducive environment to attract private investment
  - o Adopt a focused approach- Power and Roads

- Address critical infrastructural bottlenecks
- Improvement in the working of support institutions
- Rationalise Rules/regulations

- Enhanced share of public investment in economic infrastructure.
- Ensure time-bound implementation of power projects
- Poverty alleviation and sustainable employment generation through skill up-gradation
- Focus on diversification of agriculture to increase productivity and motivation for shifting to high value crops like oilseeds/pulses
- Promote development of allied activities particularly dairying, fisheries, food processing etc.
- Improve policy planning system and institutional capacity
- Rapid improvement in socio-economic conditions of the under privileged

Important Goals for Twelfth Plan are:

- Growth Rate of 10 percent in the terminal year of Twelfth Plan.
- Creation of additional employment generation opportunities to 10 million persons
- Achieve 5 percent growth in Agriculture and 10 percent + growth in Dairy, Animal Husbandry, Fisheries and Horticulture sectors
- Efforts for converting small and marginal holdings viable
- Ensure easy availability of cheap agriculture credit to farmers
- Additional area of 17.94 lakh ha under horticulture crops

Institutional and Organizational Development for Adaptive Planning

Institutional and organizational development for adaptive planning will be necessary as climate change is happening and will continue to take place at a fast pace. In order to respond effectively and efficiently in a relatively short time period will require institutional and organizational development.

Structurally, Uttar Pradesh is well positioned with district level planning committees being in place. However, the same cannot be said for current institutional and organizational set up.

Some of the key stages and processes which need to be strengthened for adaptive planning include:

Understanding the situation on ground

This is a stage with which most of the administration will be well versed with due to their working experience. However, it is advised that ground situation is documented in particular reference to climate change impacts. This can most suitably be done by involving the Gram Panchayats and recording the perceptions they have with regards to climate change and it is affecting their life. It will also be highly pertinent to understand the autonomous adaptation measures which the communities have taken.

Drawing up an adaptive plan

Based on the information and understanding gathered in the previous phase an adaptive plan needs to be drawn. The plan should focus on supporting the local communities to face the changing climate. In case autonomous adaptation options have come up within the communities than support needs to be provided to enhance their application. Once the adaptive plan has been drawn up feedback should be taken from Gram Panchayats to see if their concerns have been addressed. Adaptive plans should keep aside resources for contingencies which might arise in the future. Adaptive plans need to prioritize actions so to protect the weakest sections from most significant harm. Adaptive plans will be highly defined by the spatial context and this highlights the significance of involving the community while developing such plans. Planning should also consider the timing when the various steps would be taken, as it might be necessary to carry certain actions before others are carried out.

Gathering feedback for future interventions

Once an adaptive plan has been made it needs to be executed with prior acceptance of the fact that things might not go as planned. A particularly severe drought condition might make activities of tree plantation seem futile while making water available for irrigation a much higher priority. Such situations will require changes in plans, however, this need not change the overall focus from planting trees in the long term.

Once, the plan has been implemented the lessons learned during the implementation need to be documented. Information also needs to be gathered as what the community worked and what did not work. If possible feedback should also be collected in what ways the implementation could have been done better. Impacts created by the adaptive planning need to be measured and recorded. Efforts should be made to keep objective indicators against which performance could be achieved. The feedback generated through such exercises would prove to be a valuable tool for the next phase of adaptive planning and implementation.

In the preceding paragraphs we explored some of the key processes which need to be strengthened for effective adaptive planning. Now, another aspect of institutional and organizational development will be explored which forms the foundation of adaptive planning. This aspect is that of enhanced understanding and consists broadly of two overlapping but different approaches of capacity building through trainings and exposure visits.

Trainings for capacity building

Officials at the district, block level and Gram Panchayat level may be required to undertake tailor made and customized training programs to better understand adaptive planning. Training programs need to be designed after the understanding level of the officials has been gauged. Depending on the need and resource availability training programs may vary from half day long to a week in duration. Care needs to be taken to ensure that competent agencies with relevant on ground experience are engaged for the program.

Exposure visits

Exposure visits involve making the officials visit areas where adaptive planning is already taking place so that they may observe first hand as to how the process is undertaken. It also has the added advantage of providing the

participants with an opportunity to interact with the implementers and the community and get their perspective. First hand observation of the adaptive planning process will prove to be a supplementary exercise to training programs.

An effective approach could be mixing training programs with an exposure visit. This approach has the advantage of simultaneously providing theoretical and practical training to participants leading better understanding and higher retention of key aspects and messages.

Prioritizing Adaptive Management Strategies

Prioritizing adaptive measures based on the nature of the projected or observed impacts and the adaptive capacities is vital. However, during the adaptive planning process it will be essential to identify strategies which are more important as compared to other ones. However, prioritization needs to be carried out on in terms of objective criteria. Below we will outline the criteria which aid in prioritization of adaptive strategies and then describe them in more detail[59]. Before we begin it needs to be pointed out that no single metric can adequately describe the diversity of key vulnerabilities, nor determine their ranking.

Criteria

Intergovernmental Panel on Climate Change (IPCC) has identified various criteria for identifying critical key vulnerabilities for which adaptive strategies need to be prioritized[60]. The various identified criteria for ascertaining key vulnerabilities are as follows:

- magnitude of impacts
- timing of impacts
- persistence and reversibility of impacts
- likelihood (estimates of uncertainty) of impacts and vulnerabilities, and confidence in those estimates
- potential for adaptation
- distributional aspects of impacts and vulnerabilities
- importance of the system(s) at risk

Below is a brief description of each with particular context of adaptive planning at the district level in Uttar Pradesh.

Magnitude

Magnitude of an impact is determined by its scale (e.g., the area or number of people affected) and its intensity (e.g., the degree of damage caused). This means that a small scale flood has smaller impact than a large scale flood which submerges a larger area of land. Various quantitative measures which can be used for magnitude include

[59] Please see: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch19s19-es.html

[60] Available online at: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch19s19-2.html

loss of income, number of people of affected by impacts such as soil alkalization, floods, droughts or forced migration. Some impacts cannot be measured quantitatively and qualitative terms are more appropriate. Such impacts could be loss of sites of historical or cultural value.

Timing

Priority needs to be given to impacts which will occur in the near-term as compared to those which take place in the long-term. This would mean that during the cropping lack of water for crops needs to be accorded a higher priority as compared to arranging proper channels for getting the produce to markets. This is because it will be of no use to arrange for appropriate prices for produce when the crops are themselves at risk.

Another aspect of timing is the amount of time which an even or impact takes to develop. Impacts which appear in a short time span, or happen at an unexpected time (element of surprise), need to be accorded higher priority.

Persistence and reversibility

Harmful impacts which are permanent or last for a longer time are considered to be key than impacts which can be reversed or themselves recede with time. Loss of productivity due to alkalization of soils may therefore be considered to be a more key factor as compared to lack of micronutrients in soils. Remediation of alkaline soils will take much more time, efforts and resources as compared to application of fertilizers for correction in micronutrient imbalance in soils.

Likelihood and confidence

Events and impacts which have a higher probability or certainty of happening are usually to be provided higher priority as compared to those one which are less certain to occur. To consider an extreme case this means preparing for a drought in a dry-land as compared to a flood. However, in a different geography the situation may be reverse and the prioritization order may have to be reversed.

Potential for adaptation

The ability of human and natural systems to absorb the shock or to adapt in response to an impacts needs to an important criteria for deciding the priority actions. Those impacts for which adaptation potential is low or is absent need to take much more seriously than those for which the systems have means to adapt to. This point is in the given context of the magnitude of the impact. Systems might be able to adapt to certain magnitude of impact but might fail to do so beyond a certain threshold. For instance, farming families with low land holding will be more vulnerable to climate change as compared to households with higher land holding which have higher potential for adaptation.

Distribution

Impacts which effect different part of region to different levels or various communities to different extents are considered to be key and hence accorded priority. Impacts which are not distributed evenly create higher heterogeneity and is also likely to create social tensions resulting from inequity.

Importance of the vulnerable system

This criteria is subjective one and depends to a large extent on value judgment of individuals or communities which they attribute to a certain system. Communities might attribute higher importance to a forest from where they can collect firewood and fodder for cattle than as compared to a forest in which they are not allowed to enter.

Developing a Basic Implementation Plan and a Communication Strategy

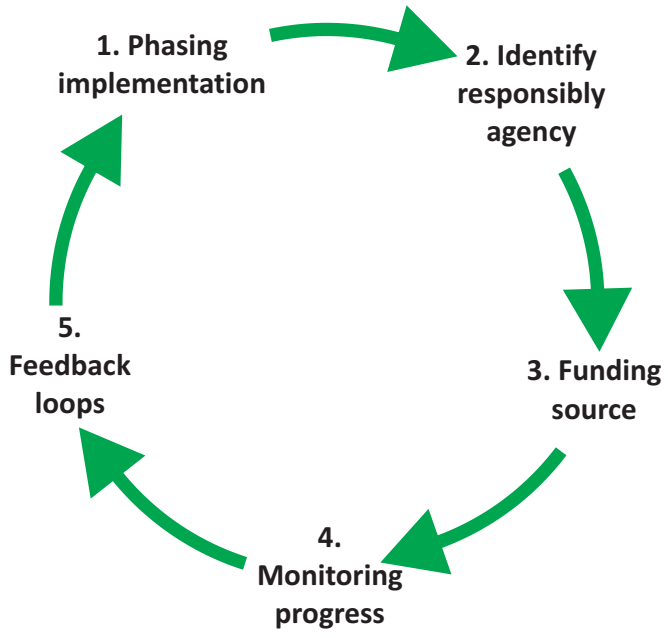
Implementing adaptation responses

Just as planning in other planning strategies successful implementation of adaptation strategies also depends on multiple factors. The various factors which need to be considered while developing implementation plan for adaptive planning should include the following: various phases of the implementation plan need to be established, agency responsible for leading the implementation needs to be identified, the funding source for the adaptive project needs to be identified, deliverables and their corresponding timelines for a monitoring plan needs to be established and feedback needs to be generated and collected for further improvement in future.

Below is a brief description of the various factors:

Phasing implementation: The adaptation implementation needs to be divided into smaller segments. This helps in implementing and also in monitoring the implementation plan. Various generic phases which may be considered are as follows: preparatory phase, procurement phase, on-ground activity phase, feedback phase.

Identify responsible agency: A particular agency needs to be identified as the focal point for implementing the adaptive strategy. Usually multiple agencies will be involved in implementing adaptive strategies, even in such instances the agency with the chunk of the implementation responsibility may be identified as the responsible one.



Funding source: Adaptation strategies will require various resources for implementation including time of staff, material and communication costs. The amount of funds required and their sources need to be identified. Funds may be diverted from existing sources or consist of additional funds from special sources which have been made available for adaptive actions.

Monitoring progress: Timelines need to be established for various phases of the adaptive strategy. Associated with the timelines is a need to identify milestones which need to be achieved by the time. Doing so will aid in racking progress of the implementation of the adaptive strategy.

Feedback loops: Feedbacks loops need to be developed for improvements in implementation of future adaptive strategies. Feedback loops may originate from end beneficiaries and also from reviews of advancements in science and practice. Lessons learned from implementation need to be documented systematically for posterity.

Communicating climate change and adaptation

Communication plays a critical role in implementation of adaptive strategies. Climate change despite being a complex subject is being discussed more and more at various geographical scales and there is hardly any aspect of human existence which is unaffected by it[61].

While developing a communication strategy the following key points need to be kept in mind:

Communicating climate change performs two activities. While it provides knowledge to the communities it also establishes a relationship between the agency and the recipient of the communication.

Communication strategy being adopted should support sustainable local initiatives. These initiatives might have been introduced by local Civil Society Organizations (CSOs) or may be autonomous adaptation practices which have been identified by the communities. Such support will assist in providing larger scale adoption of the practice.

While communication may be responding to current shorter-term needs as per prioritized strategies it should also strengthen preparedness for future climate change and uncertainty.

Communication strategies should be based on an analysis of and respond to demand at community level. Further, they should result in higher demands from the community. Communications need to recognize language, gender, age and cultural sensitivities.

There a number of tools for communicating climate change and adaptation. Options which may be explored with regards to choice of tools include using existing tools better or to introduce new tools. Innovative means such as use of wall paintings and street plays (*nautankis*) have been successfully used in communicating adaptation messages to communities.

Usually it is just the message from scientists which is brought in connection with the communities. Option of bringing the scientists directly in touch with the scientists is worth exploring. This would not only make the communities understand the adaptation strategy better but will also help the scientists in understanding the information needs of the communities and thus may prove useful for providing feedback to their research activities and questions.

Establishing right types of partnerships is of high importance in getting the message across to communities. This involves identifying the modes through which communities gain information and than tying up with these to carry climate change messages in a suitable format.

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[61] Please see following for more detailed treatment of the subject:
http://cgspace.cgiar.org/bitstream/handle/10568/24456/CCAFSWP22_ClimateChangeCSL.pdf?sequence=1

Approach for Developing Adaptive Planning Strategy

Development Alternatives (DA) is actively involved in regional, national, state, district and local level climate vulnerability, adaptation and environmental planning. DA believes that a consultative mode needs to be adopted with all stakeholders while developing an adaptive strategy. DA's approach to integrate adaptation measures into district planning process is outlined below:

Assessment of Environment and Vulnerability

In order to measure progress over time, stocktaking and visioning, a tool is needed. As in many districts data is not readily available a State of Environment (SoE) report needs to be prepared. The SoE reporting process assesses the biophysical and socio-economic conditions in a region which affect the vulnerability of the communities. The SoE provides an understanding of how human activities affect the environment and the implications these have on human well-being. It also presents an overview of actions or inactions on the environmental front and the outcome of responses such as policy initiatives, legislative reforms and the resulting changes in human lives.

Regular SoE reporting works across sectors, thus enabling different stakeholders to identify the strengths and weaknesses of the current approach and recommend future courses of action for enhancing adaptive capacities and reducing vulnerabilities. The method used in SoE reporting is integrated i.e. combination of both Participatory and Analytical Approach combining the reliability of data collection and analysis with the participatory process, where concerns are addressed. Knowledge dialogue process is adopted with the community whereby exchange of knowledge between the community and implementation team took place more effectively.

The SoE development is at the district level and Development Alternative's objective is to integrate environmental and climate concerns at the lowest level of planning also. Therefore there is a need for developing a status of environment for the project area in form of Situation Analysis Report (SAR). The availability of data is a problem even at the district level and therefore it becomes important to take physical stock of environment in project area in collaboration with the communities. To orient the local governing bodies towards environmental and climate concerns and to ensure their participation and ownership, the data collection method is kept participatory i.e. the data is collected with help of the Project Working Group (PWG) i.e. representatives from local governing bodies (Panchayati Raj Institutions, Nagar Panchayat).

Awareness and Capacity Building

For the smooth implementation and management of the project a Project Working Group (PWG) and a Project Advisory Group (PAG) is required to be set up. The PWG comprised of PRI members of the project villages and had the responsibility of operations of the project. The PAG comprised of representatives of various governmental line departments such as irrigation, agriculture, etc.

Although the village communities understand issues of change in patterns of seasons they are unable to understand the concept of climate change. Therefore special attention is required in raising the awareness of risks of climate change. Communication material needs to be engaging, in an easy to understand form and provide solutions rather than scare the communities. Once the key stakeholders were oriented both at village/town as well

as at the district level, the next task is to make the stakeholders competent so that they can integrate their environmental concerns in their planning process. For building their capacities, the tools/techniques adopted were training workshops, focus group discussions and exposure visit to good practices sites. The purpose of training workshops is to make them aware of the present status of their environment and about various solutions to minimize environmental degradation and sustainable use of resources. The kind of exposure required by the stakeholders is assessed during the interactions with them. Based on their feedback and need, a good practice site needs to be selected where the development was done by participation of both panchayat and community.

Action

Joint Action Plan

The assessment and awareness components lay the base for development of Joint Action Plan (JAP). For developing the JAP various activities that are identified by the PWG and the available resources from various (State, Central) schemes are collated. The JAP ideally also includes timeline for the various tasks identified. The purpose of JAP is to integrate climate adaptation and environmental issues into the relevant sector-based plans. For example climate change adaptation measures in agriculture sector will target the agriculture and irrigation plan of the district.

Identification of Relevant Schemes for Leveraging Funds

As the objective is to bring about convergence and integration of climate change adaptation and environmental concerns therefore once the key issues have been identified the relevant existing development schemes from which the funds required to carry out the works need to be shortlisted. For example in the agriculture sector some of the schemes are National Food Security Mission, National Horticulture Mission and the Integrated Watershed Development Program.