

Status of Avian Influenza in India

Avian influenza (AI) virus has been circulating worldwide for centuries with four known outbreaks recorded in the last century. The present wave of Highly Pathogenic Avian Influenza (HPAI) emerged in Hong Kong in 1997. In view of a threat of global outbreak of AI and apprehensions of a human pandemic, the Department of Animal Husbandry, Dairying & Fisheries (DADF), Government of India had prepared an Action Plan in 2005 itself (well before the first outbreak in the country) for prevention, control and containment of Avian Influenza.

India remained free from Avian Influenza till mid-February 2006.

Past Outbreaks of Avian Influenza in India

1. India experienced the first Highly Pathogenic Avian Influenza (H5N1) outbreak in the State of Maharashtra and Gujarat on 18th February, 2015 followed by second outbreak in Madhya Pradesh during March, 2006.

A total of 10.44 lakh birds were culled during control and containment operations undertaken. After successful completion of operations, country regained freedom from the disease in August 2006.

2. The third outbreak of Avian Influenza occurred during July 2007 in a small poultry farm at Chingmeirong in East Imphal district of Manipur. The outbreak was controlled immediately without any further spread to the neighboring areas. A total of 3.39 lakh birds were culled. India achieved freedom from the disease on 7th November, 2007.

3. The fourth outbreak of Avian Influenza in the country was confirmed in Birbhum and Dakshin Dinajpur districts of West Bengal on 15.01.2008. Subsequently, the disease spread to 13 more districts of the State, viz., Murshidabad, Burdwan, South-24 Parganas, Nadia, Hooghly, Howrah, Coochbehar, Malda, Paschim Medinapur, Bankura, Purulia, Jalpaiguri and Darjeeling. The outbreak covered 55 blocks and 2 municipalities in 15 districts of West Bengal. A total of about 42.62 lakh birds had to be culled in the control and containment operations.

4. Fifth outbreak Avian Influenza was also reported in Salema Block of Dhalai district of Tripura on 7th April 2008. Subsequently, the disease spread to two more blocks viz. Mohanpur and Bishalgarh in West Tripura district. A total of 19 lakh birds had to be culled. After successful control and containment operations, India declared itself free from the disease on 4th November, 2008.

5. After a lull of about a month, sixth episode of Avian Influenza was confirmed on 27.11.2008 in Kamrup district of Assam. Subsequently, the disease spread to eight more districts of the State i.e. Kamrup (Metro), Barpeta, Nalbari, Chirang, Dibrugarh, Bongaigaon, Nagaon and Baksa. The outbreak covered 13 blocks and 2 municipalities in 9 districts of Assam. A total of 5.09 birds were culled.

6. Avian Influenza re-emerged in Englishbazar Block of Malda District of West Bengal (7th outbreak) on 15th December, 2008. Subsequently, the disease spreads to 9 more blocks in 5 districts. A total of 2.01 lakh birds were culled.

7. The outbreak was also confirmed in Ravongla municipality (8th outbreak) in South Sikkim district in Sikkim and about 4 thousand birds were culled. The control and containment operations were carried out successfully and the country was declared free on 27th October, 2009.

8. The ninth outbreak was reported confirmed on 14.01.2010 in Khargram block of Murshidabad district of West Bengal, which spread to adjacent block (Burwan) on 30th January, 2010. A total of 1.56 lakh birds were culled, and 0.18 lakh eggs (approx.). The control and containment operations were carried out successfully and the country was declared free from the disease on 2nd June, 2010.

9. Two outbreaks of Avian Influenza one each in Government Duck Farm R.K. Nagar, Agartala on 17.2.2011 and Government Poultry Farm Gandhinagar, Agartala on 6.3.2011 were notified. The outbreaks were limited to the affected farms only. During the operations, 0.21 lakh birds were culled. The control and containment operations were carried out successfully and the country was declared free from the disease on 4th July, 2011.

10. An outbreak was reported in village Bhamondanga Part-1 in Agomoni block in district Dhubri in Assam on 8th September, 2011 which was controlled and contained in time. Two more outbreaks were reported on 19th September, 2011 in villages Nanshatola and Putimari in block Tehatta of District Nadia in West Bengal on 19th September, 2011. During control and containment operations, 48581 birds were culled. The country was declared free from the disease on 4th January, 2012.

11. During 2012, the outbreaks were reported from the states of Odisha (three outbreaks), Meghalaya (one) and Tripura (Three). Another outbreak was notified on 25th October 2012 at CPDO, Hessarghatta, Bangalore. During control & containment operations, 0.81 lakh birds were culled in Odisha, 0.07 lakh birds in Meghalaya, 0.13 lakh birds in Tripura and 0.33 lakh birds in Karnataka.

12. During 2013, an outbreak of Avian Influenza was reported from the state of Bihar at epicenter Regional Poultry Farm, Lanka Tola, Madhubani, district Purnea

and outbreak was notified on 8th March, 2013. During the control & containment operations, 0.06 lakh birds were culled and Rs. 2.06 lakh were distributed as compensation. Another outbreak was reported from Chhattisgarh at Durg and Jagdalpur on 5th August, 2014 where 0.31 lakh birds were culled. Subsequently, the country was declared free from Avian Influenza on 11.11.2013.

13. During 2014, after a gap of about 14 months since August 2013, outbreaks were reported at six epicenters in Kerala during November-December, 2014 and 2.7 lakh birds were culled. An outbreak in ducks was also reported at Sukhna lake, Chandigarh on 18th December, 2014 where 110 ducks were culled during control and containment operations.

14. Another outbreak was reported on 25.01.2015 at Regional Poultry Farm, Kureepuzha in district Kollam of Kerala.

15. An outbreak of Avian Influenza was reported in Amethi district of Uttar Pradesh on 13th March, 2015. During control and containment operations, 844 birds were culled.

16. On 13.04.2015, outbreak was reported from Hayat Nagar district of Telangana where 1.60 lakh birds were culled during operation.

17. The latest outbreak was reported from Imphal of Manipur State on 18.04.2015. During control and containment operations, about 21 thousand birds were culled.

The country was declared free from Avian Influenza on 29.7.2015 after completion of disinfection and Post Operation Surveillance. As part of preparedness, Country wide surveillance is being maintained against the disease.

Till date, the country has experienced 28 episodes of disease in States/one UT. During control and containment operations about 72.46 lakh birds have been culled and about Rs. 24.32 crore has been paid as compensation to the farmers.

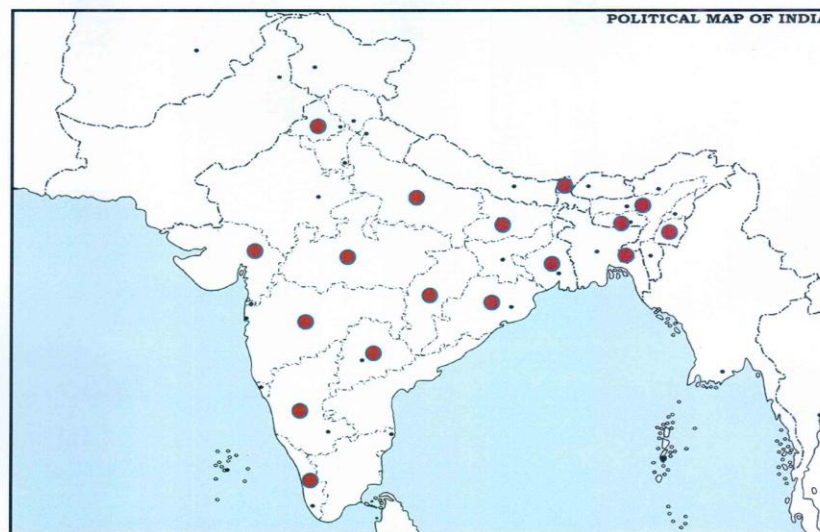
Brief Scenario on Outbreaks of Avian Influenza in India

The trend of infection of Avian Influenza has changed. Initially, in India, the disease was being reported mainly in backyard poultry in vicinity of migratory birds/ water bodies particularly in North-Eastern States and West Bengal. The main species affected used to be chicken. The ducks used to be reservoir of the virus, harbouring the infection without showing the clinical signs/ disease. However, the trend of occurrence of AI changed since 2011, gradually and most of the

occurrences were reported from the poultry farms of central government such as DADF, ICAR and State Governments. Disease also shifted from Northern East to East and southern parts of India such as Odisha, Karnataka and Bihar. Even the wild birds such as crows were not spared, owing to their scavenging nature or due to direct contacts with migratory birds. Occurrences since November 2014 saw AI in new areas of farthest southern areas and North India and disease shifted predominantly from poultry to ducks. In Kerala, number of ducks had to be culled.

Three major H5N1 virus clades have been found in the country till date. The clade identified from outbreaks reported during 2006-2010 was 2.2. This clade was earlier reported from Mongolia. The clade identified between 2011-2014 was 2.3.2.1-A. However, a new clade 2.3.2.1-C has replaced the earlier ones during the outbreaks of late 2014 and 2015. These clades have been reported from Nepal prior to India.

A summarized position of the episodes of Avian Influenza mentioned above is also given in **Annexure-I** and on the map given below :



The map highlights the States where highly pathogenic avian influenza H5N1 outbreaks in poultry were reported (Feb 2006-April 2015).

World-wide AI outbreaks- Present situation

Avian influenza is currently rampant throughout the world. Occurrences of Avian Influenza have been reported from least developed countries, developing countries and the developed countries without any discrimination. There are large number of occurrences of AI infection in developed countries such as USA, Germany and UK despite having a higher level of biosecurity and advanced husbandry practices than in developed countries. During 2014, 26 countries reported the

outbreaks to World Organisation for Animal Health (OIE). The number is even higher during 2015, wherein 39 countries have reported the disease by now.

The virus has been changing its characteristics (clades) very often. Even different sub-types of AI virus have been reported from different parts of the world which were not prevalent earlier. Various new sub-types have emerged.

Migratory birds are considered to be transmitting the infection from one place to distantly placed location. This is evident from the fact that the clades reported from one part of the world have been reported from a different part of the world falling on the route of migratory birds.

Even vaccination has not been of much help in preventing the disease. The countries, who have adopted the immunization approach, have not got much success.

Prevention, Control and Containment of Avian Influenza in the country

All outbreaks of Avian Influenza are handled as per the guidelines in Action Plan on "Preparedness, Control and Containment of Avian Influenza". The major activities undertaken for control and containment are: notification of Outbreak to OIE, demarcation of culling and surveillance areas as per Action Plan, launch of control & containment operations by Rapid Response Teams (RRTs), culling of birds in the culling area, absolute Ban on Movement of Poultry and products from the culling and surveillance zones, disposal of Dead Birds; instant Compensation for Culling, clean-up and Disinfection, Post Operation Surveillance, declaration of Freedom from Disease etc.

Containment operations during outbreaks: Further role of Department

The Department deputed Central observers of the states to help, guide and monitor the control and containment operations. The neighbouring states were informed and alerted for the necessary preventive measures/actions. Ministry of Health was involved in control and containment operations to prevent the ingress of disease to human beings.

A massive Information, Education and Communication (IEC) campaign to prevent and contain the disease has been useful in generating public awareness, cooperation, timely reporting of the disease and biosecurity measures to prevent further damages.

Possible reasons for occurrence of Avian Influenza:

A number of factors contribute to make India vulnerable to primary incursion of Avian Influenza into the country. These include high density of poultry population;

mixed rearing of chicken and ducks; three flyways of migratory birds passing through the country; illegal movement of poultry and poultry products from infected areas into the country; presence of large number of water-bodies visited by migratory / wild birds; inadequate bio-security in backyard rearing; inadequate sanitation of wholesale and retail poultry markets; endemic situation of Avian Influenza in the neighboring countries and porous nature of the border.

Surveillance and monitoring:

Surveillance of the disease and monitoring of preparedness for prevention and control of avian influenza are constantly emphasised with State Governments. A robust surveillance plan was prepared by the Department based on wider consultations and was implemented from November, 2013. Under Surveillance Plan, general surveillance in absence of AI outbreak includes passive surveillance which is basically clinical surveillance and active surveillance envisaging collection of samples, both Virological as well serological samples, from poultry for agent and antibody detections and targeted surveillance on wild birds, live birds markets, ducks and water fowls. Intensive surveillance is carried out during AI outbreaks in the designate surveillance zone.

Reports of unusual mortality in poultry and wild birds are constantly reviewed by the department and samples are immediately required to be sent to the concerned Regional Disease Diagnostic Laboratory (RDDL) and NIHSAD, Bhopal for disease diagnosis. In the event of Avian Influenza outbreak, the concerned State and the adjoining States are alerted immediately. A number of measures have been prescribed by the Department for better preparedness against Avian Influenza. Details are at **Annexure-II**.

Strengthening of laboratory infrastructure:

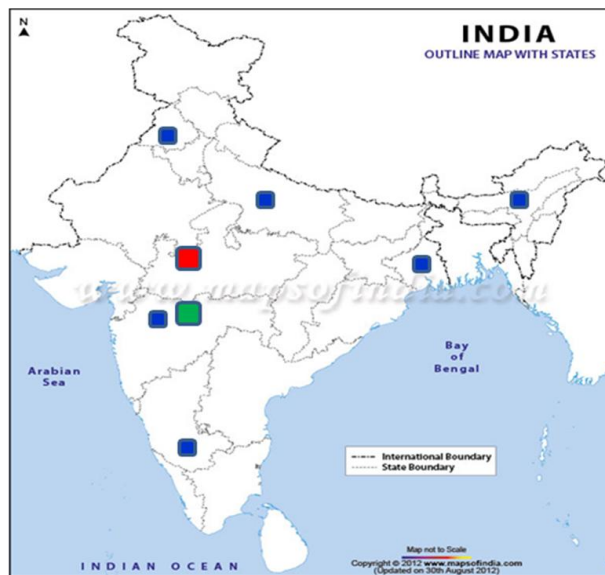
During the course of tackling various episodes of Avian Influenza in the country, non-availability of adequate laboratory infrastructure to handle samples for testing of Avian Influenza emerged as a serious constraint. In order to overcome this constraint, the Department had taken up the task of systematic strengthening of laboratory infrastructure under a World Bank assisted project, as given below:

- (a) To strengthen the diagnosis of Avian Influenza, under World Bank assisted project on Avian Influenza, four pre-fabricated Bio-Safety Level-III (BSL-III) laboratories have been established at Jalandhar, Kolkata, Bangalore and Bareilly. In addition, a mobile BSL-III laboratory gifted by Japan has been installed at NERDDL, Guwahati.
- (b) Department is funding RDDLs for testing of AI & other animal diseases and National institute of High Security Animal Diseases (NISHAD), Bhopal is funded for AI

testing as national surveillance programme. It is an apex laboratory on AI testing accredited by OIE.

(c) Out of 23 State Disease Diagnostic Laboratories in 21 States selected for upgradation to BSL-II level, 21 have already been upgraded and are functional. Remaining are at various stages of completion. This will enable these laboratories to handle serum samples for testing Avian Influenza.

National Laboratory network is shown in the map below:



ICAR-NIHSAD, National Reference Centre for Animal Influenza
NIV, National reference Centre for Human influenza
Central/Regional Disease Diagnostic Laboratories (6 nos.)

Laboratory diagnosis:

Laboratory diagnosis is done for Avian Influenza by

- (a) Viral RWA detection by RT-PCR and Real Time RT-PCR
- (b) Virus isolation is done in embryonated specific pathogenic free eggs followed by HA sub-typing using Haemagglutination and Haemagglutination Inhibition tests, RT-PCR and Real time RT-PCR.
- (c) Antibody detection is done by Agar Gel immunodiffusion tests to detect the presence or absence of antibodies to Influenza A virus infection.

Haemagglutination Inhibition test is done to determine if antibodies indicating Influenza A virus infection are of different subtypes including H5 and H7.

Virus isolation is done by NISHAD, Bhopal.

Characterization of Avian Influenza virus:

National Institute of High Security Animal Diseases (NIHSAD), Bhopal under the Indian Council of Agricultural Research, New Delhi carries out genome sequencing and analysis of the avian influenza viruses isolated from the outbreaks as part of virus characterization. Sequence analysis of the H5N1 avian influenza viruses isolated from outbreaks during 2006 to 2015 identified four genetic lineages/clades of the virus. Clade 2.2 (Qinghai-like) virus was detected in poultry during 2006 and 2007 outbreaks. Outbreaks during 2008-2010 (in West Bengal, Tripura, Assam and Sikkim) were due to clade 2.2.2.1, whereas clade 2.3.2.1a was identified during outbreaks in 2011 in states of Tripura, Assam and West Bengal, in 2012 in states of Odisha, Meghalaya, Tripura and Karnataka, in 2013 in states of Bihar and Chattisgarh. This clade has also been reported in 2015 from states of Telangana and Manipur. However, a new clade 2.3.2.1c was detected during late 2014 till early 2015 in the States of Kerala, Uttar Pradesh and Union Territory of Chandigarh. This new clade (2.3.2.1c) was first reported in the South-Asia region (Nepal) in 2010. Details of clades of H5N1 viruses reported in the neighbouring countries since 2007 are also given below:

Bangladesh: H5N1 clades 2.2, 2.2.2.1, 2.3.2.1a and 2.3.4.2

Bhutan: H5N1 clades 2.2.2.1 and 2.3.2.1

Nepal: H5N1 clades 2.2, 2.3.2.1a and 2.3.2.1c

Lessons learnt:

Strategy of rapid diagnosis and culling of birds in the infected area (culling zone) has proved very effective in controlling Avian Influenza in the Country. The robust implementation of Surveillance Plan by States for early detection of viruses at risk areas such as poultry establishments, wholesale markets (particularly at border areas) retail value chain, wetland, migratory birds nesting places, ducks, water fowls and geese is the most important need for preventing of AI in the country. There is a

need for further strengthening and expansion of AI diagnostic infrastructure for timely and accurate diagnosis for rapid control and containment operations.

Cost and benefits of AI control

Direct cost from AI outbreaks occur from death of the birds and the birds culled during AI control and containment operations including costs on account of preparedness such as trained manpower, surveillance, reporting, communication diagnostic infrastructure and implemented costs on control and containment operations etc. cost, are also on account of bio-security and preventive human healthcare also. Cost on payment of compensation on account of the birds culled during AI control and containment operations in the country so far is amounting to Rs. 24.32 Crore. There are indirect costs on account of loss of livelihood, which affects full households in loss of wages, loss of assets and exposure to economic distress, market loss and impact on international trade.

Control measures on AI conversely benefit poultry owners particularly backyard poultry, poultry farm owners, domestic market and international market operations. It prevents risk to human health apart from protection of poultry/poultry products for a regular supply chain in domestic market.

Due to effective control and containment operations in the country, AI is contained almost at source and the country is able to declare itself free on regular intervals. Disease is reported regularly to OIE and correspondence is made to the importing countries of poultry products from India. As a result, there is no interruption in the growth of international trade as well as domestic trade in poultry & poultry products.

Future Plans

1. Action Plan on Preparedness, Control and Containment of Avian Influenza would be reviewed and updated time to time based on experiences gained and scientific knowledge. Accordingly, Action Plan has been revised in March 2015 and circulated to States and other stakeholders for implementation
2. Surveillance on Avian Influenza (AI) is an ongoing activity and would stress on early detection of AI viruses for a rapid response for Control & Containment Operations under the Action Plan on Avian Influenza. The country has sufficient knowledge and expertise in handling the outbreaks of Avian Influenza. To strengthen the efforts of the Department for early warning and in prevention of disease, a robust surveillance regime has been prescribed. However, this needs to be fine-tuned time to time based

on experiences gained and latest international standards so as to enable timely prevention and control of Avian Influenza.

3. Stress on Surveillance in live birds markets at international border areas, wetlands/water bodies and nesting places of migrated birds with regular surveillance on ducks & geese and waterfowls.
4. Further strengthening and expanding of laboratory infrastructure for AI testing. For this purpose, laboratories of ICMR such as NIV Pune and other places are proposed to be included in the laboratory network.
5. Regular review of the preparedness of the States for Control and Containment Operations.

Position of the outbreaks of Avian Influenza in the country

Episode	Period	State Affected	Number of Epicenters	No. of birds culled (in lakhs)	Compen-sation paid (in INRs lakhs)
1 st	Feb – Apr, 2006	Maharashtra	28	9.4	270.00
	Feb, 2006	Gujarat	1	0.92	32.00
2 nd	Mar ,2006	Madhya Pradesh	1	0.09	3.00
3 rd	July, 2007	Manipur	1	3.39	94.00
4 th	Jan – May, 2008	West Bengal (1 st episode)	68	42.62	1229.00
5 th	Apr, 2008	Tripura	3	1.93	71.00
6 th	Nov – Dec, 2008	Assam	18	5.09	170.00
7 th	Dec, 2008 – May, 2009	West Bengal (2 nd episode)	11	2.01	36.00
8 th	Jan, 2009	Sikkim	1	0.04	3.00
9 th	Jan, 2010	West Bengal (3 rd episode)	12	1.56	68.80
10 th	Feb –Mar, 2011	Tripura	2	0.21	2.40
11 th	8 th September, 2011	Assam	1	0.15	6.52
12 th	19 th September, 2011	West Bengal	2	0.49	19.29

13 th	11 th January, 2012	Odisha	1	0.32	24.71
14 th	13 th January, 2012	Meghalaya	1	0.07	7.89
15 th	17 th January, 2012	Odisha	1	0.11	5.87
16 th	28 th January, 2012	Tripura	1	0.06	1.20
17 th	4 th February, 2012	Odisha	1	0.38	2.86
18 th	15 th March, 2012	Tripura	1	0.05	0.09
19 th	28 th April, 2012	Tripura	1	0.02	0.72
20 th	25 th October 2012	Karnataka	1	0.33	0.00**
21 st	8 th March, 2013	Bihar	1	0.06	2.06
22 nd	5 th August, 2013	Chhattisgarh	2	0.31	0.00**
*23 rd	25 th November- 8 th December 2014	Kerala	6	2.77	379.51
*24 th	18 th December, 2014	Chandigarh	1	.00110	0.00**
*25 th	25 th January, 2015	Kerala	1	0.08	2.16
26 th	13 th March, 2015	Uttar Pradesh	1	.00844	-
27 th	13 th April, 2015	Telangana	1	1.60	176.80
28 th	18 th April, 2015	Manipur	1	0.21	13.89
Total			171	74.30	2622.77

****Government farms/lake (Chandigarh). No compensation paid.**

Measures implemented by the Department for Preparedness, Control and Containment of Avian Influenza

- i. The Surveillance Plan on Avian Influenza in the country has been prepared in November, 2013 and circulated to the State/UT Governments/ Regional laboratories etc. for implementation.
- ii. Action Plan on Avian Influenza was revised in November, 2006 based on experience gained during control and containment operations in 2006. After subsequent outbreaks of AI, the Action Plan on “Preparedness, Control and Containment of Avian Influenza” was revised in 2012 based on the gaps identified during control and containment and new scientific knowledge available. The same was circulated to the State/UT Governments for implementation. It has further been revised in March 2015 and have been circulated to the States for its implementation.
- iii. Surveillance of the disease and monitoring of preparedness for prevention and control of avian influenza are constantly emphasized with State Governments. NIHSAD, Bhopal and various RDDs are involved in surveillance of the disease. In the event of Avian Influenza outbreak, the concerned State and the adjoining States are alerted immediately. The bordering states are also alerted in case of an outbreak in a neighboring country.
- iv. To strengthen the diagnosis of Avian Influenza, under World Bank assisted project on Avian Influenza, four pre-fabricated Bio-Safety Level-III (BSL-III) laboratories have been established at Jalandhar, Kolkata, Bangalore and Bareilly. Out of 23 State Disease Diagnostic Laboratories taken up for the purpose, twenty one have been upgraded to BSL-II and the remaining is under upgradation. In addition, a mobile BSL-III laboratory gifted by Japan has been installed at NERDDL, Guwahati.
- v. About 90% veterinary workforces in the country have been trained to handle control and containment operations.
- vi. To enable an immediate response, 44395 community members trained for providing information on HPAI/ suspected HPAI to the nearest veterinary institution.

- vii. Sensitization of general public on Avian Influenza through Information, Education and Communication (IEC) campaigns.
 - viii. The Department compensates the farmers for the forced culling of poultry and the destruction of eggs and poultry feed on 50: 50 basis between Centre and State.
 - ix. Import of poultry and poultry products from HPAI positive countries have been banned.
 - x. Border check posts with neighboring countries have been strengthened.
 - xi. Advisories are issued to the states for further guidance to the poultry farmers from time to time on various aspects of disease control, surveillance and importance of biosecurity.
-

Status of BSL -2 laboratories

23 laboratories are being set up in 21 States.

Sr. No.	State	Status
1.	Himachal Pradesh (Shimla)	Completed and functional.
2.	Gujarat (Vadodara)	Completed and functional.
3.	Uttarakhand (Hrishikesh)	Completed and functional.
4.	Goa (Panjim)	Completed and functional.
5.	Haryana (Sonipat)	Completed and functional.
6.	Chhattisgarh (Raipur)	Completed and functional.
7.	Meghalaya (Shillong)	Incomplete, Status unknown.
8.	J & K (Jammu)	Completed and functional.
9.	Rajasthan(Jaipur)	Completed and functional.
10.	West Bengal (Jalpaiguri)	Completed and functional.
11.	Madhya Pradesh (Bhopal)	Incomplete.
12.	Karnataka (Devnagar)	Completed and functional.
13.	Orissa (Cuttack)	Complete.
14.	Tamil Nadu (2) Erode & Angalur Namakkal	Completed and functional.
15.	Maharashtra (Nagpur)	Completed and functional.
16.	Kerala (Tiruvalla)	Incomplete.
17.	Andhra Pradesh (2) (Vijayawara, Hyderabad)	Completed and functional.
18.	Manipur (Imphal)	Completed and functional.
19.	Tripura (Agartala)	Completed and functional.
20.	Jharkhand (Ranchi)	Complete and functional.
21.	Bihar (Patna)	Incomplete.

