

Unprecedented floods in Ghaggar Basin

Swarup Bhattacharya and Vineet Kumar travelled to affected areas during floods in Ghaggar basin in Punjab and Haryana and bring this report from the ground

In the first and second week of July 2010, Punjab and Haryana state experienced massive flood disaster in the Ghaggar River basin. Ghaggar and its tributaries breached embankments one after another along its stretch and flooded vast areas. Over 2 lakh ha of agricultural land have been affected in Punjab and Haryana, scores of people and hundreds of cattle have died, houses, roads, bridges, railway lines and canals have been damaged. There were also breaches in canals, leading to transfer of flood waters to other parts of the basin far away from the rivers, spreading floods to areas that should not have experienced floods. Punjab and Haryana Govts have demanded financial assistance to the tune of over a thousand crores each from the Central govt.

Ghaggar, a west flowing river originates in Shivalik hills of Himachal Pradesh flows through Haryana, Punjab, Chandigarh and Rajasthan and disappears in the Thar Desert of Rajasthan. Tangri, Markanda, Saraswati, Pachhisdhara are the few important tributaries. Total basin area of Ghaggar is 32132 sq km.

Villagers residing in the upper catchment of the Ghaggar in Patiala and Ambala Districts have mentioned that the river flow was abnormally high from 5th to 8th July, 2010 due to which the river overflowed and submerged its flood plain at many places. Haryana and Punjab govt. blamed each other for the blockade of river flow and diversion of water. But both of them have raised their fingers on an unprecedented downpour in the catchment of Ghaggar River. Heavy discharge and human interference in the natural flow of river water along with the lack of maintenance of embankments and canals are supposed to be the causes for such a massive loss of life and property of the common people residing in the Ghaggar basin.

Asst. Engineer, Patiala Drainage Division, Punjab told SANDRP that in Patiala District alone, 73 major and minor breaches have occurred in the first quarter of the rainy season in 2010. Here, a breach means the breakdown of manmade barrier called embankment on the both side of the river. He pointed out that Sangrur District of Punjab has completed Ghaggar Channelization process of River Ghaggar just like Sirsa of Haryana District. The Channelization project consists of putting new embankment discarding the older ones.

Pachhisdhara, a tributary of Ghaggar received heavy flow and it overflowed in Punjab in the first week of the July. Main stream Ghaggar along with Markanda and Tangri were full of water during that period. On July 6, Ambala and Patiala District received breached water and that flood water, along the slope of the basin, started

moving in the south-west direction. On 22nd July, flood entered into Hanumangarh District of Rajasthan.

Chronology: How the flood unfolded and travelled

July 6, 2010

- Ambala Cantonment, Ambala city was flooded due to a breach of embankment nearly 5 km North East of the town on Tangri River.
- Parts of the Shahabad town of Ambala District submerged due to a breach on Markanda River.
- Left bank of Sutlej-Yamuna Link Canal (SYL) breached near Jyotisar, Kurukshetra District, Haryana. Thanesar, Kurukshetra, Didar Nagar, Shanti Nagar and Jyotisar got affected.

July 7, 2010

- Another breach occurred 8 km upstream of the previous day breach site near Jyotisar on SYL.
- Ghaggar water spread on both sides of the river near Tatiana, Kaithal District of Haryana. Bordering villages of Patiala District of Punjab flooded. Punjab blamed Haryana for blocking river flow at the siphon site of Ghaggar with Hansi Butana Canal.
- Pachhisdhara water overflowed and inundated Bada Kammi, Lachhuroo, Sarala villages of Patiala District, Punjab.

July 8, 2010

- Ghaggar water breached Hansi Butana Canal and water entered into the HBC (at 0030 hrs) near Tatiana.
- Right bank of the HBC near Tatiana breached at 0330 hrs.
- Pachhisdhara breached left bank of SYL at two places near Bada Kammi, Punjab. Pachhisdhara flow entered into SYL.
- Two more breaches on Pachhisdhara near Mahdudan village, Punjab.
- Bibipur Lake near Jyotisar breached.

July 9, 2010

- Right bank of HBC breached near Keorak, Kaithal District, Haryana.

July 11, 2010

- Three breaches on Rangoi Nallah in Fatehabad District, Haryana. 77 villages affected.

July 12, 2010

- Ghaggar breached near Moonak, Sangrur District of Punjab. 12 villages affected.
- Two breaches on Ghaggar near Sardulgarh, Punjab. 30 villages submerged

July 13, 2010

- Two breaches downstream of Ottu Weir in Sirsa District, Haryana. 6 villages affected

July 14, 2010

- Two more breaches down stream of Ottu Weir. 8000 acres of land and 13 villages affected

July 15, 2010

- Outer embankment breached near Jhopra in Sirsa District. Ellenabad of Sirsa District affected.

July 22, 2010

- Hanumangarh District of Rajasthan affected

Ghaggar floods could be seen in two ways; one is breaching of embankments and spreading of river water in the fields. Another way to look at it is how the Ghaggar water entered the ill designed and ill maintained canals like SYL and HBC and spread to far off areas. Let's see how water entered the two defunct canals (they are yet to be commissioned and are supposed to have no water) and how those two canals instead of providing irrigation water destroyed the standing crop.

Sutlej-Yamuna Link canal Sutlej-Yamuna Link canal

(SYL) with the capacity of 2000 cusecs (cubic feet per second), was built in 1989-90 (90% of the entire canal was built except some portion in Punjab and its head work near Anandpur Sahib) to divert water of Sutlej river to Yamuna. Since then, due to Interstate dispute on sharing of river water between Punjab and Haryana, the SYL canal is yet to be commissioned. Villagers told us that throughout the year, the SYL (though it is not functional) has retained

some water. Since its inception, SYL was not maintained properly. Asst. Engineer, Patiala Drainage Division, Punjab, mentioned that the water from the area around the canal in the Punjab region also sipped and entered into SYL through cracks on the wall of SYL. Haryana farmers blamed Punjab farmers for throwing excess water of their fields to SYL by deliberately puncturing the wall of the canal. It has been observed that in Bada Kammi village, the farmers of Punjab were pumping water from the SYL whereas in Haryana portion of the SYL, we could not see a single such pumpset along the SYL (Haryana farmers criticized the state govt. for not giving permission to pump water from the SYL).

Left bank of SYL near Jyotisar, Kurukshetra District of Haryana breached on July 6, 2010 and flooded the surrounding area. Breached water spread up to Shanti Nagar and Didar Nagar of Kurukshetra city. Just 50 meters upstream of the breached site, Saraswati River and a sewage drain of Kurukshetra are crossing the SYL. Flood water also spread on the other side of the SYL through these cross drainage structures and flooded Jyotisar area. Mr Mithun Lal, Beldar (watchman) of Haryana Irrigation Department who was posted at the breach site near Jogana Khera village of Jyotisar told SANDRP that 10 days before the breach on July 6, the same breach point was under repair from earlier breach.

He said that the negligence to make that temporary plug into a permanent one is one of the main cause for the breach on July 6 and inundation of vast areas of the district. Another breach of SYL occurred on the very next day just few km upstream of the Jyotisar breach point.

Pachhisdhara, a small tributary of River Ghaggar originates near Chandigarh and confluence near Sarala village in Patiala District of Punjab. This tributary also receives sewage water from Chandigarh Drain. Punjab villagers have mentioned that Pachhisdhara was flowing beyond its capacity on 6th, 7th and 8th July 2010 and water overflowed at many places near Bada Kammi,

Lachhuroo, Kapuri, Sanjanpur, Sarada, Raipur, Bada Lachhuroo. Assistant Engineer of Punjab Drainage Department, who is in-charge of this region, told us that Pachhisdhara had breached the left bank of SYL near Bada Kammi village in the early morning of 8th July, 2010. But the breach was plugged. Another breach occurred few hundred meters downstream of the plugged site but this breach could not be plugged. Eventually, 100 feet breach developed by

about 10 am on the same day and the water of Pachhisdhara entered into the SYL. Assistant Engineer also said that two more breaches occurred on the embankment of Pachhisdhara near Mahdudan village but there the flood water did not enter into the SYL.

It is clear from this sequence of events that flood water entered the ill maintained SYL and when the canal breached at downstream locations, it spread the floods to new locations that may not have been flood without such breaches. Thus SYL was instrumental in bringing floods to new areas. The lack of proper maintenance of the canal both in Punjab and Haryana was a major reason. This story of ill maintained canals creating disasters is not limited to SYL, it seems, as we see below for the Hansi Butana Canal, another yet to be commissioned canal of Haryana.

Hansi-Butana Canal Hansi-Butana Canal (HBC), a project of Haryana Govt., officially known as BML-HB-BB-MPLC, was completed for most of its length in 2008-09 at a cost of Rs 400 crores to take Sutlej water to Hansi and Butana region of Haryana. It is supposed to carry 2086 cusecs of water through its brick-lined canal. As per the project design, it is supposed to get water after puncturing the BML (Bhakra Main Line) when it enters into Haryana for a brief stretch in Kaithal District near Samana in Punjab.

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The canal is yet to be commissioned since Punjab and Rajasthan, who have share of water in the BML, have opposed this and Haryana did not get their consent before building the canal. The case is now pending in the Supreme Court.

On 7th July midnight at about 0030 hrs in presence of senior officials of Haryana Irrigation Department, a massive breach (about 70 m) occurred on the left bank of the HBC at Kharal Village. This left bank of the HBC is also the left embankment of River Ghaggar (note that the flow of water in HBC and Ghaggar is in opposite directions). Mr. Arvind Kaushik, XEN (Executive Engineer), Irrigation Department, Kaithal, Haryana told SANDRP that Ghaggar received heavy discharge due to rains and inundated flood plains in Kaithal District of Haryana and Patiala District of Punjab. Flood water created pressure on the left embankment near Tatiana and breached the embankment. Irrigation department of Haryana Govt. claimed that on 8th July Ghaggar water reached 27.50 ft in the gauging station near Tatiana which was 2nd highest in last 26 yrs.

Date	Year	Gauge in ft.	Discharge (in Cusecs)
26-09	1988	25.40	56353
12-07	1993	30.40	100000
06-09	1995	27.10	62070
06-08	2004	27.00	61730
08-07	2010	27.50	63460

Villagers of Khambheda, a flood affected village near Tatiana, told us that after 1993, they have for the first time witnessed such a massive downpour as well as heavy discharge of river Ghaggar. They also mentioned that the floods of 1993 hadn't affected them so much but this flood had taken everything from them. They pointed out that the siphon of HBC on Ghaggar River had obstructed the natural flow and hence, backwater effect inundated the vast areas.

The Punjab govt. has also blamed the Haryana govt. on the same ground of inadequate capacity of the siphon for flooding of Patiala District of Punjab. Another villager said that the large number of pillars of the siphon had obstructed the natural flow. Mr. Arvind Kaushik, XEN replied that in 1993, the level of flood water in Ghaggar River increased from 21ft to 30 ft in one week at the same

gauge station near Tatiana but in 2010, the level of flood water increased from 16ft to 27ft in just one night of 6th-7th July.

Mr. Arvind Kaushik, XEN denied this claim and supported the structural design of siphon by saying that the capacity of that siphon is more than one lakh cusecs (this itself was a gross understatement and an inaccurate figure from the engineer, considering that the design capacity is supposed to be 162300 cusecs) whereas on the night of July 7 the flow in Ghaggar was 63460 cusecs (the discharge capacity of Ghaggar river at the siphon, as mentioned on the board at the site says: 1,62,300 cusecs, see the photo, for other photos of this visit, see: [http://www.sandrp.in/floods/Pictorial depiction of Ghaggar Flood 2010.pdf](http://www.sandrp.in/floods/Pictorial%20depiction%20of%20Ghaggar%20Flood%2009.pdf)).

The politics around the capacity of that siphon will actually require a separate analysis and investigation. There is no doubt that the siphon is going to play crucial role in coming years.

Mrs. Gurnaam Kaur, 55 yrs., residing beside the siphon told us that her paddy field was submerged but not affected too much because it was on the downstream of the siphon on Ghaggar River. She clearly mentioned that their fellow villagers whose land was in the upstream of the siphon, were worst affected than her. She was clearly hinting that siphon did act as a block even at the below design flow of 63460 cusecs. In addition to the siphon structure, villagers also blamed the use of poor construction material and negligence of maintenance.

They showed anger against the state govt for misusing Rs 400 crores on the HBC project. During the field visit, we observed that from Tatiana to Siphon site (nearly 4 km), both the banks of the HBC are in bad

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shape.

Just about two years old, newly built HBC again collapsed nearly 25 kms downstream of Tatiana village at RD 160400 (RD is running distance, all in feet, from some starting point, which is the puncture point at BML for HBC). This time, it was the right bank of HBC near Keorak village. Mr. Vijender Singh, 36 yrs, residing nearby village along with district officials were on the spot on 8th July to strengthen the right embankment of the canal but failed to do so. Mr. Singh blamed on the ill function of the cross-drainage structures near its breach portion. He said that the flood water from

HARYANA IRRIGATION DEPARTMENT		
NAME OF STRUCTURE: SYPHON AQUEDUCT RD.36100		
BML HB:BB MPLC X-ING RIVER GHAGGAR RD.134600		
YEAR 2007-08		
DESCRIPTION	BML HB:BB MPLC	RIVER GHAGGAR
DISCHARGE	2086 CUSECS	162 300 CUS
BED LEVEL	236.564 MTR	228.167 MTR
HFL	U/S	240.943
	D/S,	240.919
F.B.	2.5	
BAYS		48
ANGLE OF X-ING	90°	90°

Kurukshetra entered into the Kaithal drain and that drain was not properly maintained due to which the water engulfed the nearby areas. This stagnant water created pressure from the outer side on the right bank of the embankment on HBC.

Mr. Arvind Kaushik, XEN, said that in-between Tatiana and Keorak, there are 10-20 water inlets which contribute to the HBC. On July 8, water level of HBC rose significantly and created overflowing situation. He said that the flood water of Ghaggar which entered near Kharal village, Tatiana was not the only reason for overflowing HBC near Keorak. Flood water entering through those 10-20 inlets (mentioned above) and breached water of Bibipur Lake flowing through Saraswati drain (another inlet) contributed to the situation. He pointed out that due to the relatively lower height of the right bank of embankment (at breach point), water came out and eroded the outer wall very fast. Suddenly, a portion of the wall collapsed and water spread near to Kaithal town inundating vast areas.

It is clear from this sequence of events that the ill designed (for example the siphon over the Ghaggar river) and ill maintained Hansi Butana Canal has played a crucial role in spreading the flood disaster in Ghaggar basin to new areas.

Interestingly, twenty years ago, a committee was formed named "Ghaggar Standing Committee", which was supposed to work on the flood problems of the basin. The committee is chaired by a Central Water Commission member and includes officials of Punjab, Haryana and Rajasthan. According to Mr. S. S More, Draftsman, Kaithal Water Services Division, Haryana, "More than 20 meetings have had happened since its formation but no result has come out yet."

No matter how much was the "unprecedented" rain in the catchment of the Ghaggar basin, human interference in its natural flow has caused devastation. In the name of "Channelisation" or embankment, policy makers virtually want to turn a river into a canal. The embankments basically work to rapidly transfer the flood from upstream to downstream areas. Suddenly, when a river basin receives more rainfall than what the ill maintained embankments can safely carry, they pass the blame to unprecedented rains or to the other basin states. In the

There are a number of other factors that have contributed to the Ghaggar basin flood disaster. At a number of places the flood plains and even flow paths have been encroached upon by various builders, with the partnership of the bureaucrats, politicians and the engineers. Secondly, the local water harvesting structures have been poorly maintained.

name of embankments we are restricting the movement of a free flowing river. We are putting wall in the name of embankment and narrowing its path. Secondly, we are not properly maintaining the embankments. Thirdly, we are creating additional structures like the canals which are neither properly designed, nor properly maintained.

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builders, with the partnership of the bureaucrats, politicians and the engineers. Secondly, the local water harvesting structures have been poorly maintained. The Building of the HBC itself had illegally encroached into sanctuary areas. Thirdly, exogenous water is entering the basin from the Sutlej and the Yamuna basin and even as parts of the basin was experiencing having rainfall and which was down to create heavy flows in the Ghaggar river, the water from exogenous sources and

groundwater kept entering the surface waters in the basin.

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Moreover, there is no coordination between the riparian states. There is no coordination even within the state also. Therefore, when an upstream state/district receives such a heavy

downpour, they don't bother to alert the downstream states/districts. The downstream areas are also not using the information about rainfall, flows in the upstream areas. Many times, the upstream states are trying to hide the facts and starting to blame others.

One of the direct consequences of this could be seen in Sirsa district when the wheat stored in the open and ill maintained godowns got destroyed, when the authorities there had a notice of more than a week that floods there are bound to come considering the upstream events see the map of Ghaggar basin flood that depicts the chronology of events and progress of flood disaster downstream so clearly.

In case of Ghaggar basin the unused, ill designed and ill maintained SYL and HBC have transferred the flood disaster to other parts of the states. The events in the Ghaggar basin in July 2010 have shown the kind of man made disasters we are inviting. It could be a wake up call if we were interested in learning some lessons. Unfortunately, that does not seem to be the case.

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## Ghaggar Basin: Some basic figures

Ghaggar Watershed:

| Basin   | Name of Stream   | Area (sq km)         |
|---------|------------------|----------------------|
| Ghaggar | Dungri Nadi      | 1138                 |
|         | Saraswati        | 1511                 |
|         | Saraswati        | 2272                 |
|         | Phagna Nadi      | 2708                 |
|         | Patiali Rao      | 1594                 |
|         | Jainti Devki Rao | 1862                 |
|         | Choa Nadi        | 985                  |
| Total   | Ghaggar          | 20062<br>32132 sq km |

Source: <http://cgwb.gov.in/watershed/cdghaghar.html>

| <b>Ghaggar River Basin Information</b> |                           |                         |                         |                                                                                                                                        |
|----------------------------------------|---------------------------|-------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| State                                  | District                  | Average Annual Rainfall | Normal Monsoon Rainfall | Percentage of district fall under Ghaggar Basin. (in Bold letter) (block level in bracket)                                             |
| Himachal Pradesh                       | Solan                     | NA                      | NA                      | NA                                                                                                                                     |
|                                        | Sirmaur                   | NA                      | NA                      | NA                                                                                                                                     |
| Chandigarh                             | Chandigarh (114 sq km)    | 1061 mm                 | NA                      | <b>100% (114 sq km)</b>                                                                                                                |
| Haryana                                | Yamuna Nagar (1756 sq km) | 1107 mm                 | 898 mm                  | <b>35% (614.6 sq km)</b><br>Bilaspur (60%)<br>Chachrauli (0%)<br>Jagadhri (0%)<br>Mustafabad (100%)<br>Radaur (30%)<br>Sadhaura (100%) |
|                                        | Panchkula (816 sq km)     | NA                      | NA                      | <b>95% (775.2 sq km)</b><br>Barwala<br>Pinjore<br>Morni<br>Raipur Rani                                                                 |
|                                        | Ambala (1574 sq km)       | 1076 mm                 | 879 mm                  | <b>100% (1574 sq km)</b><br>Ambala I (100%)<br>Ambala II (100%)<br>Barara (100%)<br>Naraingarh (100%)<br>Shehzadpur (100%)<br>Saha     |
|                                        | Kurukshetra (1530 sq km)  | 582 mm                  | NA                      | <b>95% (1453.5 sq km)</b><br>Ladwa (0%)<br>Pehowa (100%)<br>Shahabad (100%)<br>Thanesar (90%)<br>Babain (100%)                         |
|                                        | Kaithal (2317 sq km)      | 563 mm                  | 480 mm                  | <b>50% (1158.5 sq km)</b><br>Kaithal (50%)<br>Kalayat (0%)<br>Pundari (10%)<br>Rajaund (0%)<br>Guhla (100%)                            |

| State           | District               | Average Annual Rainfall | Normal Monsoon Rainfall | Percentage of district fall under Ghaggar Basin. (in Bold letter) (block level in bracket)                                                                                                                                                      |
|-----------------|------------------------|-------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Haryana (Cont.) | Jind (2702 sq km)      | 515 mm                  | 433 mm                  | <b>5% (135.1 sq km)</b><br>Narwana (30%)<br>Uchana (0%)<br>Alewa (0%)<br>Jind (0%)<br>Julana (0%)<br>Pilukhera (0%)<br>Safidon (0%)                                                                                                             |
|                 | Fatehabad (2490 sq km) | 373 mm                  | 297 mm                  | <b>50% (1245 sq km)</b><br>Fatehabad (60%)<br>Ratia (100%)<br>Tohara (90%)<br>Bhattu Kalan (0%)<br>Bhuna (40%)                                                                                                                                  |
|                 | Sirsa (4277 sq km)     | 318 mm                  | 253 mm                  | <b>75% (3207.75 sq km)</b><br>Sirsa (50%)<br>Dabwali (70%)<br>Odhan (100%)<br>Baragudha (100%)<br>Nathusari Choupta (0%)<br>Rania (100%)<br>Ellenabad (100%)                                                                                    |
| Punjab          | Patiala (3290 sq km)   | 677 mm                  | 547 mm                  | <b>95% (3125.5 sq km)</b><br>Patiala (100%)<br>Nabha (95%)<br>Sanaur (100%)<br>Bhunerheri (100%)<br>Rajpura (100%)<br>Ghanaur (100%)<br>Samana (100%)<br>Patran (100%)                                                                          |
|                 | Sangrur (5020 sq km)   | 558 mm                  | NA                      | <b>95% (4769 sq km)</b><br>Sangrur (70%)<br>Bhawaniagarh (100%)<br>Malerkotla-I (0%)<br>Malerkotla-II (0%)<br>Dhuri (15%)<br>Sherpur (0%)<br>Barnala (0%)<br>Sehna (0%)<br>Mehalkalan (0%)<br>Sunam (100%)<br>Lehargage (100%)<br>Andona (100%) |
|                 | Mansa (2171 sq km)     | 480 mm                  | 397 mm                  | <b>90% (1953.9 sq km)</b><br>Mansa (90%)<br>Bhiki (60%)<br>Bhudhlada (100%)<br>Jhunir (100%)<br>Sardulgarh (100%)                                                                                                                               |

| State     | District                     | Average Annual Rainfall | Normal Monsoon Rainfall | Percentage of district fall under Ghaggar Basin. (in Bold letter) (block level in bracket)                                                   |
|-----------|------------------------------|-------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|           | Bathinda (3367 sq km)        | 408 mm                  | NA                      | <b>20% (673.4 sq km)</b><br>Bathinda (0%)<br>Nathana (0%)<br>Rampura (0%)<br>Phool (0%)<br>Talwandi Sabo (95%)<br>Sangat (20%)<br>Maur (30%) |
|           | S A S Nagar (110 sq km)      | 1061 mm                 | NA                      | <b>95% (104.5 sq km)</b><br>Kharar (100%)<br>Sialba Majri (90%)<br>Dera Bassi (100%)                                                         |
|           | Fatehgarh Sahib (1147 sq km) | 692 mm                  | 547 mm                  | <b>70% (802.9 sq km)</b><br>Sirhind (100%)<br>Amloh (70%)<br>Khamanon (0%)<br>Khera (95%)<br>Bassi Pathana (5%)                              |
|           | Ropar (1440 sq km)           | 855 mm                  | NA                      | <b>5% (72 sq km)</b><br>Anandapur Sahib (0%)<br>Chamkaur Sahib (0%)<br>Morinda (40%)<br>Nurpurbedi (0%)<br>Ropar (0%)                        |
| Rajasthan | Hanumangarh (9656.09 sq km)  | 253 mm                  | NA                      | <b>50% (4828.05 sq km)</b><br>Bhadra (0%)<br>Hanumangarh (70%)<br>Nohar (50%)                                                                |
|           | Sri Ganganagar               | NA                      | NA                      | NA                                                                                                                                           |

Note: NA Stands for Not Available

Source: Rainfall data from District Ground Water Brochures of CGWB

Ghaggar River run-off 1,309 mcm (K L Rao. India's Water Wealth, 1975)

| District Wise Area Under Ghaggar Basin |                 |                    |                                 |                                  |
|----------------------------------------|-----------------|--------------------|---------------------------------|----------------------------------|
| State                                  | District        | Total area (sq km) | Percentage in the Ghaggar Basin | Area under Ghaggar Basin (sq km) |
| Himachal Pradesh                       | Solan           | Not Known          | Not Known                       | 250                              |
|                                        | Sirmaur         | Not Known          | Not Known                       | 250                              |
| Chandigarh Haryana                     | Chandigarh      | 114                | 100                             | 114                              |
|                                        | Yamuna Nagar    | 1756               | 35                              | 614.6                            |
|                                        | Panchkula       | 816                | 95                              | 775.2                            |
|                                        | Ambala          | 1574               | 100                             | 1574                             |
|                                        | Kurukshetra     | 1530               | 95                              | 1453.5                           |
|                                        | Kaithal         | 2317               | 50                              | 1158.5                           |
|                                        | Jind            | 2702               | 5                               | 135.1                            |
|                                        | Fatehabad       | 2490               | 50                              | 1245                             |
| Punjab                                 | Sirsa           | 4277               | 75                              | 3207.75                          |
|                                        | Patiala         | 3290               | 95                              | 3125.5                           |
|                                        | Sangrur         | 5020               | 95                              | 4769                             |
|                                        | Mansa           | 2171               | 90                              | 1953.9                           |
|                                        | Bathinda        | 3367               | 20                              | 673.4                            |
|                                        | S A S Nagar     | 110                | 95                              | 104.5                            |
|                                        | Fatehgarh Sahib | 1147               | 70                              | 802.9                            |
| Ropar                                  | 1440            | 5                  | 72                              |                                  |
| Rajasthan                              | Hanumangarh     | 9656.09            | 50                              | 4828.05                          |
|                                        | Sri Ganganagar  | Not Known          | Not Known                       | 5025.1                           |

| <b>Rainfall in Ghaggar Basin from July 1 to 7, 2010</b> |                 |              |             |               |
|---------------------------------------------------------|-----------------|--------------|-------------|---------------|
| State                                                   | District        | Actual (mm)  | Normal (mm) | Departure (%) |
| Himachal Pradesh                                        | Solan           | 202.1        | 70.5        | <b>187</b>    |
|                                                         | Sirmaur         | 235          | 95.1        | 147           |
| Chandigarh                                              |                 | 264.6        | 53.5        | <b>395</b>    |
| Haryana                                                 | Yamuna Nagar    | 192.2        | 67.5        | <b>185</b>    |
|                                                         | Panchkula       | 113          | 59.1        | 91            |
|                                                         | Ambala          | <b>325.9</b> | 57.2        | <b>470</b>    |
|                                                         | Kurukshetra     | 147.2        | 29.8        | <b>394</b>    |
|                                                         | Kaithal         | 79.3         | 23.6        | <b>236</b>    |
|                                                         | Jind            | 84.7         | 29.9        | <b>183</b>    |
|                                                         | Fatehabad       | 42.3         | 18.6        | 127           |
| Punjab                                                  | Sirsa           | 34.4         | 16.9        | 104           |
|                                                         | Patiala         | 205.4        | 39.0        | <b>427</b>    |
|                                                         | Sangrur         | 65.7         | 38.9        | 69            |
|                                                         | Mansa           | 9.2          | 20.1        | -54           |
|                                                         | Bathinda        | 7.7          | 25.7        | -70           |
|                                                         | S A S Nagar     | <b>378.8</b> | 39          | <b>871</b>    |
|                                                         | Fatehgarh Sahib | 42           | 42.1        | 0             |
| Rajasthan                                               | Ropar           | 225.9        | 44.8        | <b>404</b>    |
|                                                         | Hanumangarh     | 17.9         | 17.9        | 0             |
|                                                         | Sri Ganganagar  | 8.6          | 14.4        | -40           |

Source: <http://www.imd.gov.in/section/hydro/dynamic/rfmaps/WeekByWeekRain.htm>

**Bibipur lake restoration:** Bibipur lake near Thanesar is an old waterbody. Haryana Irrigation Department has decided to restore the Bibipur Lake in Kurukshetra district in a phased manner in order to make optimum use of surplus rain water, recharge the ground water and utilise the saved water in additional area of Western Yamuna Canal Command. During the first phase a sum of Rs 19.96 crore would be spent and farmers of about 100 villages would be benefitted by the restoration of the lake besides providing irrigation facilities to 50,450 acres of land. In the second phase of the Bibipur Lake the level of the lake would be raised to 822 ft at a cost of Rs 77.30 crore. (UNI 260406, Financial Express 16060)

Compiled by Swarup Bhattacharya, South Asia Network on Dams, Rivers & People