Spring Source Study and Climate Change of Tanahun District (RWSSP-WN Phase-II)

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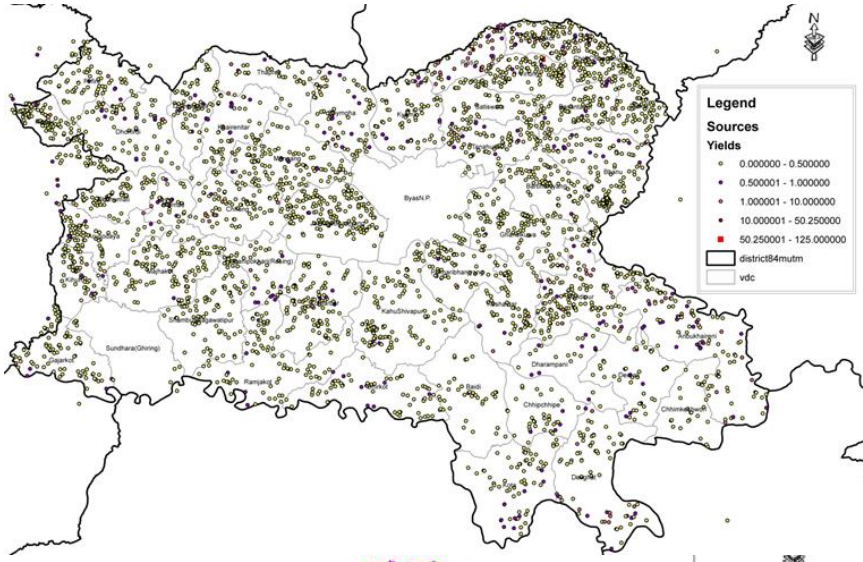
What has been done RWSSP on Field?

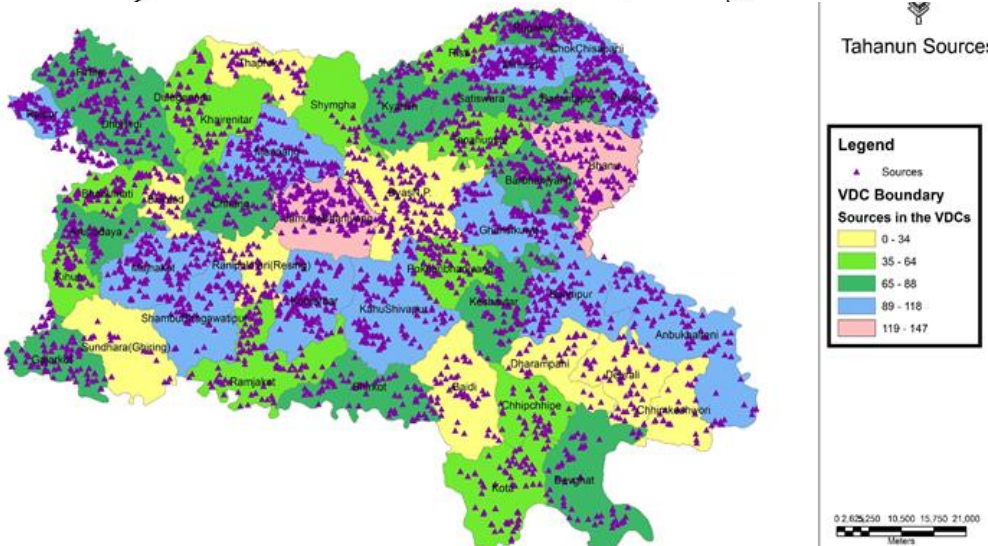
2004

- March
- 3320



2014

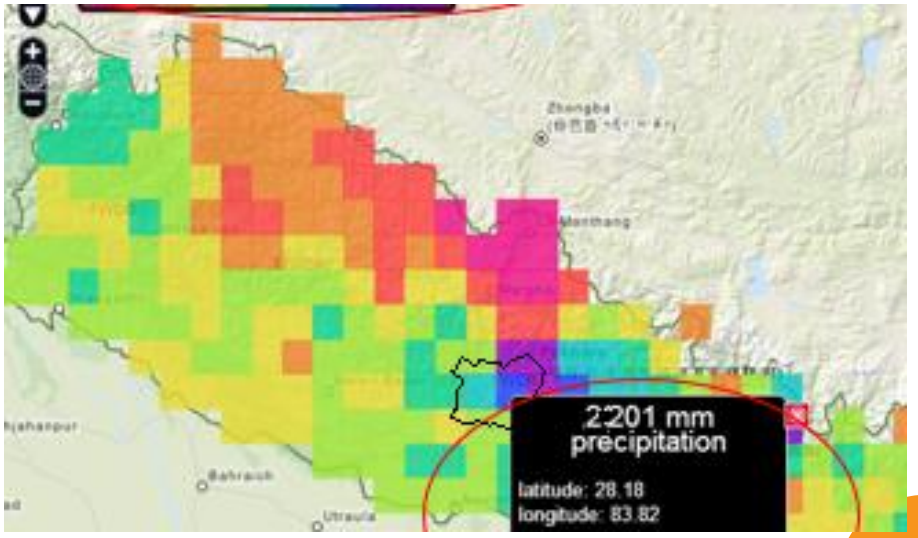
- March
- 4000



What has been done in Climate Analysis?

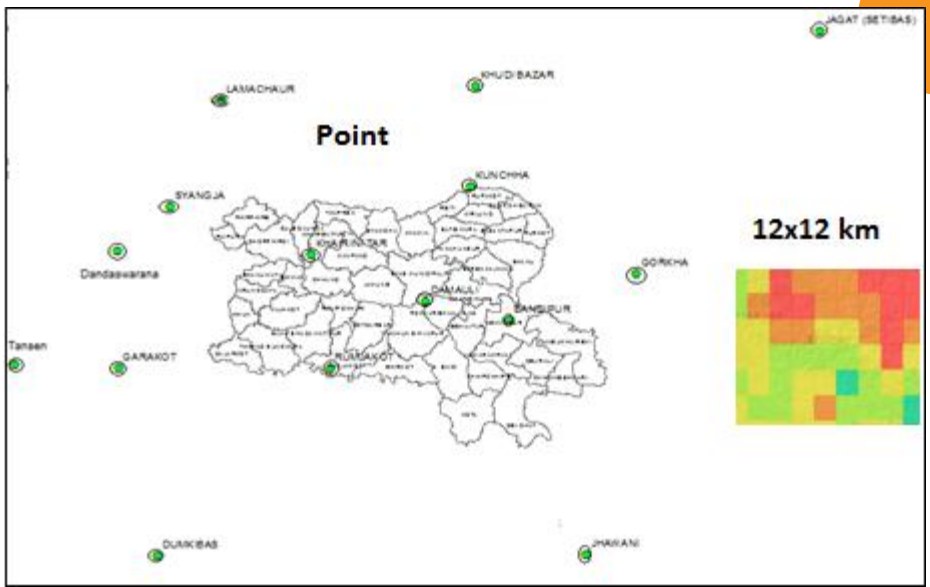
Climate Change Projected

- **PRECIS-HadCM3Q0-A1B**
- 25 x25 km



Point and gridded Climate

- DHM
- 12 x 12



Key objective

2004

- **To Prepare Water Supply and Sanitation Profile of Tanahun District**

2014

- **To identify and understand the changes in water resources by revisiting each of the 3320 water sources as identified ten years ago**

Study Purpose

Source Yield between 2004-2014

Climate between long term History

And between 2003 & 2013

Climate Change Projection

2030-2060

Yield mapping

Precipitation and Temperature

How to integrate disaster and climate change risk in preparing District Strategic WASH Plans, VDC WASH Plans and Water Use Master Plans?

Method

Climate Projected	Data analysis	Yield measurement-Field 2004-2014
PRECIS-HadCM3Q0-A1B 25 x25 km	Statistical Analysis of long term and between 2003-2013 Climate data 12 x12 km & point	**GPS – location** **Measure the water yield with bucket method** **Collect local people experiences on water yield in their VDC over the past ten years**

Water Source Information

The source site shall be visited with the villagers, measure yield and observe to fill up this format

Source: New or Old

Source location:

Source Code	Source name	VDC	Ward	Ownership (private/public)

a) Type of source: (tick any one)

a) Spring b) Spring fed Stream c) Point source (Kuwa/Pandhero) d) Other …….

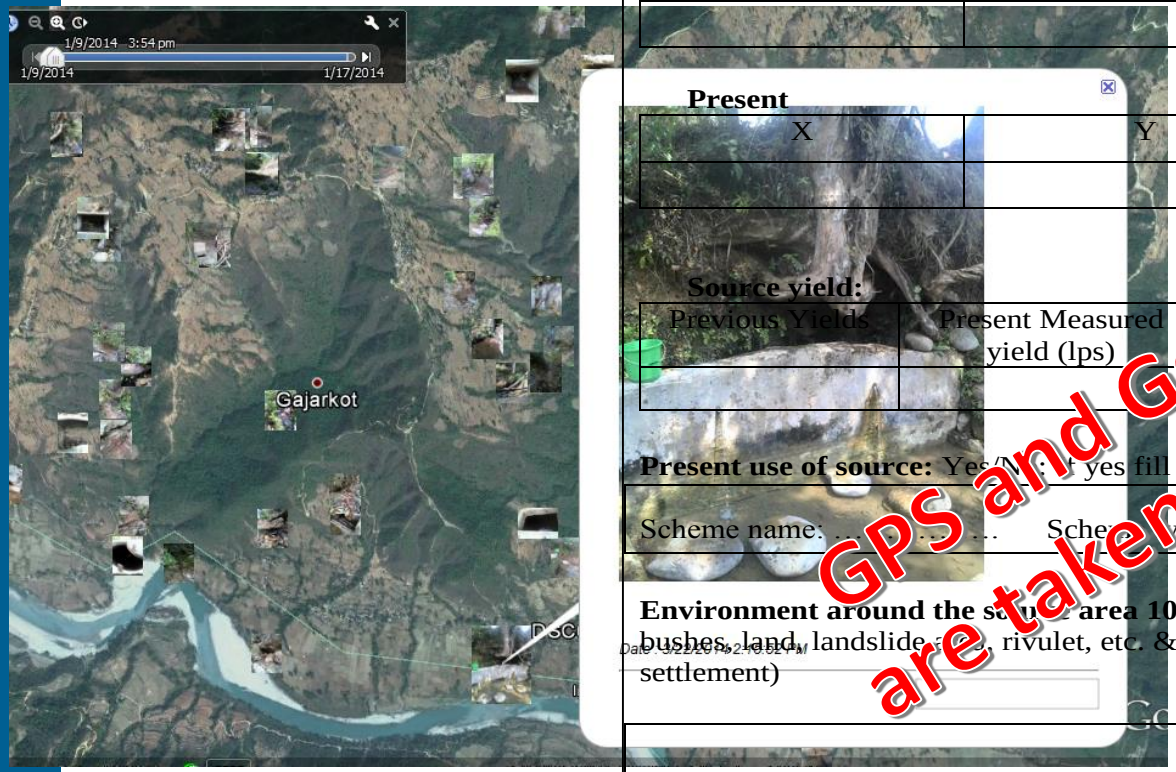
GPS reading:

Previous

X	Y	Elevation	Accuracy	Reading Number

Present

X	Y	Elevation	Accuracy	Reading Number



GPS and Geo-Tagged Photos are taken of all water sources

Source yield:

Previous Yields	Present Measured yield (lps)	Safe yield	Date measured (ddmmyy)

Present use of source: Yes/No : if yes fill existing scheme name and tick any one

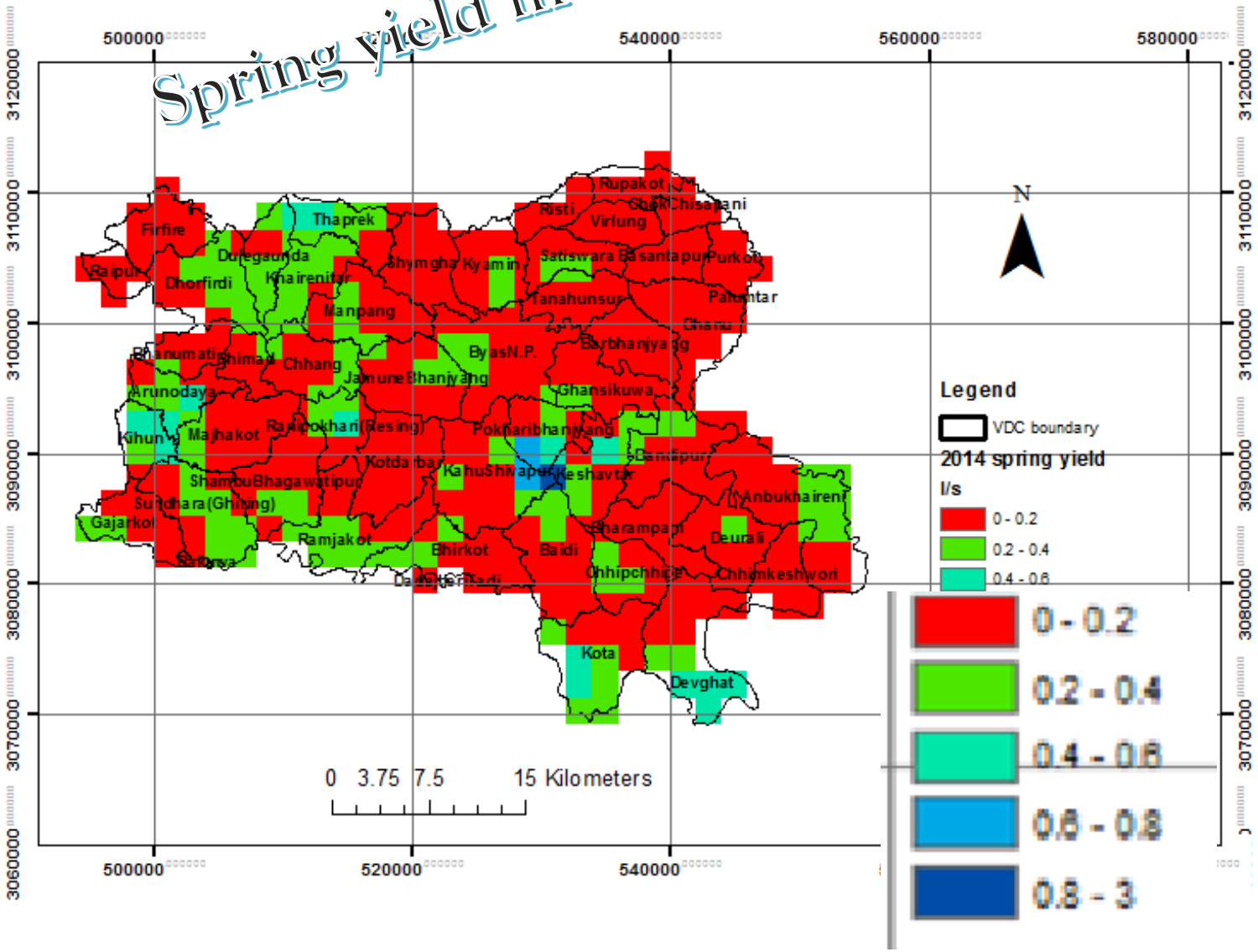
Scheme name: …… …… Scheme type : ☐Gravity ☐Irrigation ☐MHP ☐MUS ☐ . . . .

Environment around the source area 10 Years ago (discuss with villager): (middle of jungle, bushes, land, landslide area, rivulet, etc. & indicate possibility of contamination due to upstream settlement)

Environment around the source area present: (middle of jungle, bushes, land, landslide area, rivulet, etc. & indicate possibility of contamination due to upstream settlement) or other

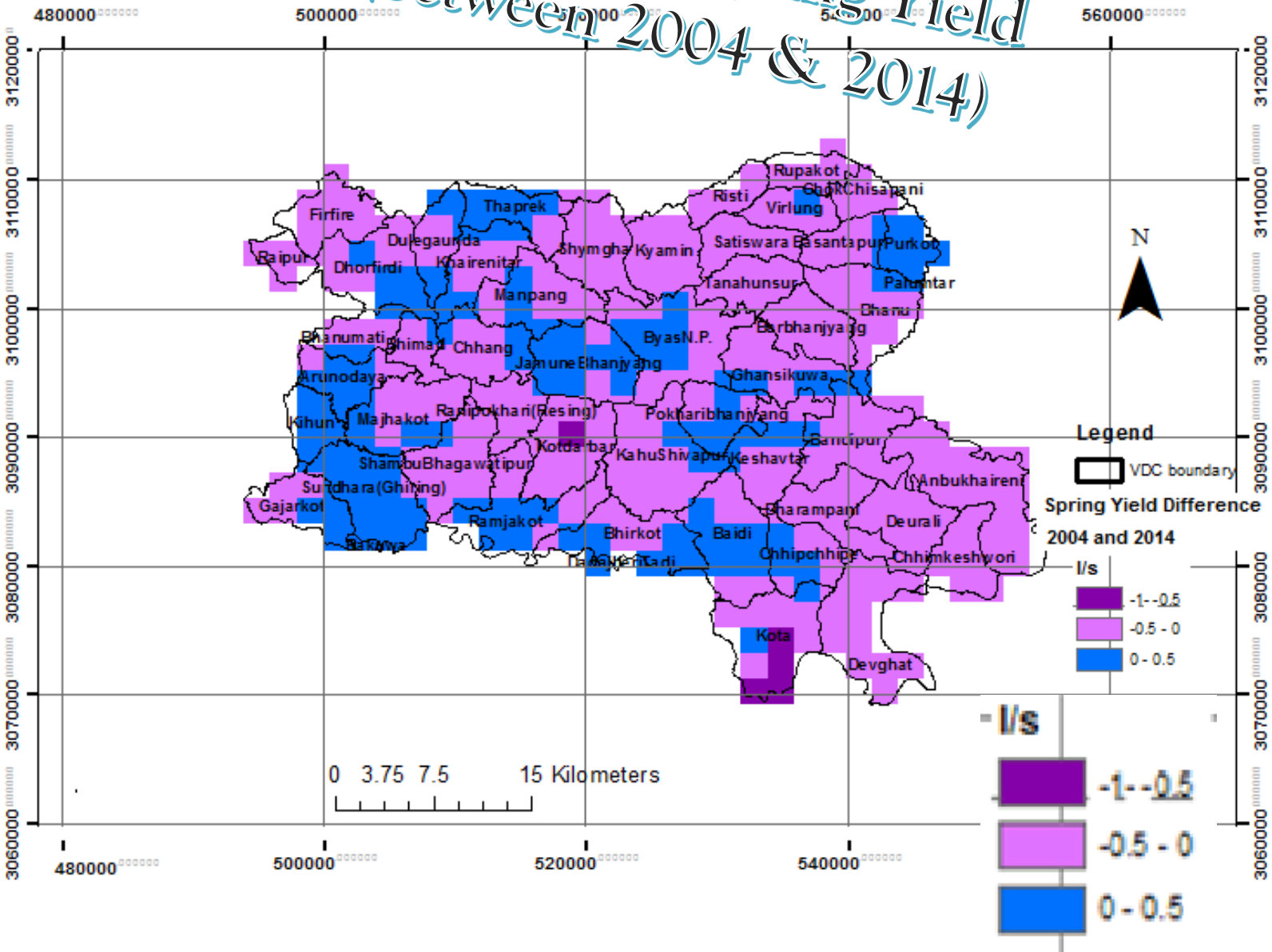
Spring yield in recent year

Kriging Interpolation



All sources

Changes in Spring Yield (between 2004 & 2014)

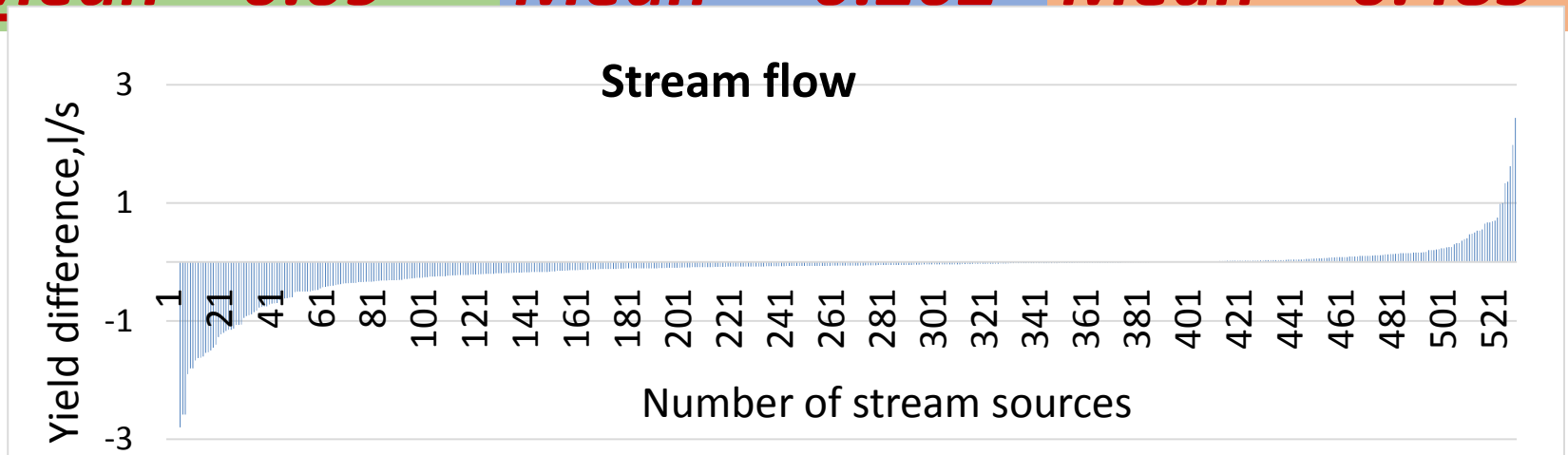


Point source (l/s) -2014		Spring Sources (l/s) - 2014		Stream source (l/s) -2014	
Sample Size	685	Sample Size	1115	Sample Size	587
Range	1.86	Range	3.329	Range	4.9
Mean	0.045	Mean	0.16	Mean	0.32
Variance	0.017	Variance	0.09	Variance	0.21
Max	1.87	Max	3.33	Max	4.98
75% (Q3)	0.045	75% (Q3)	0.16	75% (Q3)	0.32
50% (Median)	0.01	50% (Median)	0.06	50% (Median)	0.23
25% (Q1)	0.001	25% (Q1)	0.001	25% (Q1)	0.06675
Point source (l/s)-2004		Spring Sources (l/s) - 2004		Stream source (l/s) -2004	
Sample Size	685	Sample Size	1115	Sample Size	587
Range	2.99	Range	2.999	Range	4.99
Mean	0.09	Mean	0.204	Mean	0.485
Variance	0.048	Variance	0.11	Variance	0.5
Max	3	Max	3	Max	5
75% (Q3)	0. 1	75% (Q3)	0.2	75% (Q3)	0.4
50% (Median)	0.012	50% (Median)	0.11	50% (Median)	0.23
25% (Q1)	0.001	25% (Q1)	0.001	25% (Q1)	0.13

How sources are declining?

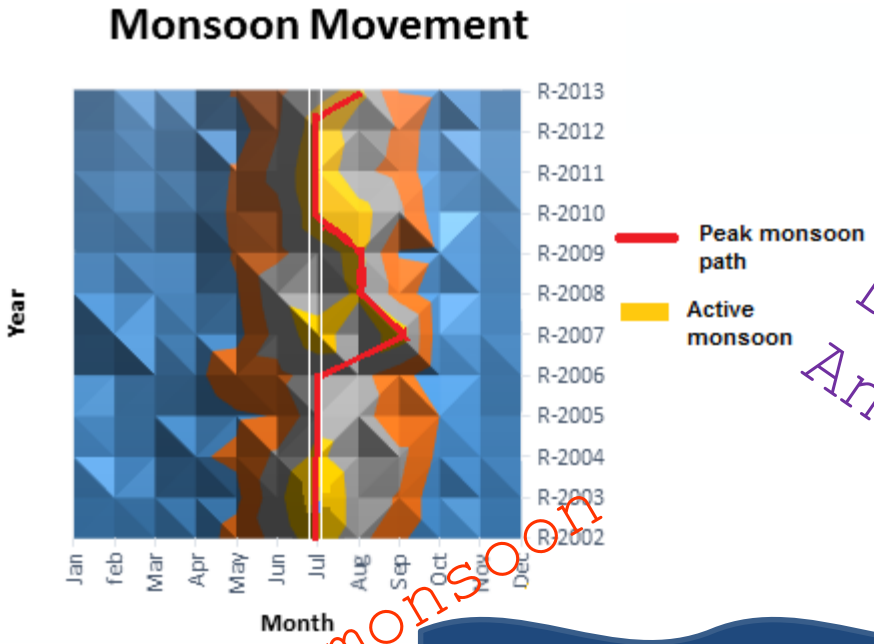
Point source (l/s) -2014	Spring Sources (l/s) -2014	Stream source (l/s) -2014
Mean 0.045	***Mean 0.16***	***Mean 0.32***
Point source (l/s)-2004	**Spring Sources (l/s) -2004**	**Stream source (l/s) -2004**
Mean 0.09	***Mean 0.202***	***Mean 0.485***

-50% -20% -34%



What are the climatic reasons behind this declining yield?

How is Climate between 2003-2013?

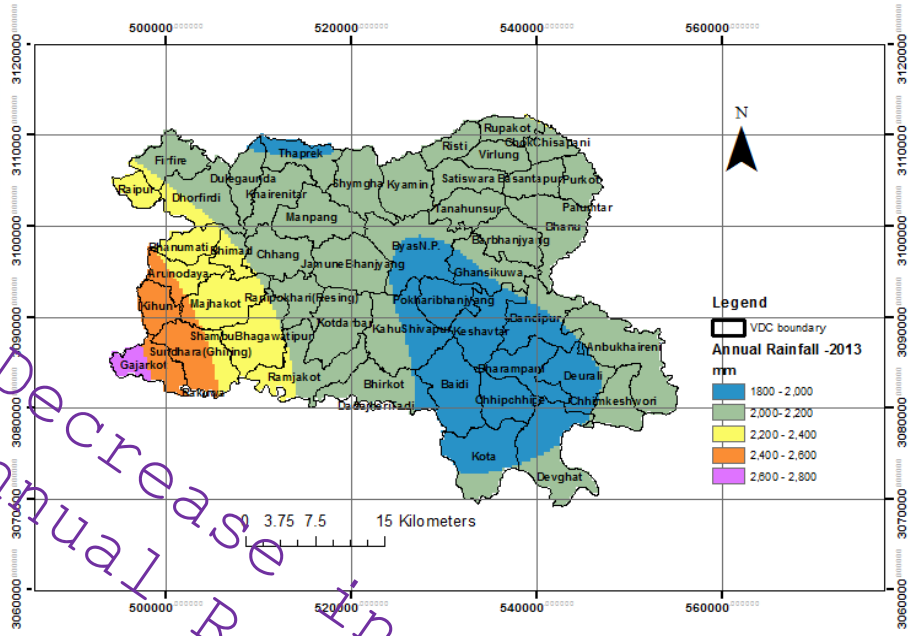


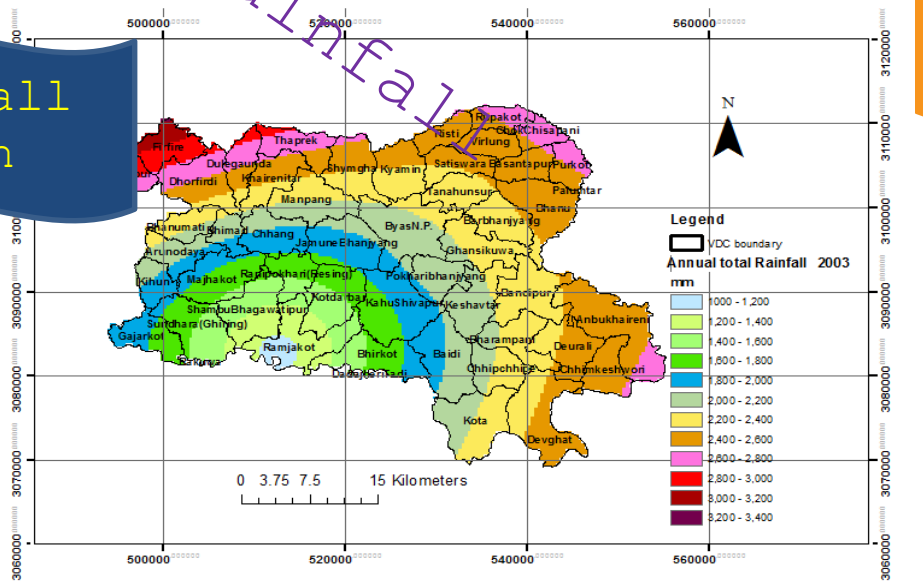
Shifting monsoon

Increase in Temperature

Erratic Rainfall Distribution

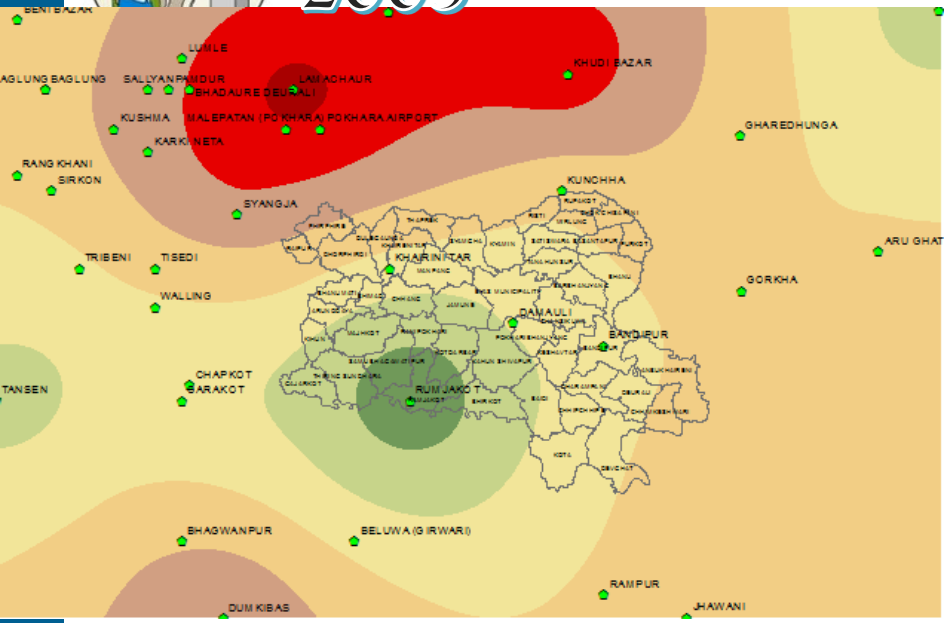
Decrease in Annual Rainfall



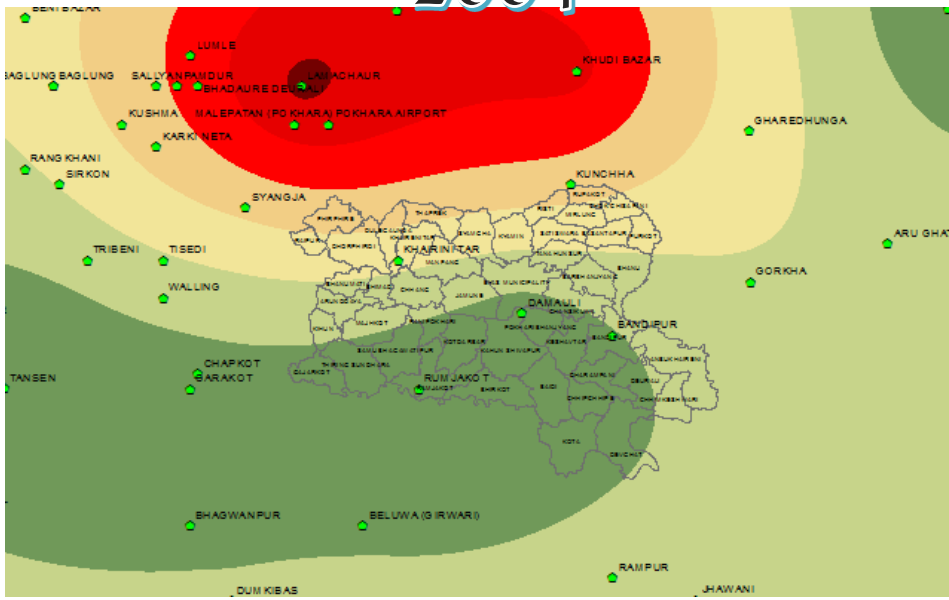


Annual Rainfall Distribution

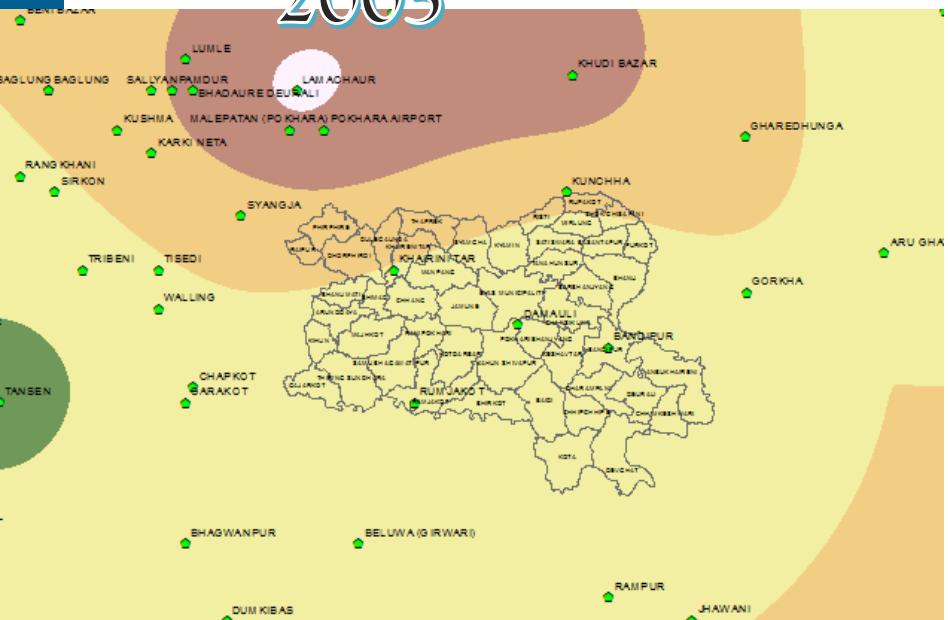
2003



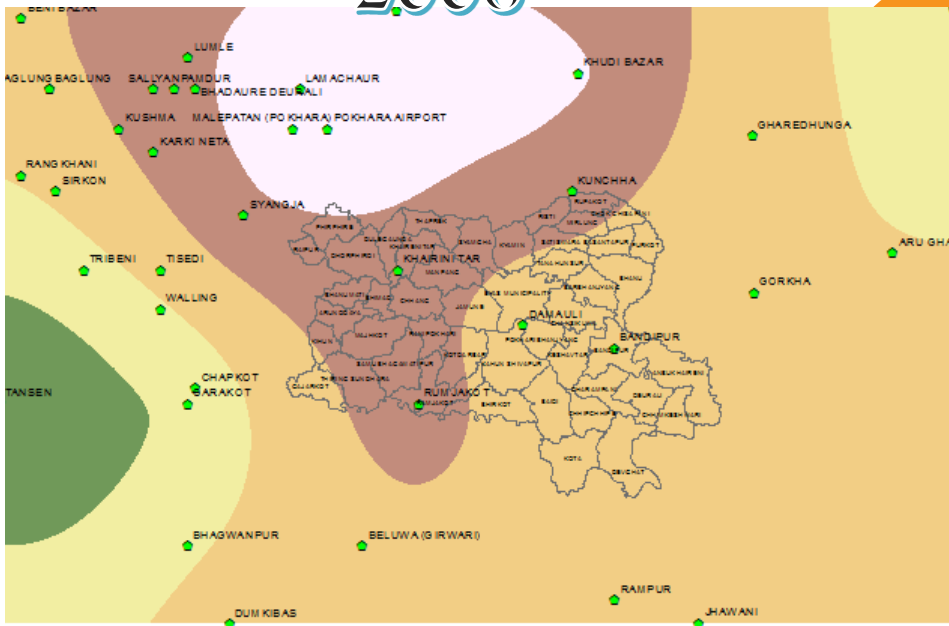
2004



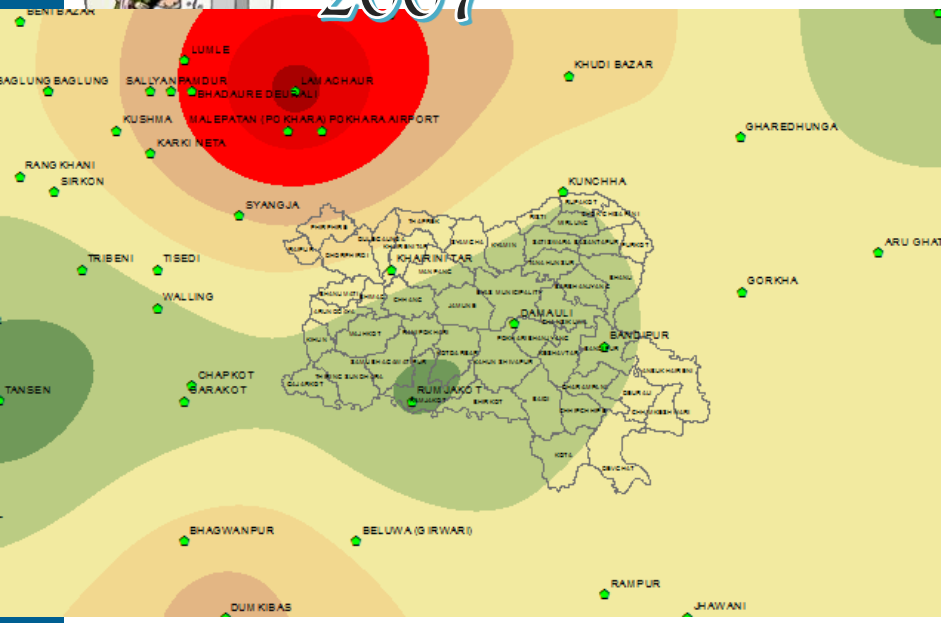
2005



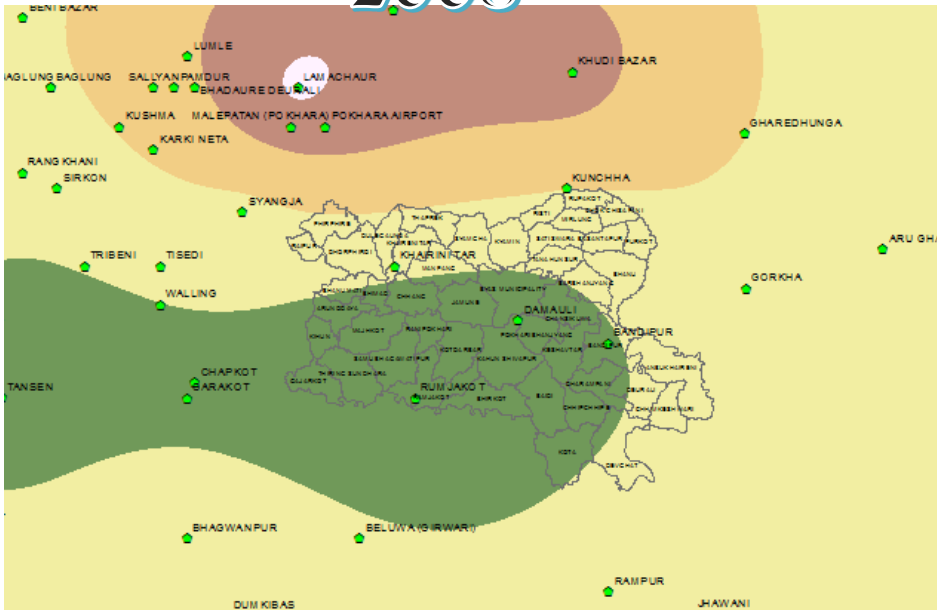
2006



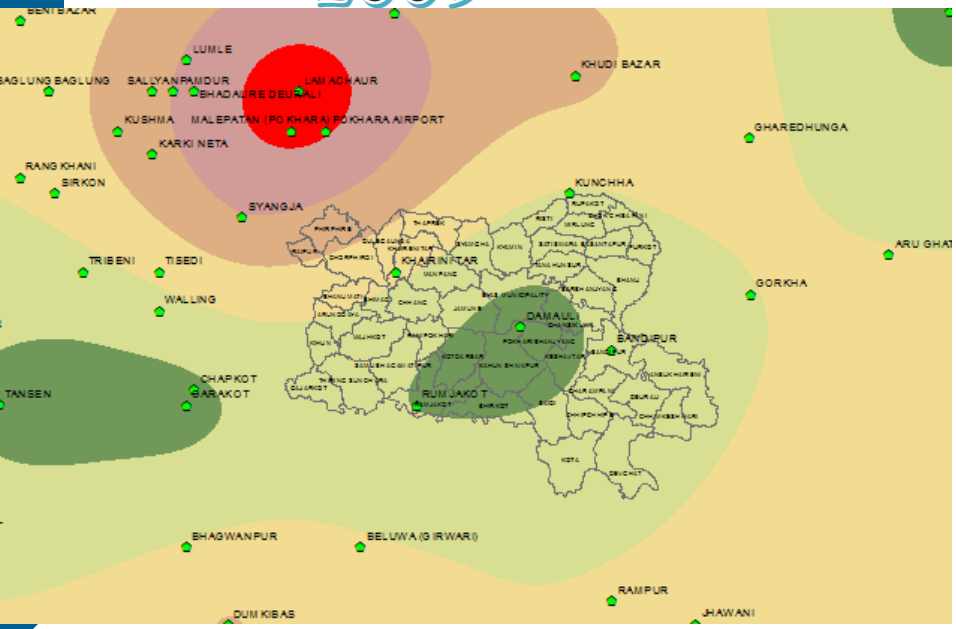
2007



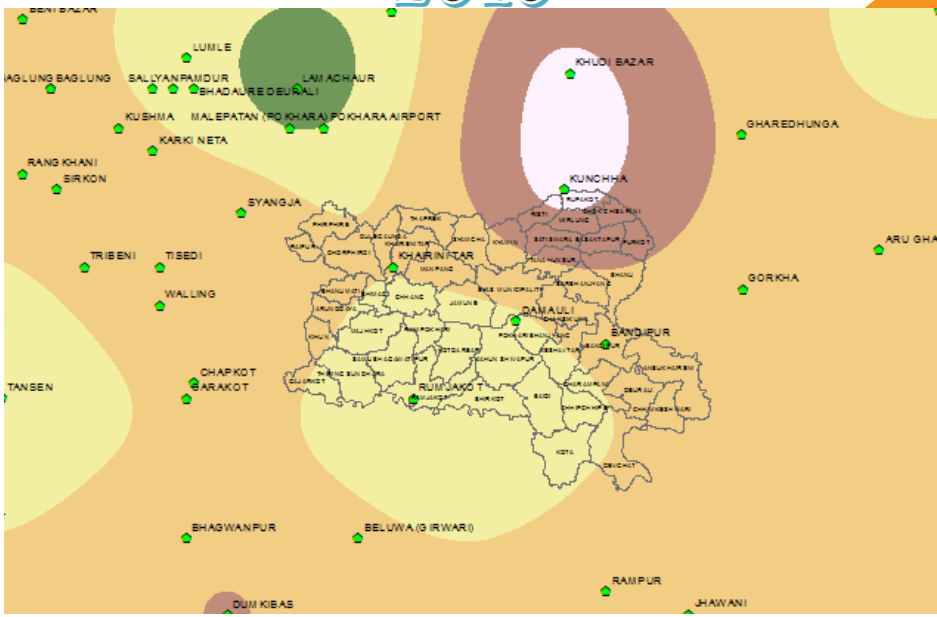
2008



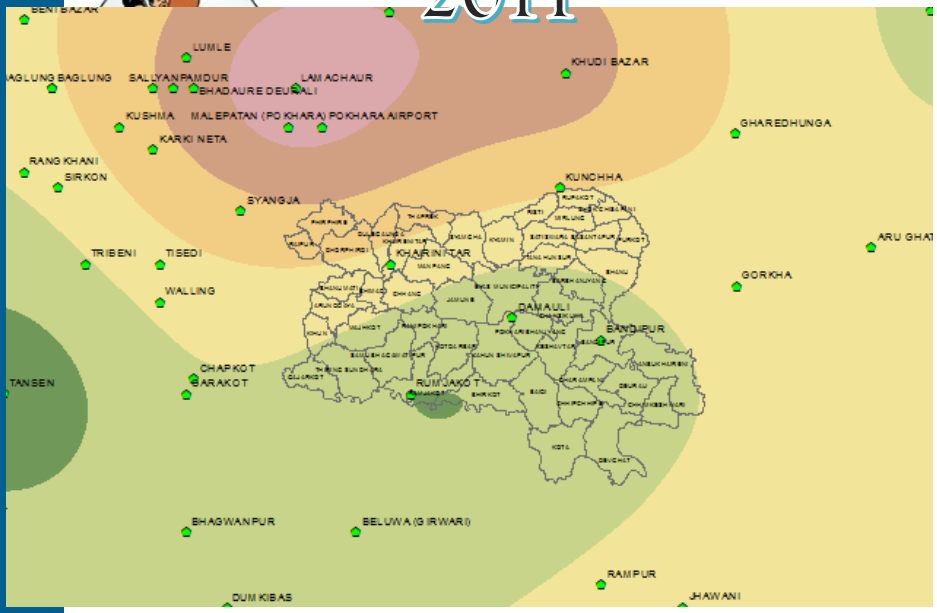
2009



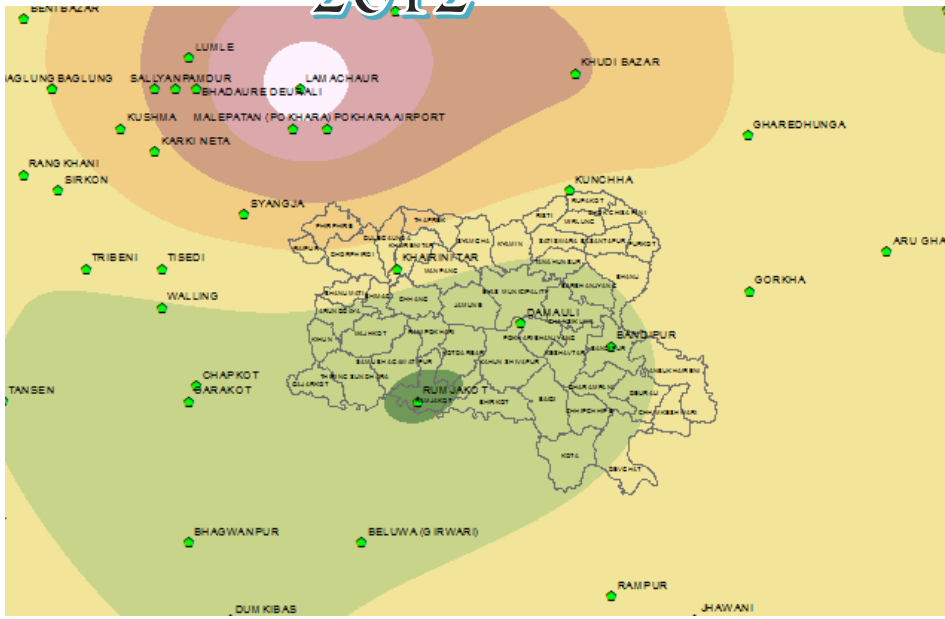
2010



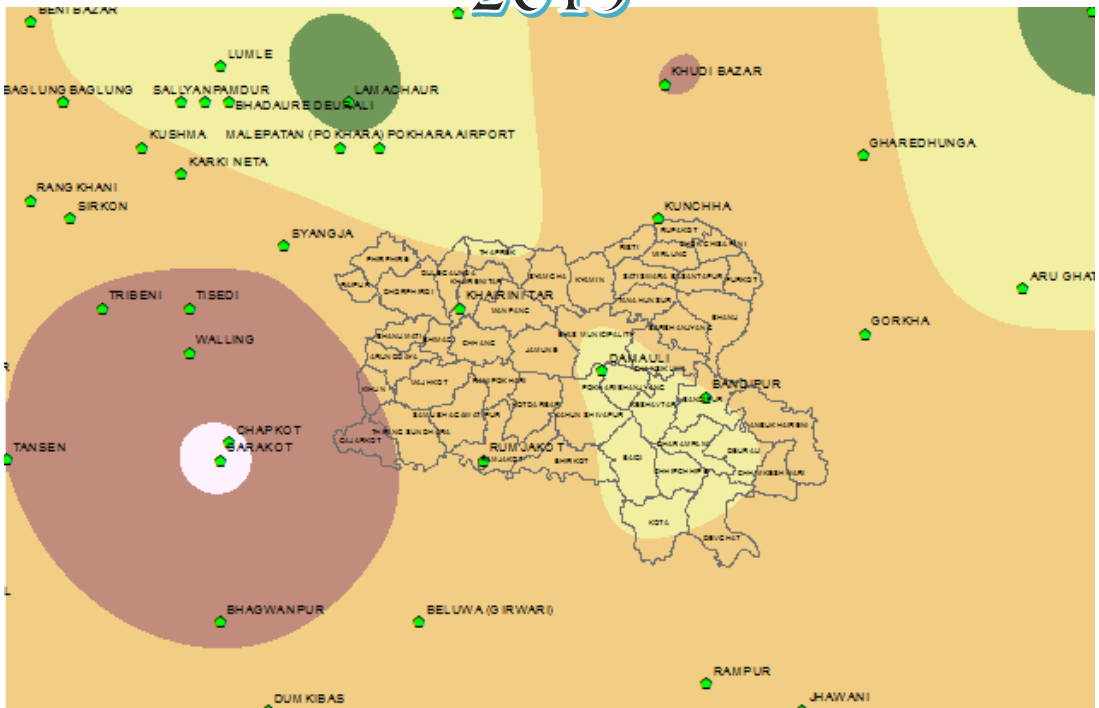
2011



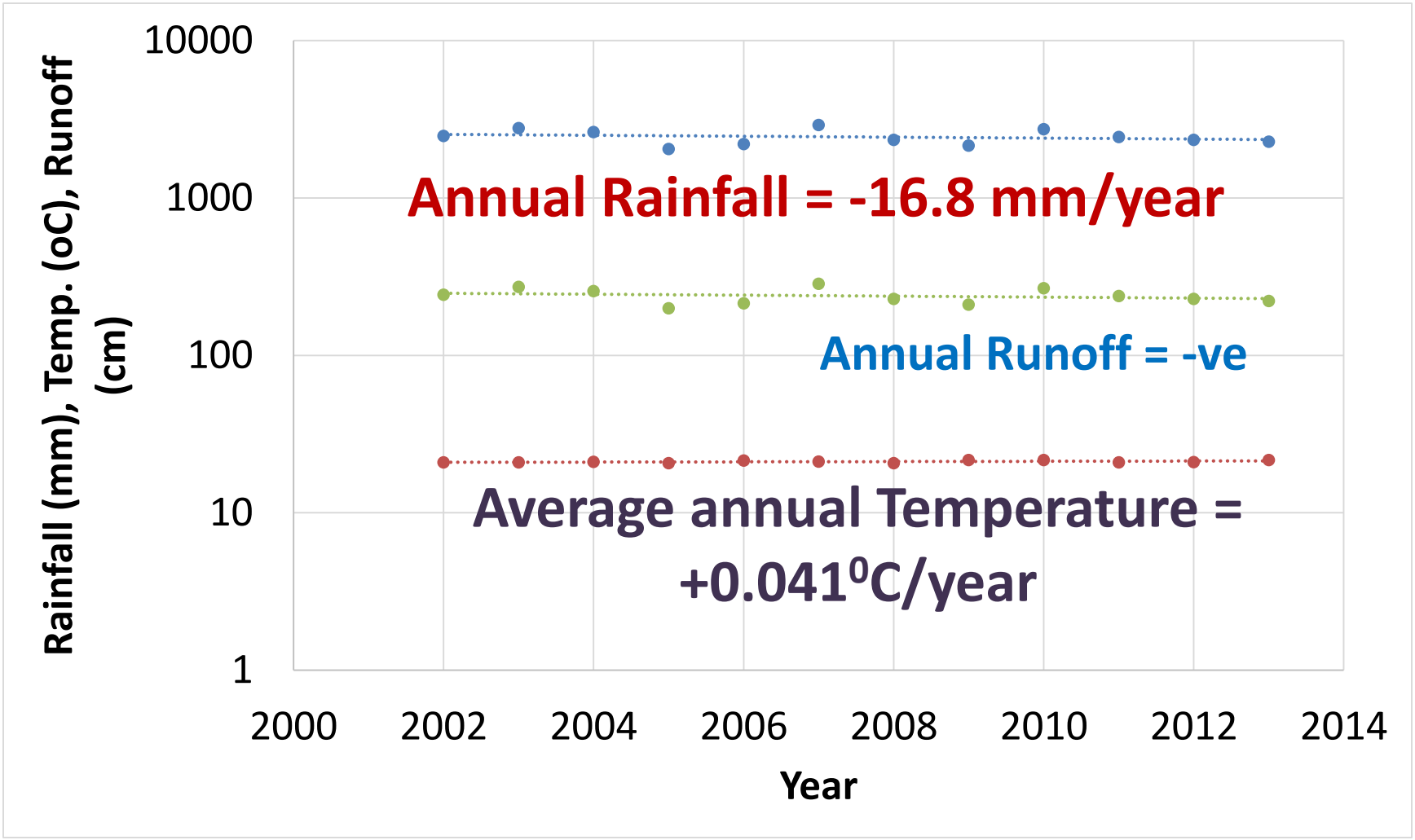
2012



2013



How is Climate between 2003-2013?



CLIMATE AND SPRING YIELD CHANGES (10 years)

Changes between 2004 and 2014	
Annual Rainfall	-16.8 mm/year
Annual Average Temperature	+ 0.041 °C /year
Runoff	-0.59 cm/year
Point source yield	-50%
Spring source yield	-21.6 %
Stream source yield	-34 %

Climate -Future Possible Changes and Current & long term Change

- Long term average (1970 to 2010)

12 x 12km interpolated gridded rainfall shows **2748 mm** (DHM climate portal).

- **The average annual rainfall between 2002 and 2013 is 2298 mm,**
- Projected annual average Rainfall (PRECIS-HadCM3Q0-A1B) between 2030 and 2060 (25x25km gridded) is **2153 mm.**

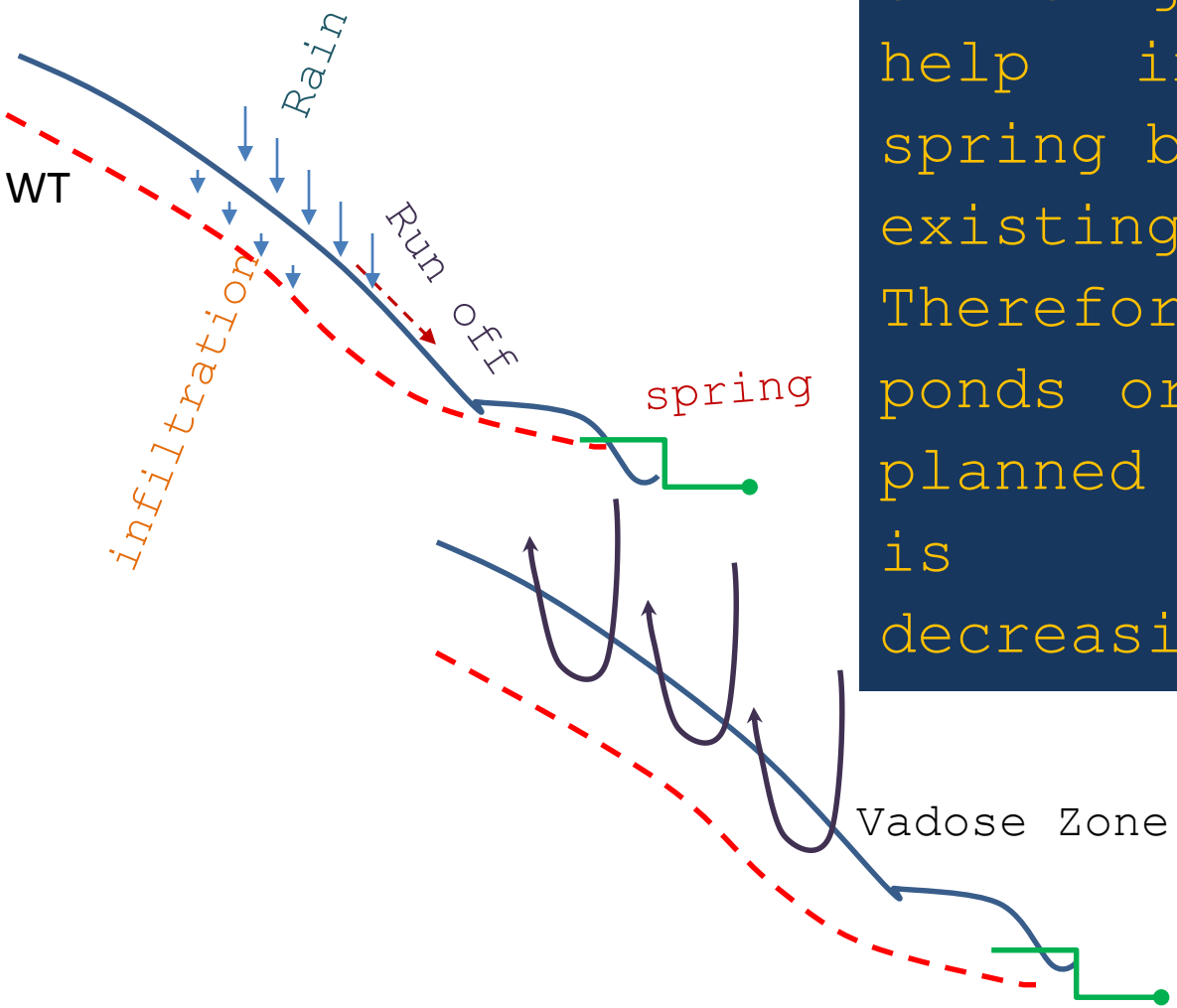
Preparing climate integration in VDC scale

Annual Rainfall	VDC	Scale
2400-2800 mm	Firfire Raipur Dhorphirdi Dulegaunda Thaprek Rupakot	High
1800-2400 mm	Ghansikuwa JamuneBhanjyang Kabilas Keshavtar Khairenitar Kihun Kota Kvamin Majhakot Manpang PokhariBhanjyang Purkot Ranipokhari Risti Satiswara Sundhara Syamgha Tanahunsur Virlung	Medium
1600-1800 mm	Ramjakot Bhirkot Samungbhagawati Ranipokhari Kotdarbar KahuShivapur	Low

Yield between 2004 & 2014

	Point Source	Spring Source	Stream source
Highly Declining	Risti (south-west), Deurali(north), Dharampani, Chipchhipe (north), Rupakot (north-west), Keshavtar (south-east), Anbukhaireni (south),	Kotdabar (central), Kota (central & south), Virlung (west and east)	Risti (central), Virlung (west) Satiswara (Central-north)
Declining	Rupakot, ChokChisapani Firfire, Dorphirdi (north-east) Thaprek, Dulegaunda Virlung, Shymgha, Kyamin Purkot, Dhorfirdi, Satiswara Basantapur, Khairenitar Raipur, Manpang (south), Tanahunsur, Bhanu (south), Barbhanjyang, ByasN.P. Chhang, Bhanumati Bhimad, Ghansikuwa Arunodaya, Majhakot Ranipokhari(Kesing), Bandipur (central), Pokharibhanjyang KahuShivapur, Kotdarbar, ShambuBhagawatipur Anbukhaireni, Ramjakot Gajarkot (northwest), Baidi, Deurali Bhirkot, Chhimkeshwori Chhipchhipe, Devghat, Kota, JamuneBhanjyang (north)	Rupakot, Risti, ChokChisapani Firfire, Thaprek, Dulegaunda Virlung, Shymgha, Kyamin Purkot, Dhorfirdi, Satiswara Basantapur, Khairenitar Raipur, Manpang, Tanahunsur, Bhanu, Barbhanjyang, ByasN.P. Chhang, Bhanumati Bhimad, Ghansikuwa Arunodaya, Majhakot Ranipokhari(Kesing), Bandipur, Pokharibhanjyang KahuShivapur, Keshavtar Kotdarbar,ShambuBhagawatipur Anbukhaireni, Ramjakot (north) Gajarkot, Dharampani Baidi (north-south), Deurali Bhirkot, Chhimkeshwori Chhipchhipe, Devghat, Kota	Thaprek(north-south-central), Syamgha, Ghansikuwa, ByasN.P (north), JamuneBhanjyang (west-south), Keshavtar, Kyamin, PokhariBhanjyang (south-east), Purkot, Ranipokhari, Syamgha, Tanahunsur, Bhanumati (northeast), Virlung, Satiswara Pokharibhanjyang, ChokChisapani, Basantapur, Kotdarbar, Chhang(north-south-central), Bandipur, Devghat, Chhimkeshwori, Deurali, Anbukhaireni Dharampani, Baidi north-south east), Bhirkot, Sundhara (south-east)
Progress	Jamune Bhayanjang (central –south), Gajarkot (south-west), Bandipur (central-north-west),Bhanumati (west), Bhanu (north),Basantapur (southeast), Phurkot (southwest), Manpang (north), Dorphirdi (west)	Thaprek (north-south-east), Purkot, Kihun, Sundhara, Arunodaya, Ramjakot, JamuneBhanjyang, Baidi, Dorphirdi (southeast), Manpang (Central), Pokharibhanjyang(south), Chipchipe (central, south west), Gajarkot (east), Ghansikuwa (south east-southwest), Byas NP(central-west), Khairanitar (south) Bhirkot (east-west)	Kota, Garakot, Majhakot, Raipur, Firfire, Dhorphirdi (north-east-central), Dulegaunda, Khairenitar (north-west-central), Kihun, Manpang (central –south-north), Chipchipe (south), Bhimad, Jamune Bhayanjang, Byas NP(south-west, Sundhara (north-central-west), Bhanumati (south-east-northwest) ShambuBhagawatipur(west), Bandipur (centralwest) Keshavtar(north), Jamune

Conclusion



Shifting of rainfall may help in forming new spring but it may dry up existing source. Therefore conservation ponds or pits should be planned if source yield is remarkably decreasing.

Steps Needed

Rain

Temperature

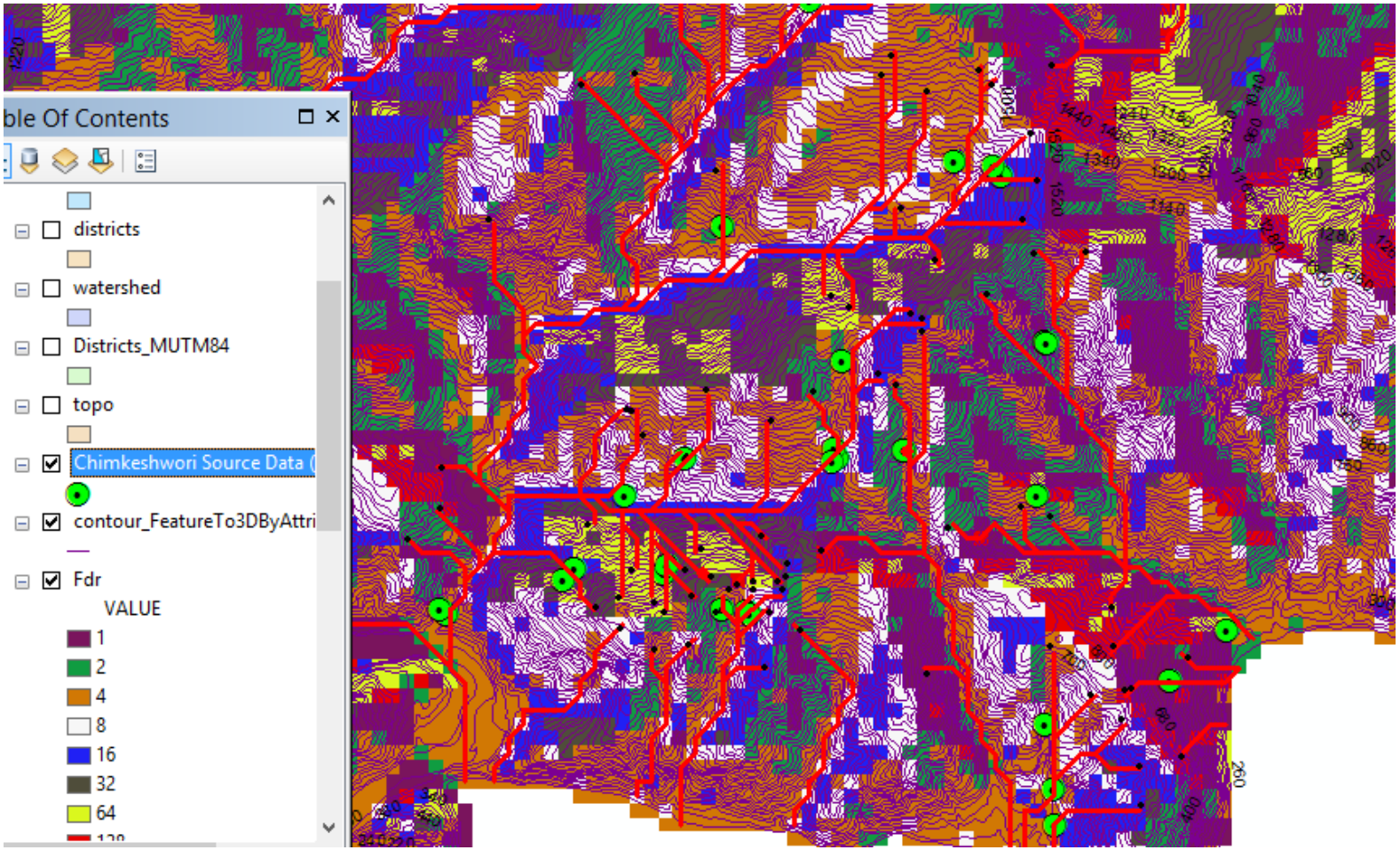
overland flow and subsurface flow tracking should be studied for recharge pits

construction of multiple percolation ponds is also recommended as recharge.

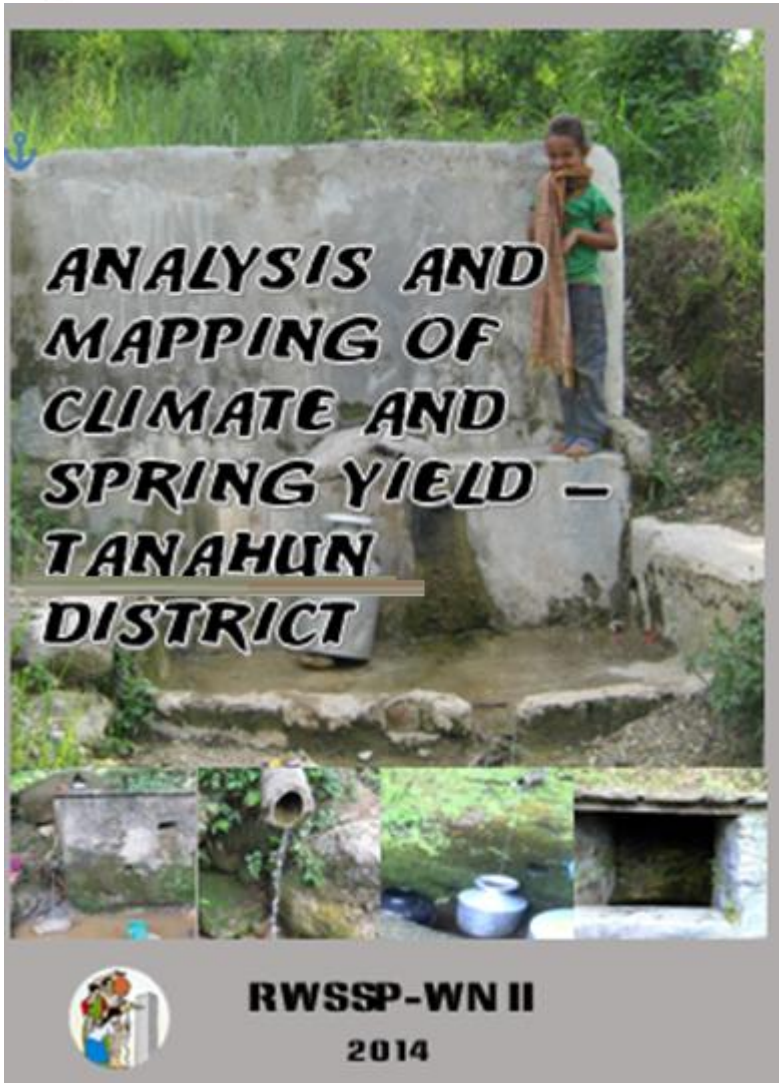
Investigation on water source recharge area using advance technology is needed –Isotopic Analysis for Construction of Recharge ponds

There might be other causes in declining water sources – study necessary

Flow path tracing –ARC hydro



Detail study report



Thank You

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