

Monitoring of Irrigation Projects using BHUVAN web Services NWA, Pune

30th June,2014

2.1 Field Data

The field data required is name of the canal, name of the parent canal, design offtake chainage, design canal length, CCA/ICA of corresponding canal, design irrigation potential for the entire project (Table-1).

Table 1.Field data Required for online monitoring

S.No	Name of Canal	Name of parent canal	Design offtake chainage (km)	Design canal length (km)	CCA (ha)	ICA (ha)	Design irrigation potential (ha)

2.2 Satellite Data

The satellite data covering the study area will be available in Bhuvan website. The data is available under corresponding project and can be accessed by selecting the project. The specifications of the satellite data are shown in Table-2.

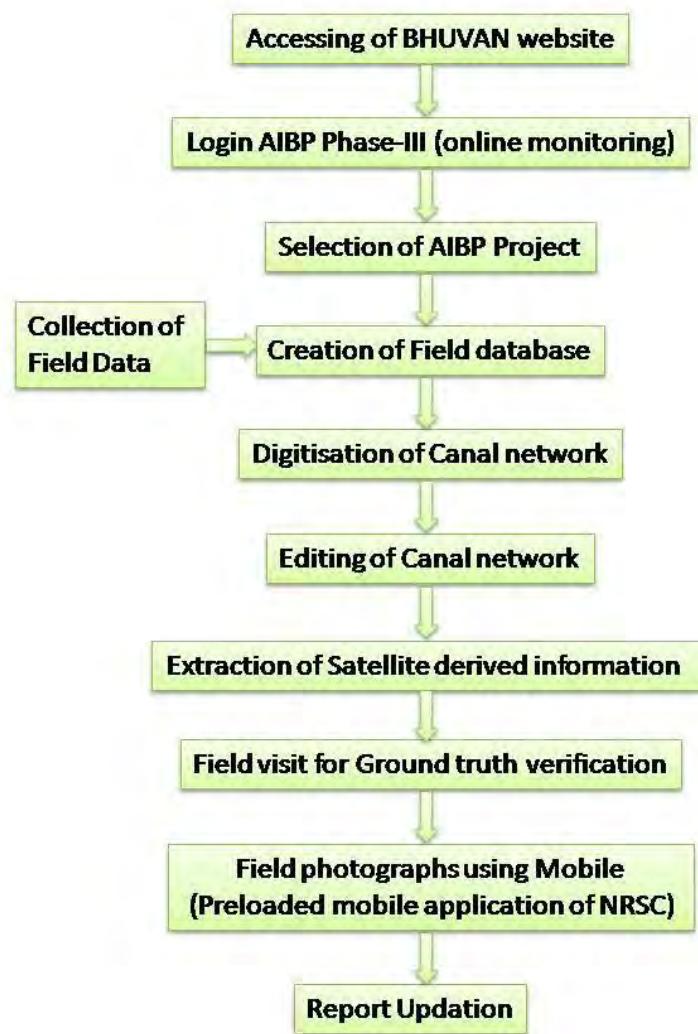
Table 2.Specifications of Satellite Data

Satellite	Cartosat-1/ Cartosat-2
Sensor	Panchromatic
Spatial Resolution	2.5 m/1 m
Level of Product	Orthorectified product



3 Overview of Online Monitoring

The basic processes involved in this study are collection of field data, accessing of Bhuvan website through authorised login, creation of field database, digitisation of canal network, editing of canal network, field visit for ground truth, etc. The following figure shows the flowchart of methodology for online monitoring of AIBP projects.



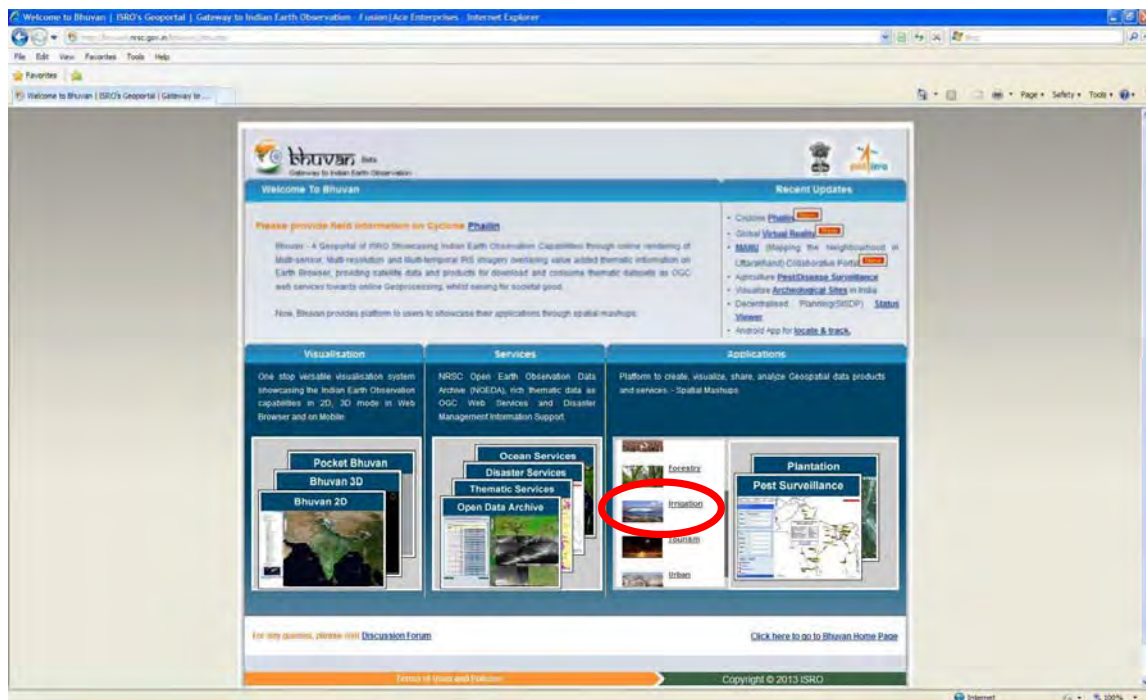
Flowchart of methodology for online monitoring of AIBP projects

4 Procedural Steps for Derivation of Canal Network

Follow the sequence of the steps given below for satellite based derivation of canal network using Bhuvan web services:

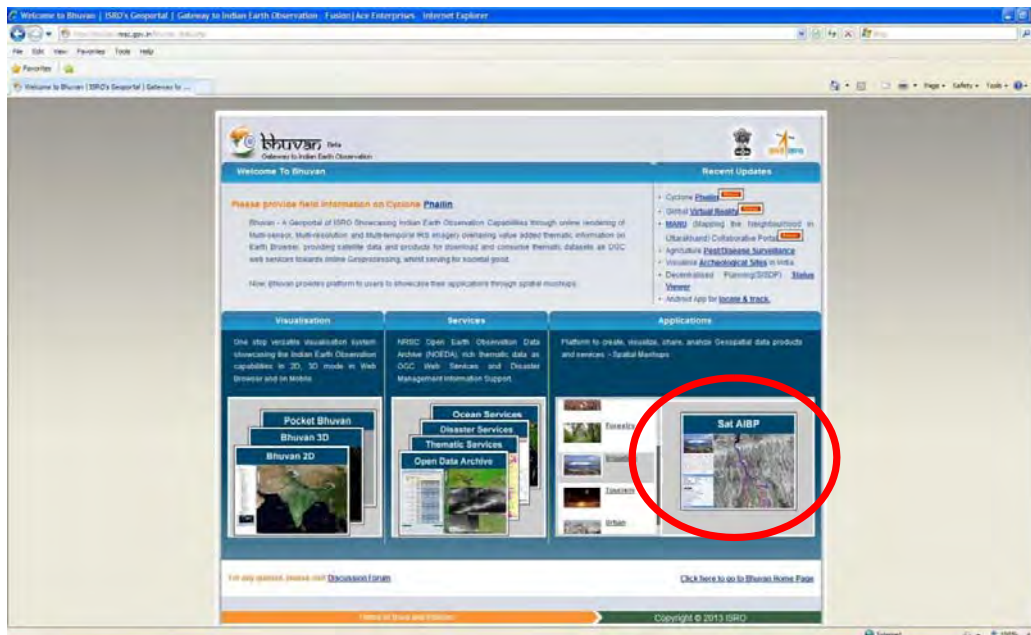
1. Type the following URL name for accessing the AIBP module on Bhuvan website

"http://bhuvan.nrsc.gov.in"



2. Scroll down 'Applications' list and Click on Irrigation theme (encircled in Red colour)

The following SatAIBP icon appears in the web page



3. Now click on SatAIBP icon (encircled in Red colour)

The following SatAIBP main page appears.

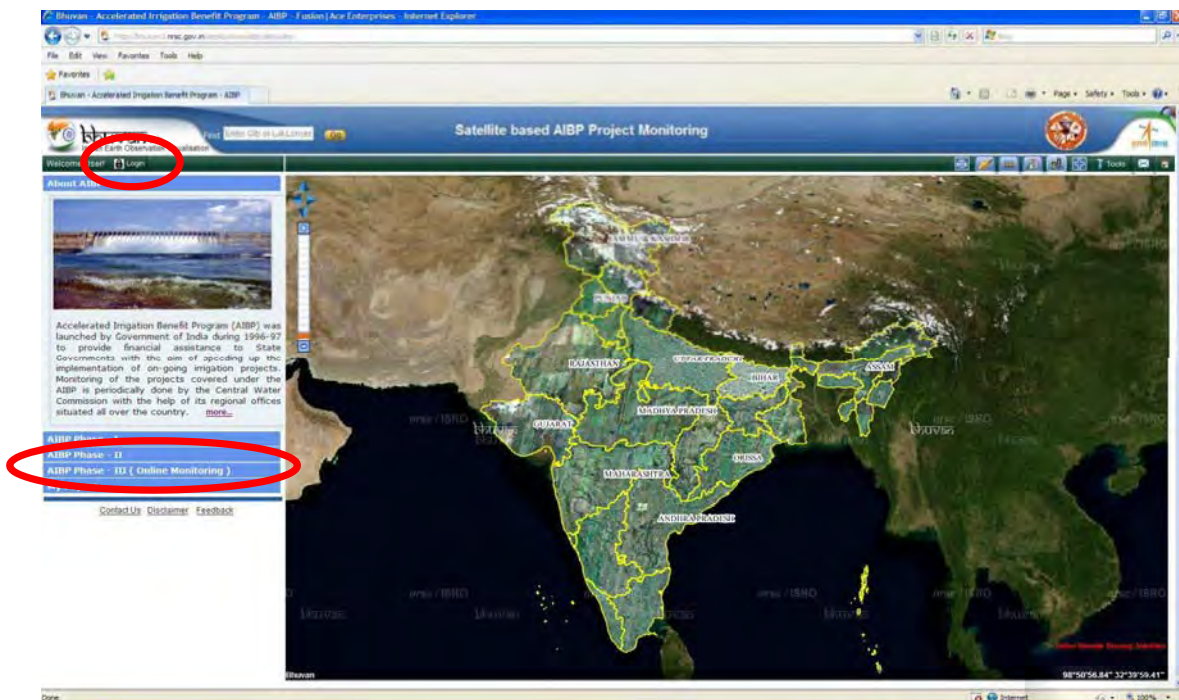


4. Click on link "Click here for AIBP Monitoring Portal" at the bottom of the page.

User Manual

The following page with below mentioned three links appears:

- i. AIBP Phase-I..... Static database of 53 projects can be accessed under this link
(Studies carried out by NRSC)
- ii. AIBP Phase-II..... Static database of 50 projects can be accessed under this link
(Studies carried out by NRSC)
- iii. AIBP Phase-III (Online Monitoring) - To be executed by CWC twice in a year.

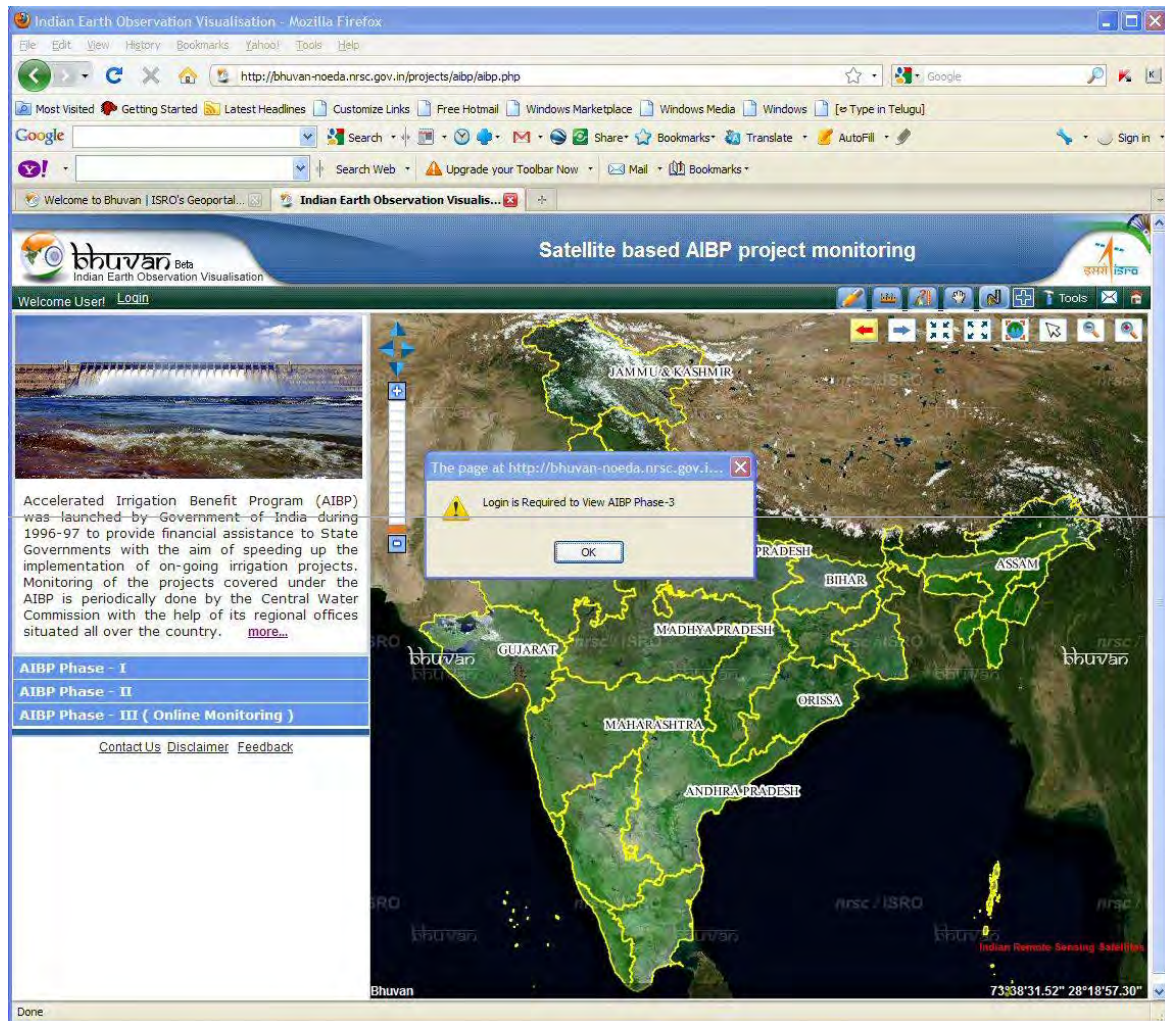


5. To log in to AIBP Phase-III, the user can click on any one of the following links: "login" or "AIBP Phase-III (Online Monitoring)".

Click on link " AIBP Phase-III (Online Monitoring) ".

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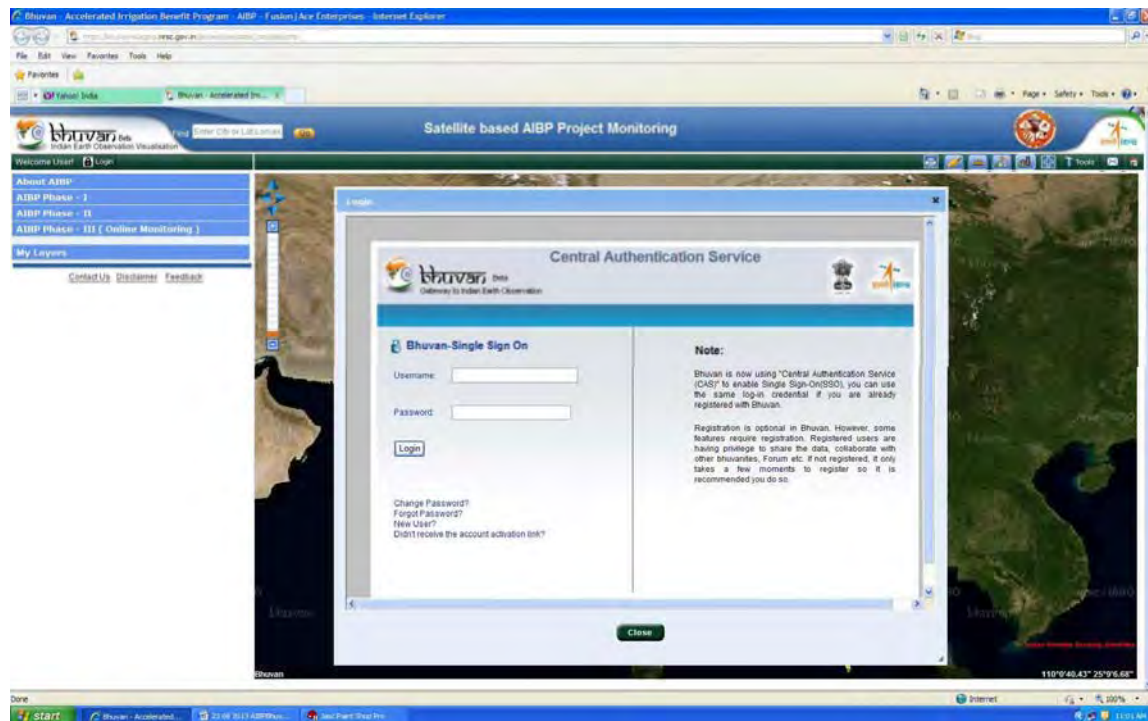
The following message appears on the web page.



6. Click on "Ok" in the message box

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The following Bhuvan authentication page appears



The Bhuvan signin has three levels of login options:

- i. Central : This login is only for officers located at Head quarters, CWC. The users of central login can have access to all the projects in Phase-III.
- ii. Regional: This login is only for officers located at Monitoring Directorate of specific region (North/south/Central/East/West). The users of regional login can have access to all the projects under their jurisdiction.
- iii. Field Monitoring Directorate: This login is only for officers located at concerned Field monitoring directorate. The users of this login can have access to the concerned projects only.

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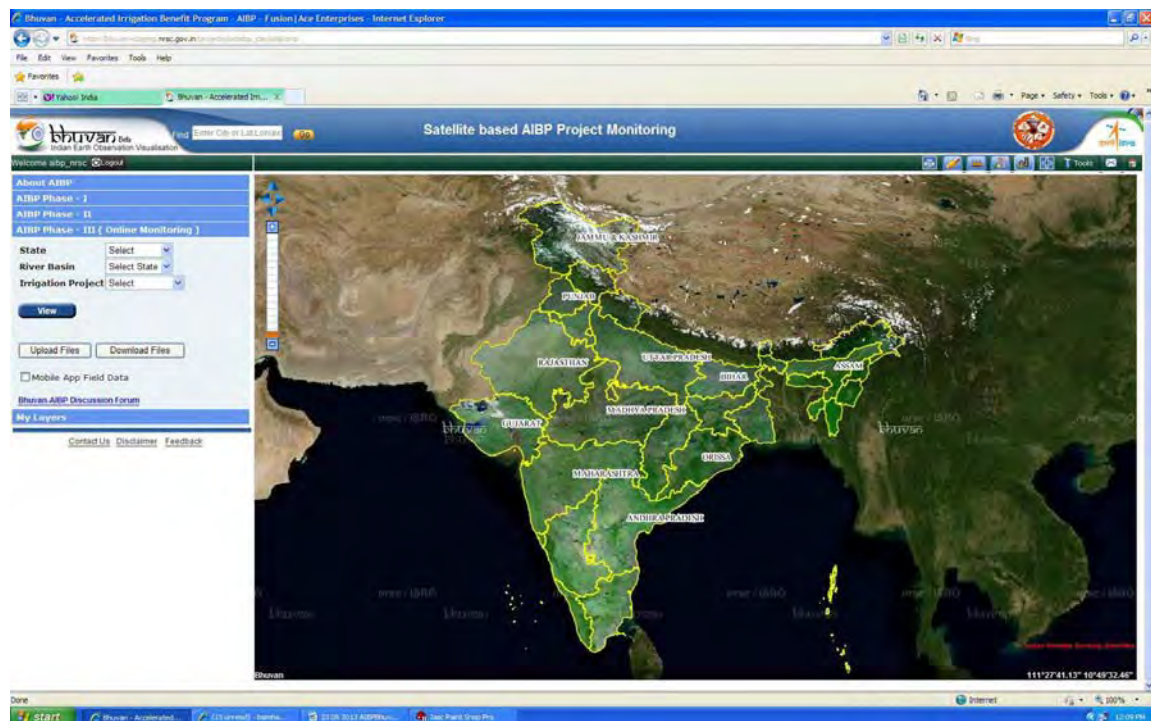
7. The user has to enter the username and password.

Eg.

Username: team 1

Password: team1

After login, the following page appears.



Then select a project either directly from the 'Irrigation Project' drop down list or using 3 dropdown menus sequentially state, river basin and irrigation project.

Eg.

i. State : Rajasthan

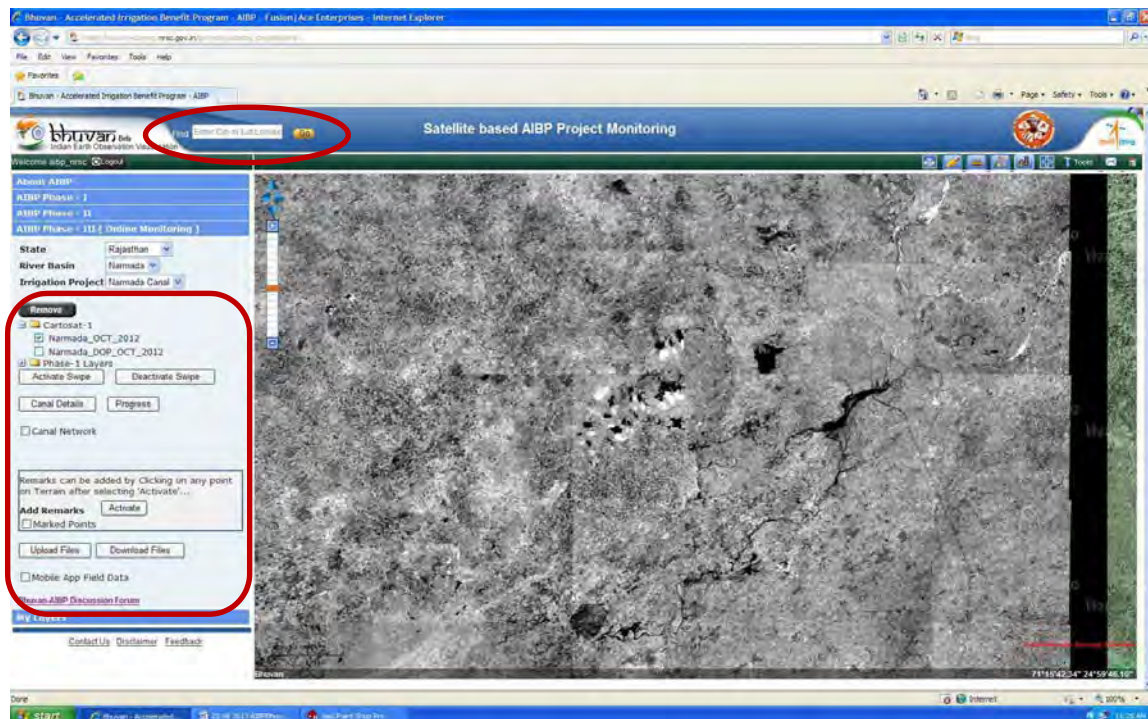
ii. River Basin : Narmada

iii. Irrigation Project : Narmada

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After selecting the project, click on "View". This view button changes to "Remove" button. To remove the contents of the current displayed project click on "Remove" button.

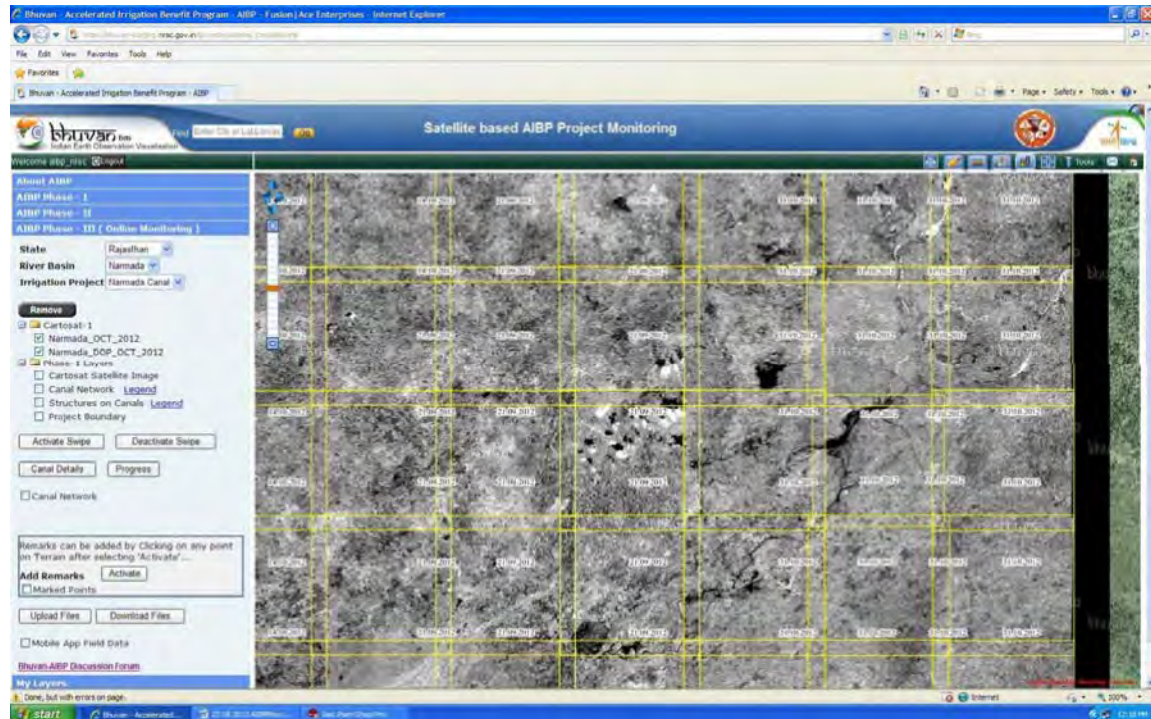
8. The cartosat data of the selected project appears as shown below.



The red outlines above shows the different options available and are described below:

i) The 1st folder, 'Cartosat -1' contains satellite images and corresponding satellite Date Of Pass (DOP) the selected project. If the project area is also covered by Cartosat-2 data it will be shown as 'Cartosat-2' folder. The latest satellite image is by default checked. To display other images check on respective dates. To view the dates of pass of an image, check the corresponding DOP layer.

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ii) The 2nd folder, 'Phase-1 Layers' (or 'Phase-2 Layers') contains satellite image, canal network, structures and project boundary layers of that particular project. If the selected project was covered under Phase-1 the folder name appears as 'Phase-1 Layers'. If the selected project was covered under Phase-2 the folder name appears as 'Phase-2 Layers'. If the selected project was not covered under Phase-1 or Phase-2 no folder is displayed.

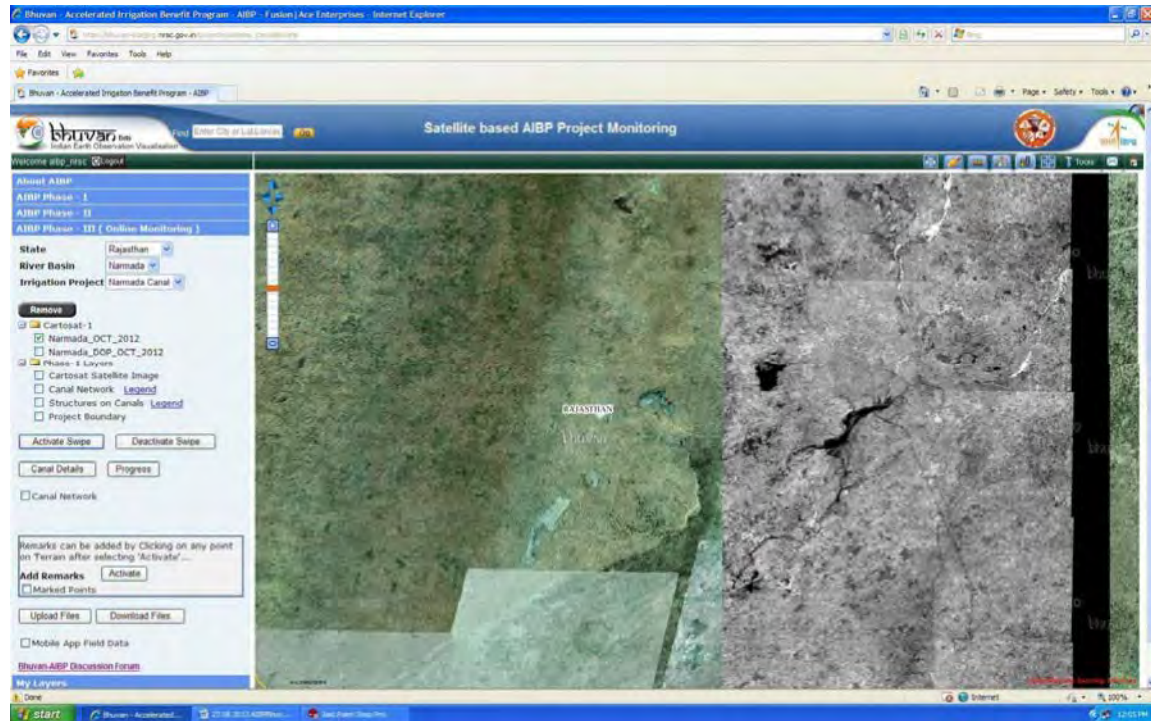
To view the content, click on the corresponding check boxes.

iii) Immediately below the folders Activate Swipe, Deactivate Swipe, Canal Details and Progress buttons are available.

'Activate Swipe' tool helps in comparing the progress of the project during the different periods of satellite images of acquisition. Click on "Activate swipe" button and place cursor over the image portion, as the user moves the cursor from left to right, the image overlaid on top becomes transparent to view the bottom image as shown below. As the user moves the cursor from left end to right end, the bottom image can be viewed and vice versa.

'Deactivate Swipe' to end the swipe mode click on this button.

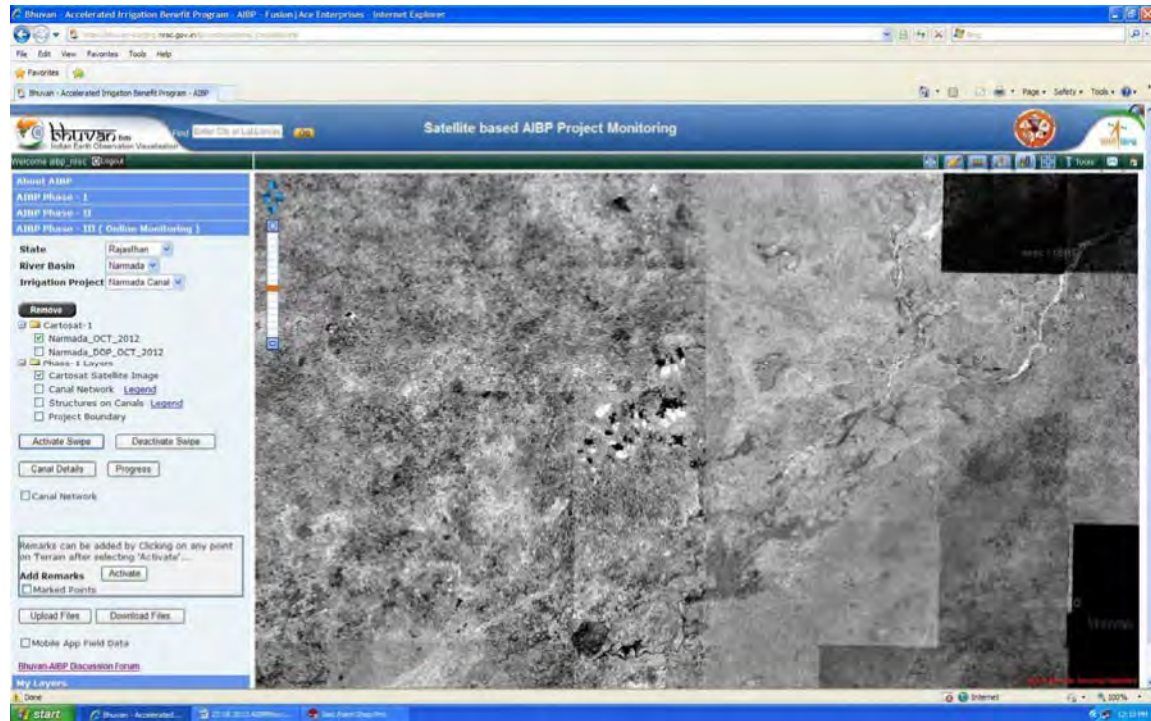
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If the Cartosat image is available in Phase-1, to compare the progress of the project from Phase-1 to Phase-3, this swipe tool can be used.

First, check the 'Cartosat Image-Phase1' check box and then click on 'Activate swipe' button (by default latest image in Cartosat-1 folder' is checked on). Now place the cursor over the image portion and move left to right to view the bottom image(pahse-1) as shown below. To end the swipe mode click on 'Deactivate Swipe' button.

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To compare any other pair of images, first uncheck all other layers and check the necessary images. Then activate swipe.

'Canal Details' button helps to view the list of canals and related field and satellite derived information of the selected project. This table contains two modules namely 'Field Data Create/Update' and 'Canal Digitization'. 'Field Data Create/Update' module is used for creation or updation of canal network field data.

'Canal Digitization' module is used for digitisation of canal network. This module also contain facility to 'Export to Shapefile' and 'Export to CSVfile'. The spatial data (digitised canal network) can be exported into shapefile format and non-spatial data (tabular data) can be exported into CSVfile.

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Draw/Edit Canal

Field Data Creation and Update, And Canal Digitization.

☐ Field Data Create/Update ☒ Canal Digitization

Canal No.	Canal Name	Parent Canal	Canal Type	Design Chainage (km)	Design Length (km)	Sat Chainage (km)	Sat Length (km)	Balance Length(km)	No of Gaps	Sat Progress (%)	C.C.A (ha)	I.C.A (ha)	Design I.P (ha)	Sat I.P (ha)	Remarks	Last Modified	User Modified	Canal Network
1	NMC		Main-Canal	0.00	74.00	0.00	88.63	0	3	0.00	245881	245881	245881	0	Test C1	2013-08-16 16:01:15	aibp_nrrsc	Edit
2	JALISLA DY	NMC	Distributary	7.89	10.15	0.00	10.35	0	0	0.00	2990.00	2990.00	2990.00	0	Test C2	2013-07-02 12:03:19	cepma	Edit
3	SILU MINOR	JALISLA DY	Minor	1.35	4.35	0.00	4.47	0	0	0.00	740.00	740.00	740.00	0	Test C3	2013-07-02 12:08:25	cepma	Edit
4	ACHALAPUR MINOR	JALISLA DY	Minor	2.30	4.13	0.00	4.15	0	0	0.00	367.90	367.90	367.90	0	TestC4	2013-07-02 12:09:37	cepma	Edit
5	JALISLA MINOR	JALISLA DY	Minor	7.956	4.60	0.00	4.64	0	0	0.00	545.00	545.00	545.00	0.00		2013-07-05 12:01:26	cepma	Edit
6	test	dfdf	Distributary	0.000	0.000	0.000	3.25	0	1	0.00	0.000	0.000	0.000	0.000		2013-08-16 16:02:53	aibp_nrrsc	Edit

Export to Shapefile Export to CSVfile Print

Close

The 'Progress' button, if clicked a table appears as shown below. This table contains physical progress and financial progress radio buttons. By default physical progress button is selected.

Note: Physical and financial progress formats are as given in CWC Monitoring reports. The information to be filled by CWC officials after assessing the project progress using satellite data.

The user can add necessary information on progress of the project by using the tools described below.

Physical-Financial Progress

Physical and Financial Progress

☒ Physical Progress ☐ Financial Progress

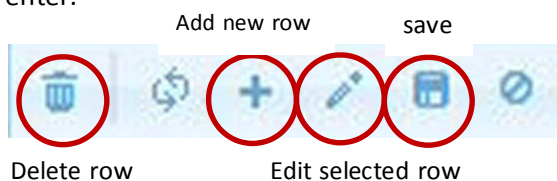
PHYSICAL PROGRAMME OF AIBP COMPONENTS											
S.No	Item of AIBP	Estimated Quantity	Quantity Executed	Balance	Programme	Year	Q1 Program	Q2 Program	Q3 Program	Q4 Program	SpillOver
1	Item1	10	5	5	P1	2012-2013	2	1	1	1	5
2	Item2	15	8	7	P2	2012-2013	5	2	3	2	5
3	Item3	20	12	6	P3	2012-2013	7	7	6	6	2

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Export CSVfile

Close

The user can add new row by clicking on '+' tool. After entering necessary information press enter.



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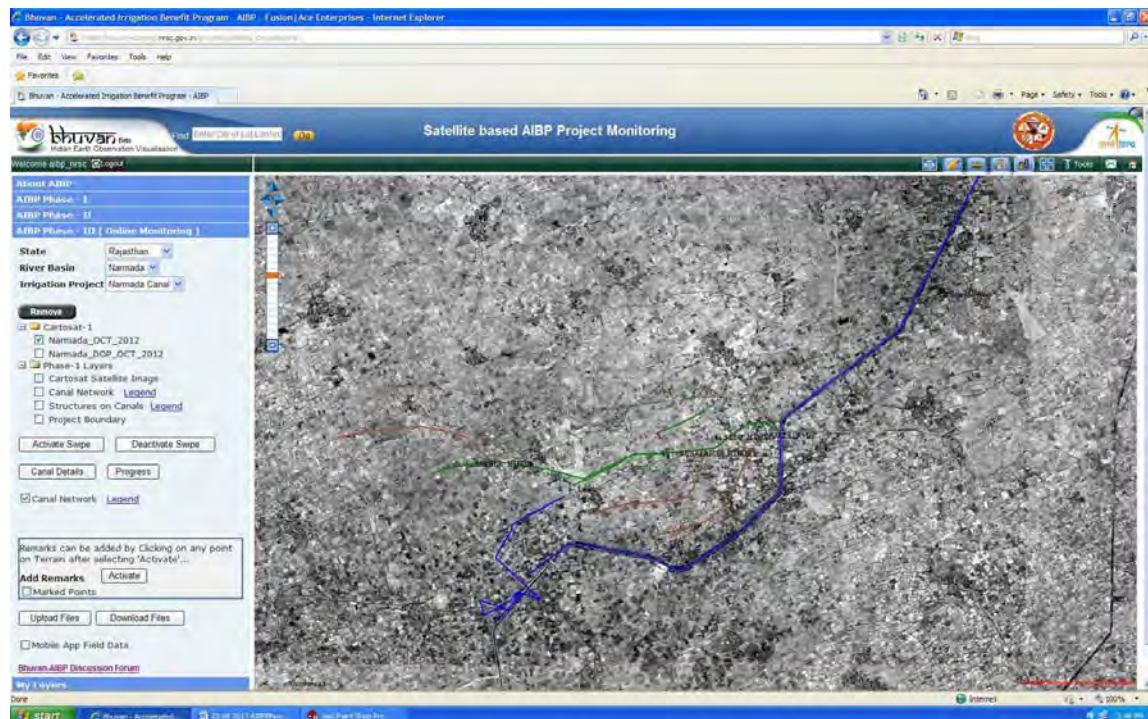
To edit any row click on the row and then click on 'edit row' tool, after editing is completed press enter.

To delete any row click on the row and then click on 'delete row' tool.

To save the entered data click on 'save' tool.

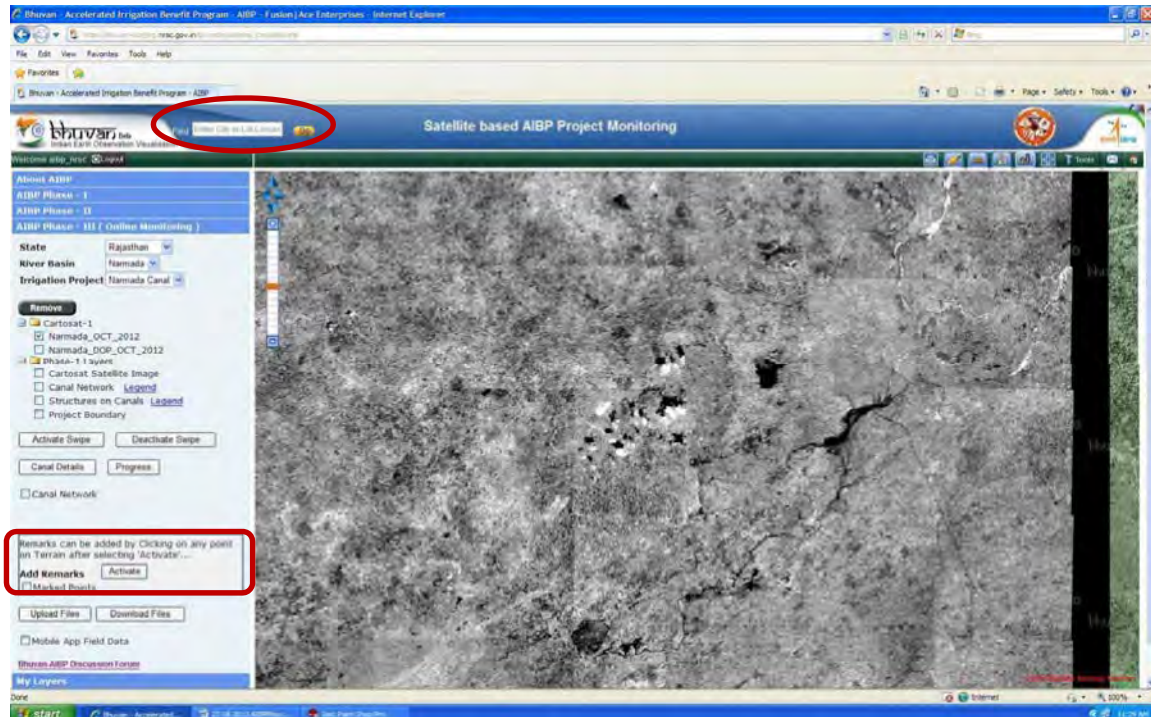
The user can bring cursor over the tool to get tooltip information.

iv) The "Canal Network" check box, if checked shows the entire canal network of the project along with names of canal network (if already available).



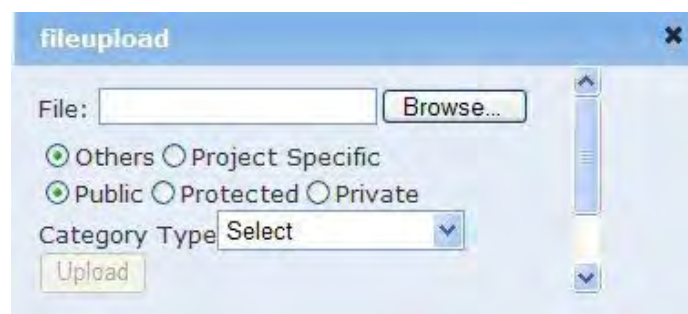
v) The project officers wishes to convey any specific remarks about a feature to the State/Central level officers, a facility is provided which shown in the rectangular outline(refer figure shown below). This facility can be activated by clicking on "Activate" button. More detailed description is given in step.19.

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vi) Below the Remarks box, two buttons are available namely 'Upload Files' and 'Download Files'

Upload Files: Project related files can be uploaded. If the user clicks on this button the following dialog box appears. The files can be selected by clicking on 'Browse' button



The user can upload the files as 'project specific' or 'others'

Project specific: The radio button is to chosen for uploading a file of a particular project.

Others: The radio button is to chosen for uploading a file of general nature. Example, a table format of financial progress or a proforma, which is useful for all projects.

Public: Can be viewed by all AIBP users of CWC (includes Field and Regional Directorates(M), CE(PMO), MoWR).

Protected: Can be viewed by Field Directorate and its corresponding Regional Directorate (M), CE(PMO), MoWR.

Private: Can be viewed only by the user who uploads the files.

After deciding about the user accessibility, category type should be selected from the available types: Documents, Maps , Monitoring Reports, Tables and Others.

Finally click on "upload" button.

Download Files: Click on this button to view the list of available files.

User Name	Project Name	Uploaded Time	File Name	Delete Option
aibp_nrsc	Others	2013-07-08 18:26:10.437	f1.csv	Delete
aibp_nrsc	Others	2013-07-08 17:46:14.171	try2.csv	Delete
aibp_nrsc	Others	2013-06-25 10:16:41.25	1.docx	Delete
aibp_nrsc	Others	2013-06-25 10:13:28.593	test.xlsx	Delete
aibp_nrsc	Others	2013-06-25 10:08:32.687	1.docx	Delete
aibp_nrsc	Others	2013-06-25 10:08:19.046	1.docx	Delete
aibp_nrsc	Others	2013-06-24 19:43:02.296	12.JPG	Delete

To download a file, click on 'file name'.

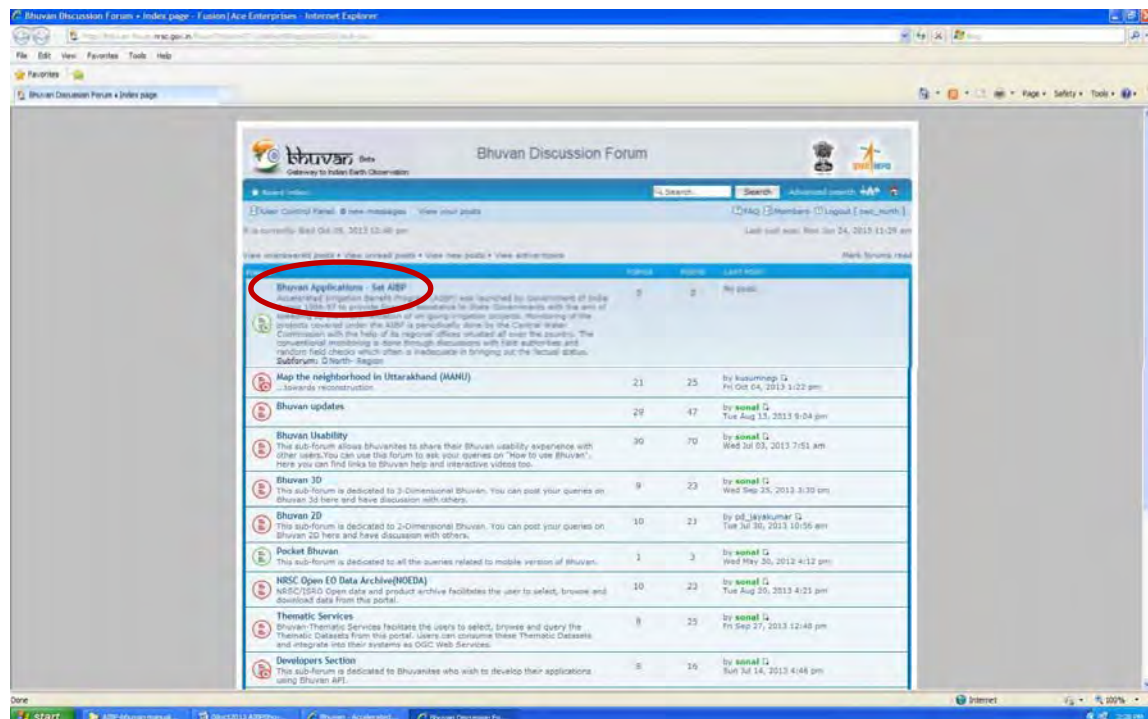
To delete the files click on 'delete' (Files can be deleted only by users who uploaded them).

vii) Mobile app Field Data: The check box "Mobile app Field Data", if checked displays markers on the satellite image at different locations where field photographs and ancillary information is available. If the user clicks on any marker, it shows the photograph taken at the location and

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associated remarks. The details regarding mobile application are discussed in section 5 (Field visit for ground truth verification).

viii) Bhuvan-AIBP Discussion Forum: Click on this hyper link to go to exclusive Bhuvan-AIBP discussion Forum. In this forum all AIBP users can post queries and answers related to their projects.



ix) A "Find" option at top left of the page provides a search facility. The user has option to search either by city or latitude and longitude (in decimal degrees).

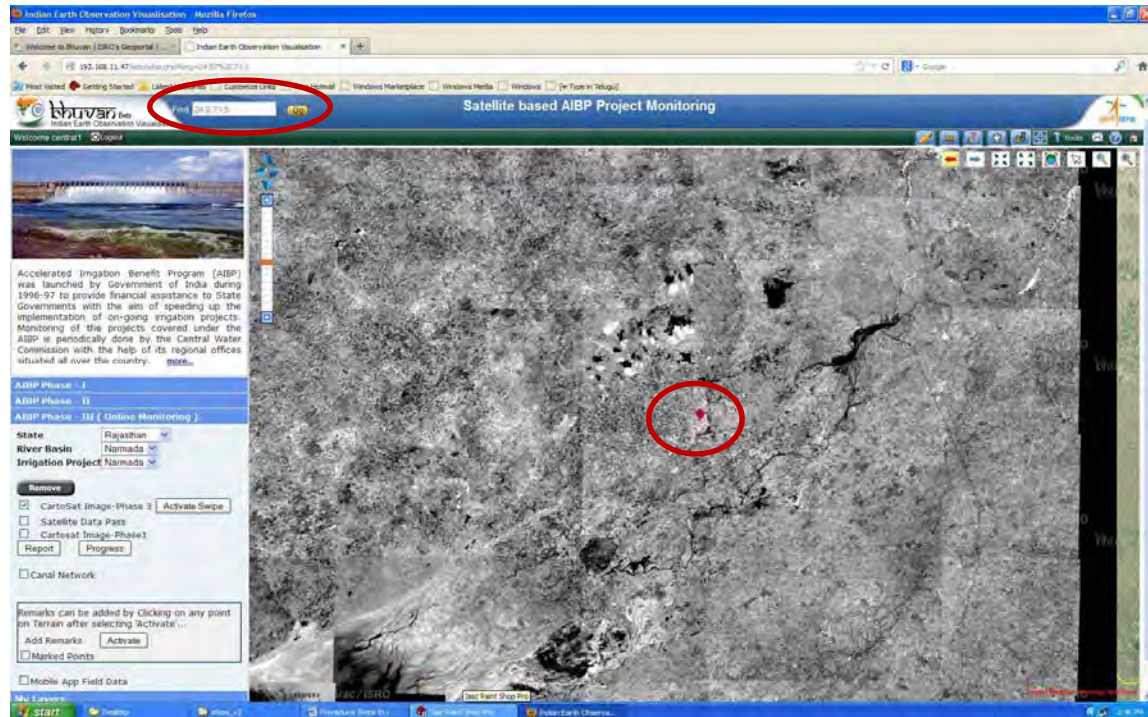
Eg.

City Name : Hyderabad

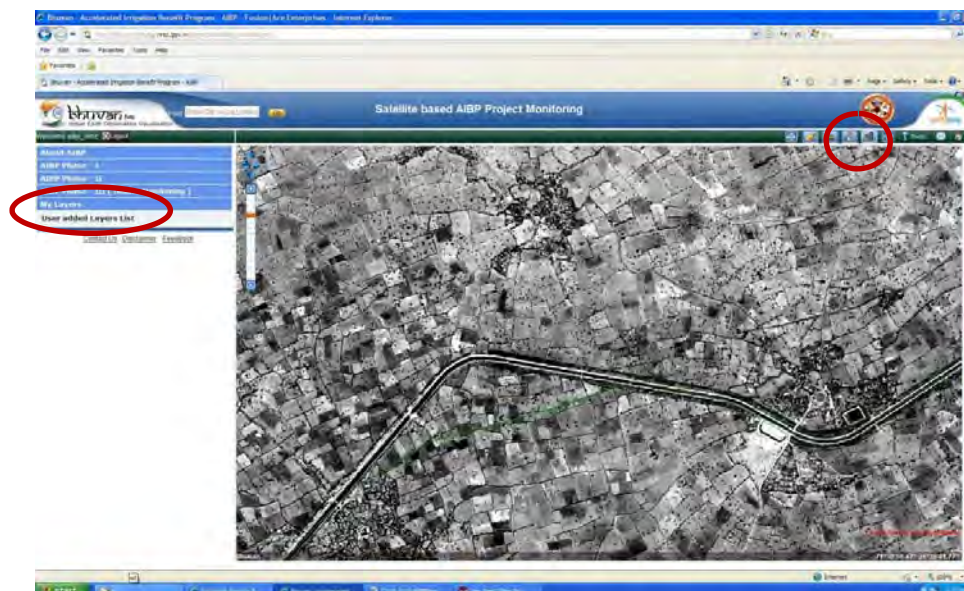
Latitude and Longitude :24.9,71.5

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If the user enters 24.9,71.5 and click on 'Go', a marker appears on the place of search as shown below.



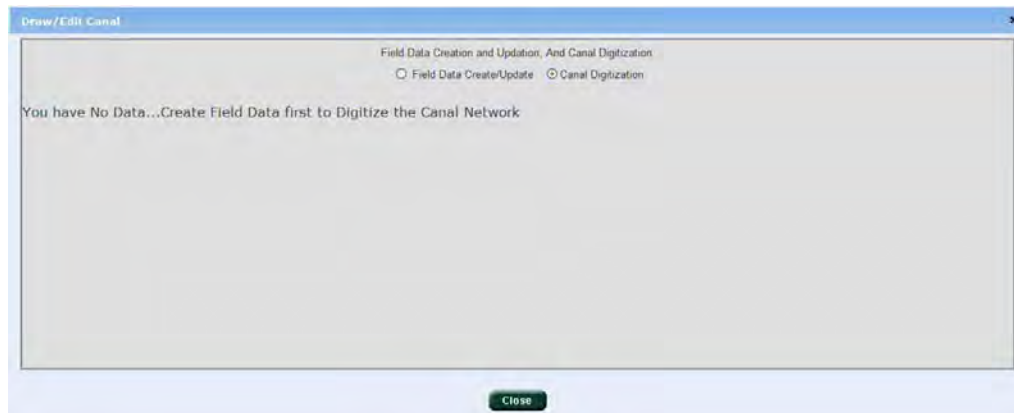
x) Clicking on 'My Layers' will list the external layers added by the user. The user can add external layer (shape file) using the 'Add Layer' facility as shown below.



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9. Now to start creating canal network, click on "Canal Details" button .

The following message appears showing no data is available. This message appears first time where no data is available.

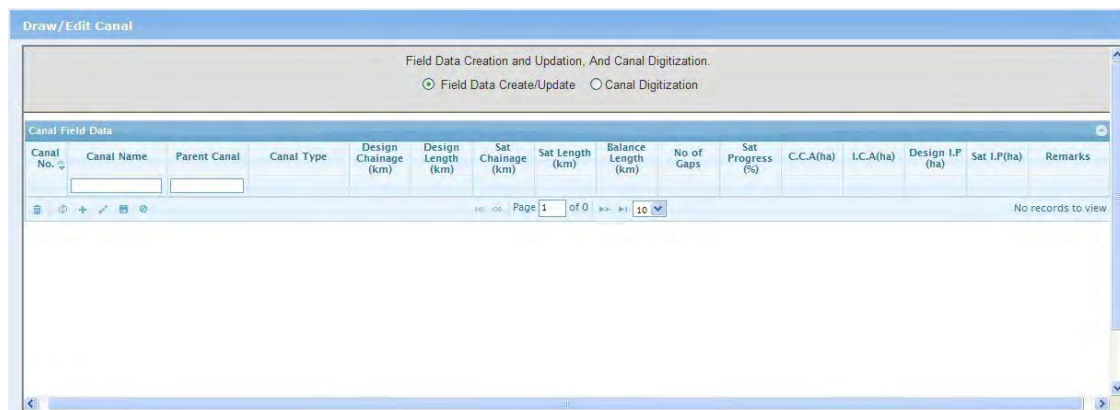


To start creation of new canal network layer, 2 steps are to be done in sequence:

- i. Field database creation and
- ii. Canal digitisation

10. First click on radio button "Field data create/update"

The following table appears



Canal No.	Canal Name	Parent Canal	Canal Type	Design Chainage (km)	Design Length (km)	Sat Chainage (km)	Sat Length (km)	Balance Length (km)	No of Gaps	Sat Progress (%)	C.C.A(ha)	L.C.A(ha)	Design I.P (ha)	Sat I.P(ha)	Remarks
-----------	------------	--------------	------------	----------------------	--------------------	-------------------	-----------------	---------------------	------------	------------------	-----------	-----------	-----------------	-------------	---------

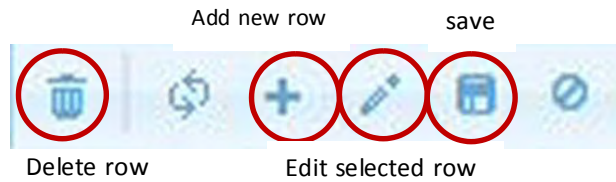
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The table contains the columns as shown below:

Canal No.	- Canal Serial number	(To be entered by user)
Canal name	- Name of the canal	(To be entered by user)
Parent canal	- Name of parent canal	(To be entered by user)
Canal type	- Type of canal	(To be selected by user)
Design chainage	- Designed chainage of canal in km	(To be entered by user)
Design Length	- Designed length of canal in km	(To be entered by user)
Sat chainage	- Satellite derived chainage of canal in km	(To be entered by user)
Sat length	- Satellite derived length of canal in km	(Computed by System)
Balance Length	- Satellite derived gap lengths in canal in km (Computed by System)	
No of Gaps	- Satellite derived number of gaps in canal (Computed by System)	
Sat Progress	- Satellite derived progress in length of canal in % (Estimated as satellite derived length divided by Design length of a canal - To be entered by user)	
CCA	-CCA of corresponding canal in Ha	(To be entered by user)
ICA	- ICA of corresponding canal in Ha	(To be entered by user)
Design IP	- Design Irrigation Potential of canal in Ha	(To be entered by user)
Sat IP	- Satellite derived IP of canal in Ha	(To be entered by user)
Remarks	- Remarks if any	(To be entered by user)

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11. Click on "+" tool for adding a new canal



A new row is created as shown below for entering the details of the canal.

The screenshot shows the 'Draw/Edit Canal' window. At the top, it says 'Field Data Creation and Updation, And Canal Digitization.' with two radio buttons: 'Field Data Create/Update' (selected) and 'Canal Digitization'. Below this is a table titled 'Canal Field Data'. The table has columns: Canal No., Canal Name, Parent Canal, Canal Type, Design Chainage (km), Design Length (km), Sat Chainage (km), Sat Length (km), Balance Length (km), No of Gaps, Sat Progress (%), C.C.A(ha), I.C.A(ha), Design I.P (ha), Sat I.P(ha), and Remarks. The first row is highlighted in yellow. The 'Canal No.' is 1, 'Canal Name' is 'narmada main canal', 'Parent Canal' is empty, 'Canal Type' is 'Main-Canal', 'Design Chainage (km)' is 0.000, 'Design Length (km)' is 80.000, 'Sat Chainage (km)' is 0.000, 'Sat Length (km)' is empty, 'Balance Length (km)' is empty, 'No of Gaps' is empty, 'Sat Progress (%)' is 0.00, 'C.C.A(ha)' is 0.000, 'I.C.A(ha)' is 0.000, 'Design I.P (ha)' is 0.000, 'Sat I.P(ha)' is 0.000, and 'Remarks' is empty. The status bar at the bottom says 'Page 1 of 0' and 'View 1 - 1 of 1'.

The columns with white background are to be entered by user and yellow background are automatically computed by system as mentioned above.

12. Now enter the necessary details of the canal and press 'Enter'. The entire row changes into yellow background and cannot be edited. To edit a row, select the row by clicking on it and press tool as shown above (step 11)

The screenshot shows the 'Draw/Edit Canal' window. At the top, it says 'Field Data Creation and Updation, And Canal Digitization.' with two radio buttons: 'Field Data Create/Update' (selected) and 'Canal Digitization'. Below this is a table titled 'Canal Field Data'. The table has columns: Canal No., Canal Name, Parent Canal, Canal Type, Design Chainage (km), Design Length (km), Sat Chainage (km), Sat Length (km), Balance Length (km), No of Gaps, Sat Progress (%), C.C.A(ha), I.C.A(ha), Design I.P (ha), Sat I.P(ha), and Remarks. The first row is highlighted in yellow. The 'Canal No.' is 1, 'Canal Name' is 'narmada main canal', 'Parent Canal' is empty, 'Canal Type' is 'Main-Canal', 'Design Chainage (km)' is 0.000, 'Design Length (km)' is 80.000, 'Sat Chainage (km)' is 0.000, 'Sat Length (km)' is empty, 'Balance Length (km)' is empty, 'No of Gaps' is empty, 'Sat Progress (%)' is 0.00, 'C.C.A(ha)' is 0.000, 'I.C.A(ha)' is 0.000, 'Design I.P (ha)' is 0.000, 'Sat I.P(ha)' is 0.000, and 'Remarks' is empty. The status bar at the bottom says 'Page 1 of 0' and 'View 1 - 1 of 1'.

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13. After entering the details of a canal the next step is digitisation of canal. To start digitisation click on the radio button 'Canal Digitisation'.

The table appears as shown below.

Draw/Edit Canal

Field Data Creation and Updation, And Canal Digitization.

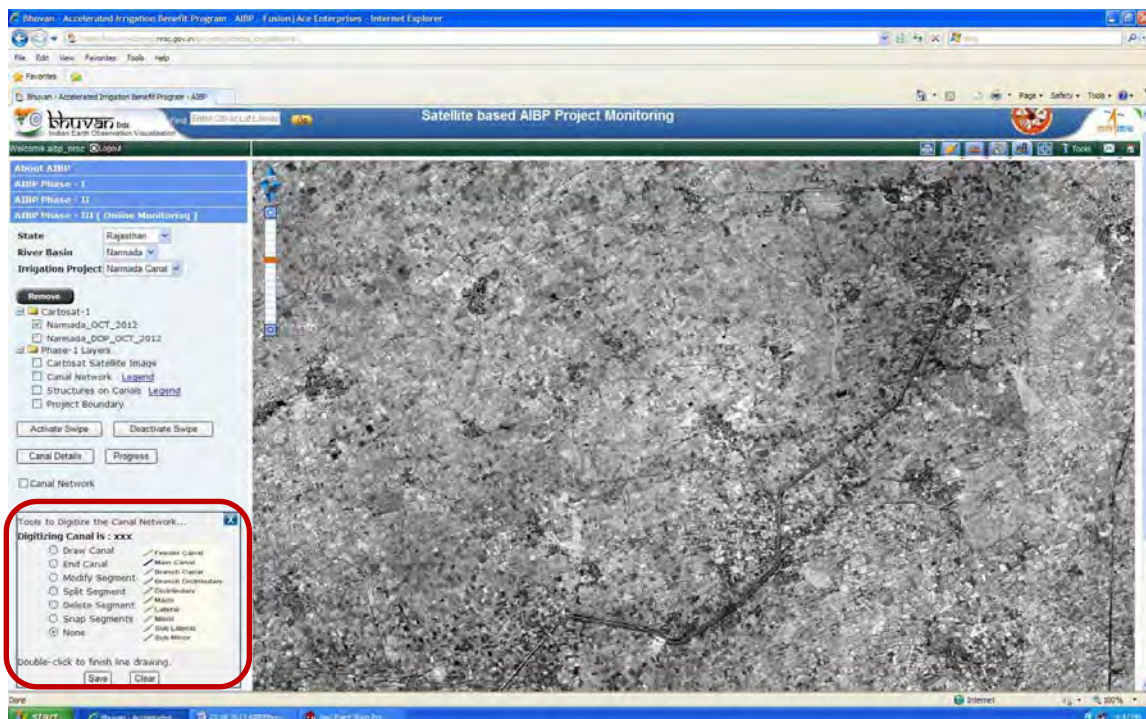
☐ Field Data Create/Update ☒ Canal Digitization

Canal No.	Canal Name	Parent Canal	Canal Type	Design Chainage(km)	Design Length(km)	Sat Chainage(km)	Sat Length(km)	Balance Length(km)	No of Gaps	Sat Progress(%)	C.C.A (ha)	I.C.A (ha)	Design I.P (ha)	Sat I.P (ha)	Remarks	Last Modified	User Modified	Canal Network
1	xxxx	xxxxx	Distributary	0.000	0.000	0.000	0	0.000	0	0.00	0.000	0.000	0.000	0.000				Create

Close

14. To start digitisation of the canal click on button 'Create' located at the end of the row (as shown above).

The following set of new facilities appear (shown in red outline box)



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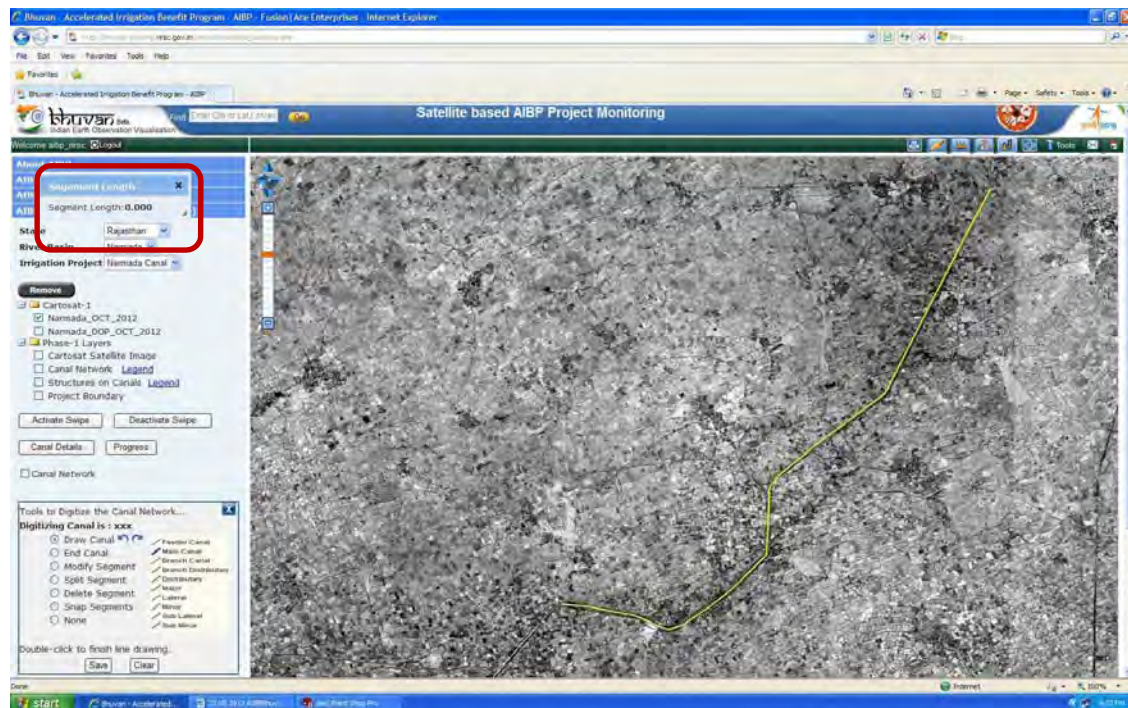
The tools are described below.

- Draw canal - To digitise a canal
- End canal - To stop the digitisation of canal
- Modify Segment - To edit already digitised canal (line vertices can be adjusted)
- Split segment - To split canal line segment
- Delete segment - To delete canal line segment
- Snap segment - To snap canal line segment
- None - To close the editing tasks

Below the editing tools two button are available.

- Save - To save canal line after digitisation is completed
- clear - To remove contents of canal

To draw canal, click on 'Draw canal' radio button. The cursor changes into cyan colour circle, start digitising along the canal and finish digitisation by Double-clicking the mouse.

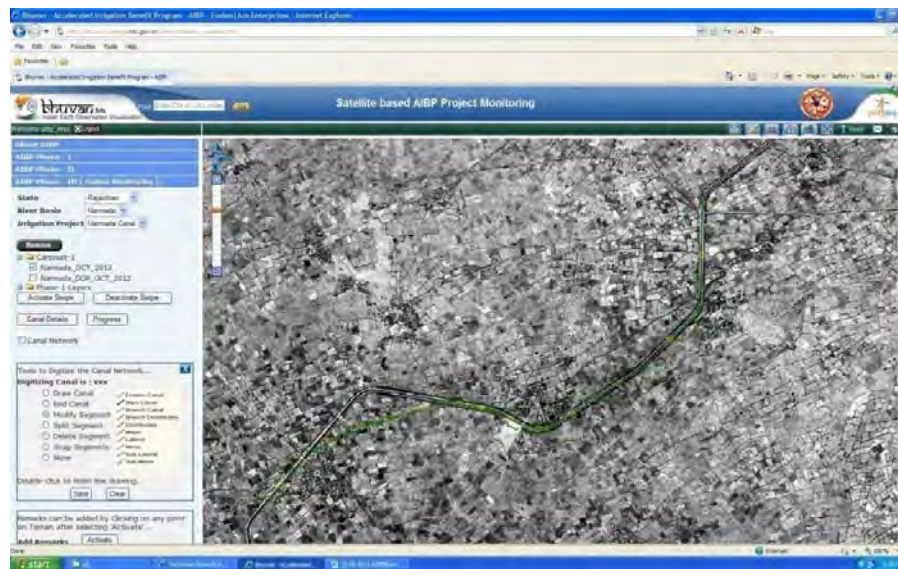


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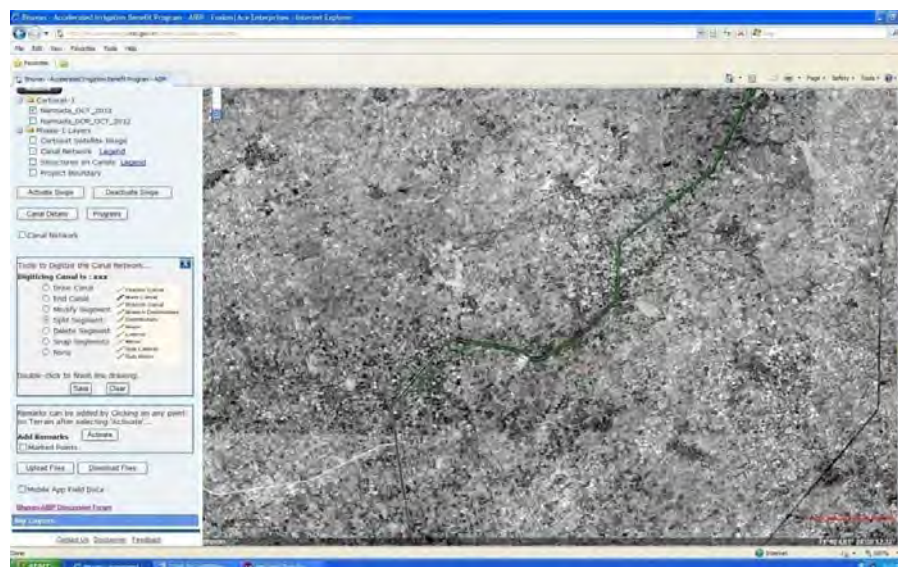
Once the user chooses to click on 'Draw canal' radio button, a box appears top left corner of the screen (red outline) displaying length of the segment digitised.

After digitisation of a canal, click on 'End canal' button to stop digitisation of canal.

To modify the line segment, click on 'Modify segment' and select the line segment to be edited. The line changes in to editable mode with vertices as shown below. Hold the vertice and move to the desired place.

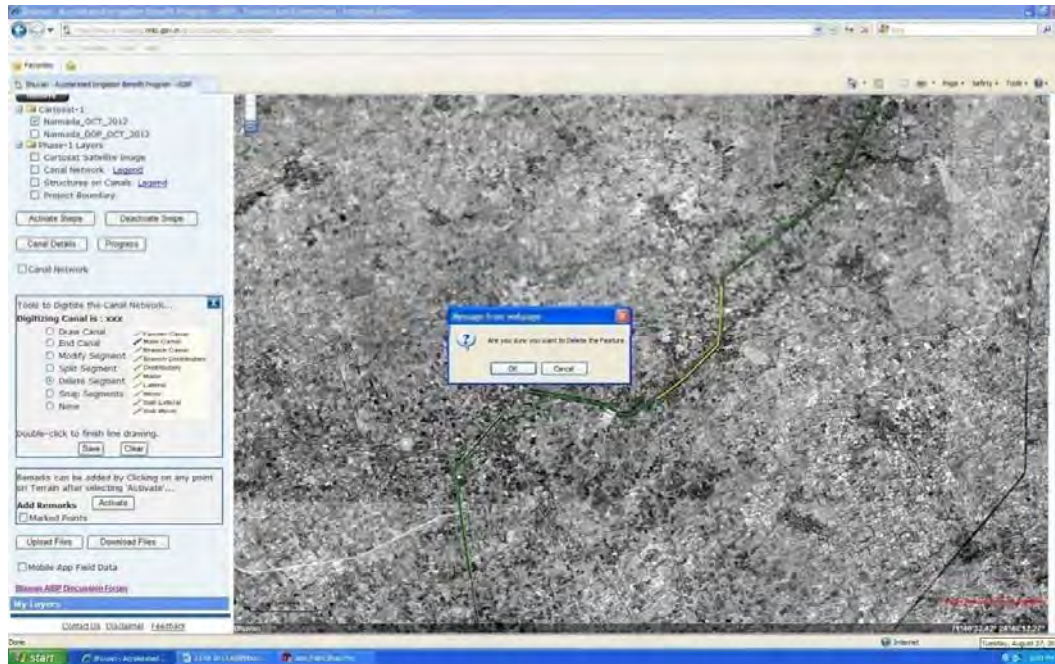


To split a line segment, click on 'split segment' and draw across the line segment to split the line segment into two separate line segments.

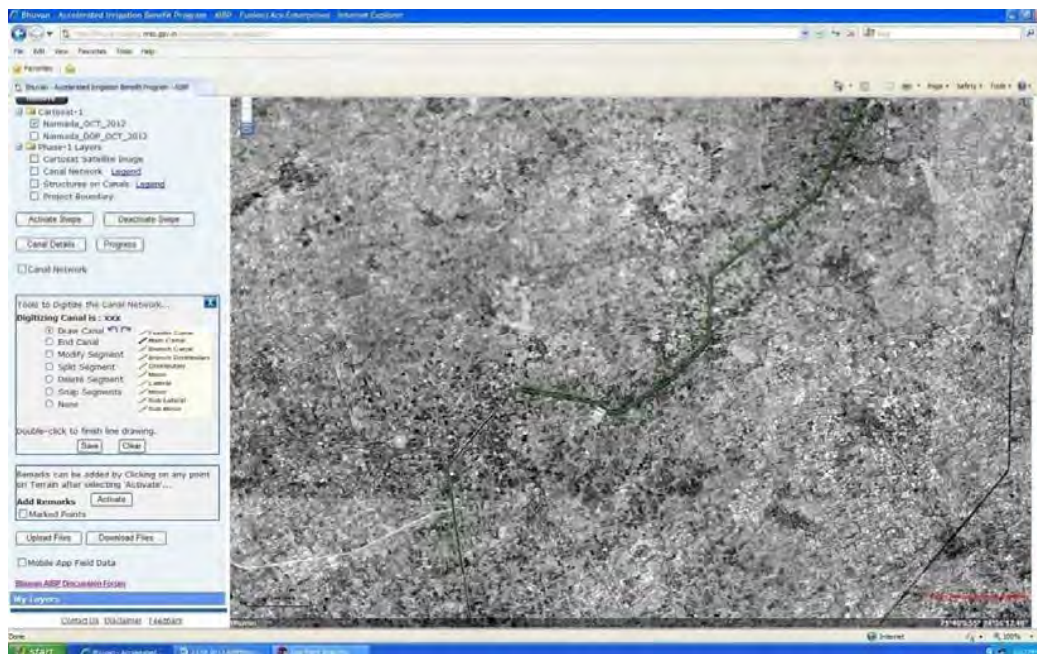


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To delete a line segment, click on 'delete segment' and click on the line segment which the user want to delete. A message appears "Are you sure you want to Delete the Feature". Click on 'OK' will delete the selected segment as shown below.



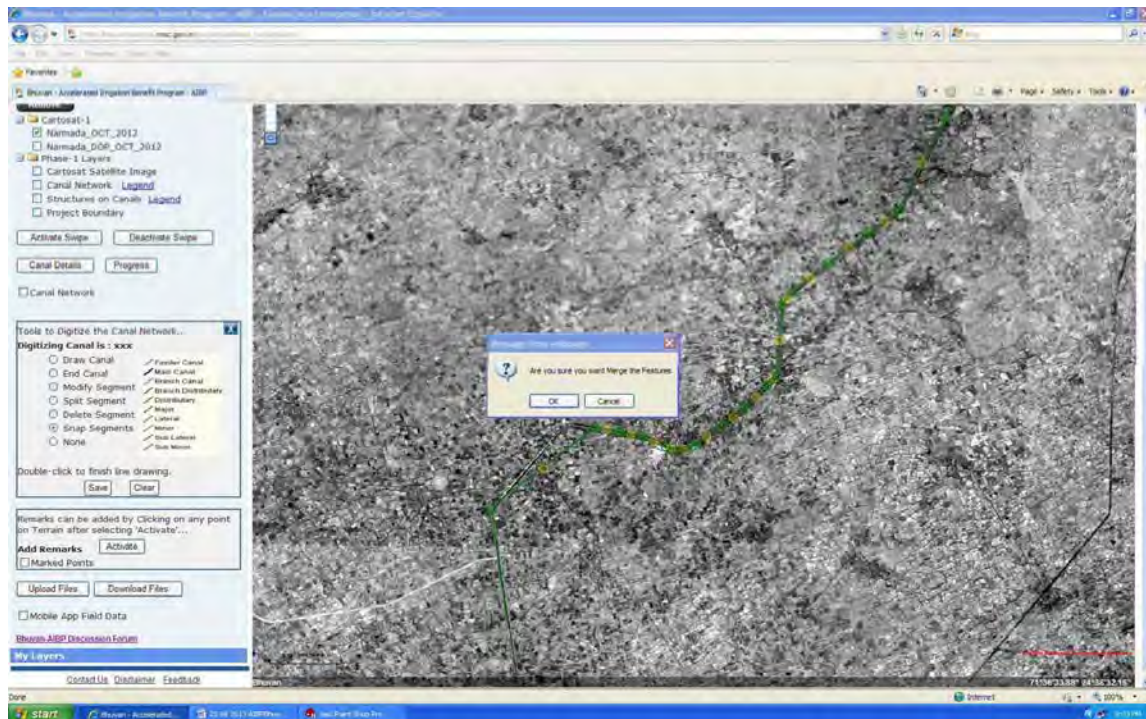
To snap two line segments which are digitised as shown below



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Click on 'Snap segment' and then click on any one line. The line segment changes in to snapping mode as shown below. Hold the end vertex of the line (snap mode) and drag towards the other line segment and drop it so that both the lines join together.

A message appears "Are you sure you want to Merge the Features". Click on 'OK' will merge two segments into one segment.



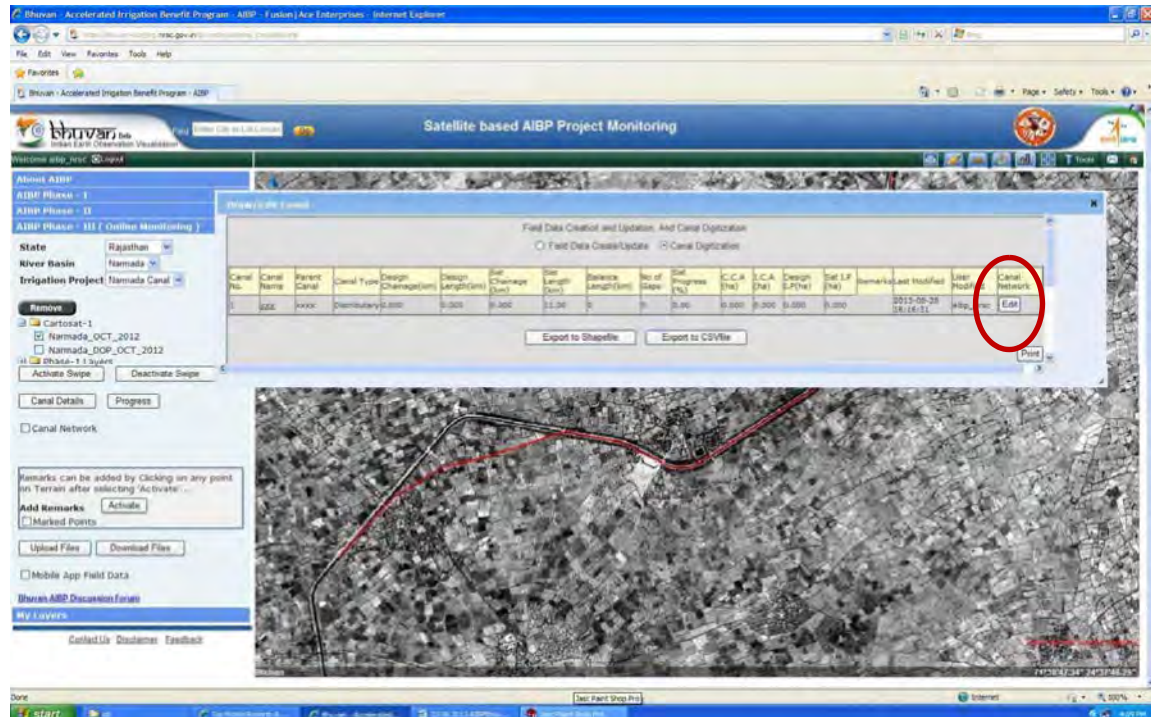
Finally to save the canal digitised, click on 'Save' button.

15. The same steps can be repeated for other canals by entering the details of canals and digitising the canals.

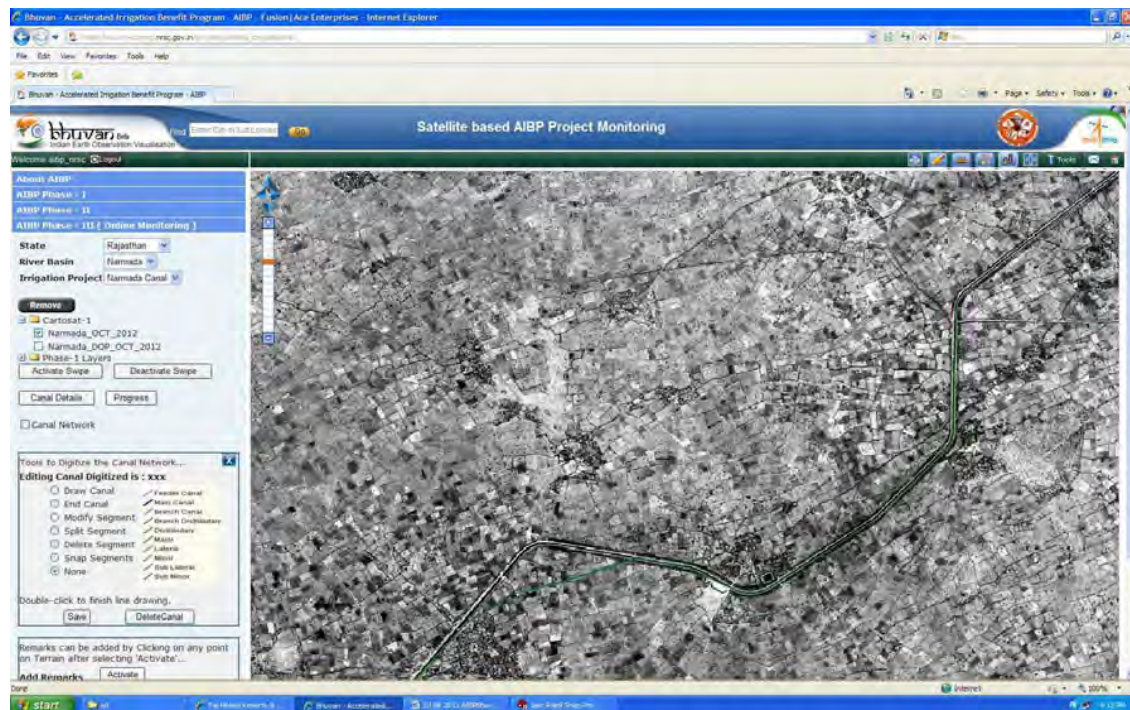
16. Once a canal is digitised and to carry out any editing work of the canal line again click on 'Canal Details' button.

The table appears as shown below. But at the end of the corresponding canal row 'edit' button appears instead of 'create' button.

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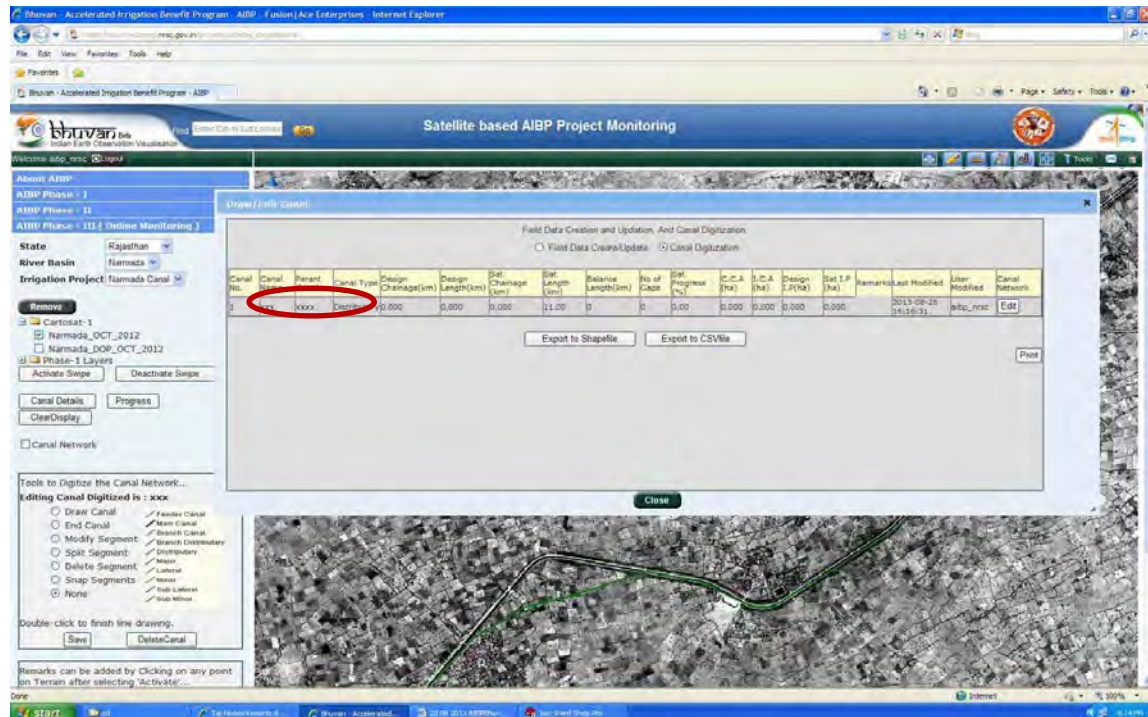
17. Click on 'edit' button for any editing of corresponding canal. The tools appears as shown below. The functionality of these tools are same as described above (step 14).



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After editing work is completed, click on 'save' button to save the editing work. If the user has wrongly digitised canal and want to delete the entire canal, click on 'Delete Canal' button.

18. To view only specific canals already digitised, the user can click on 'Canal Details' button. The Table containing canal list appears as shown below.



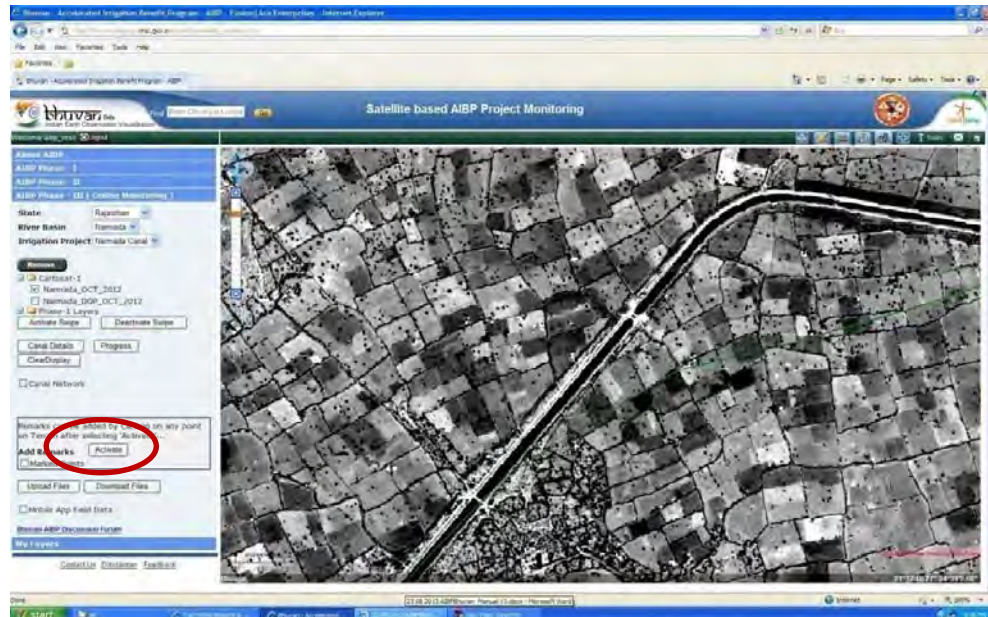
Now click on the specific canal name listed in the table, the digitised canal appears on the image screen. The Canal.No and canal name appears on the image along with canal.

A button 'ClearDisplay' appears below the 'Canal Details' button. To remove the displayed canals click on 'Cleardisplay' button.

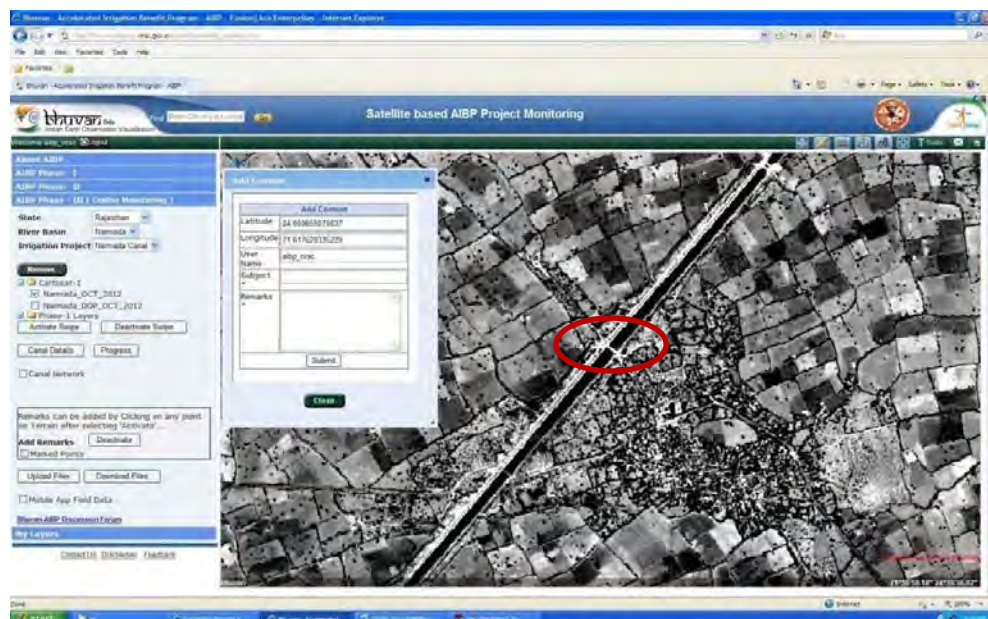
If the user wants to view all the canals in the project which are already digitised click on check box 'Canal Network'. The user can view all the canals in the project (already described in iv of step.8).

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19. The project officers wishes to convey any specific remarks about a feature to the State/Central level officers, clicking on "Activate" button as shown below.



For example, the user wants to convey that the road bridge on the canal is recently completed. Click on 'Activate' button and then click on location of road crossing the canal. The following table appears.



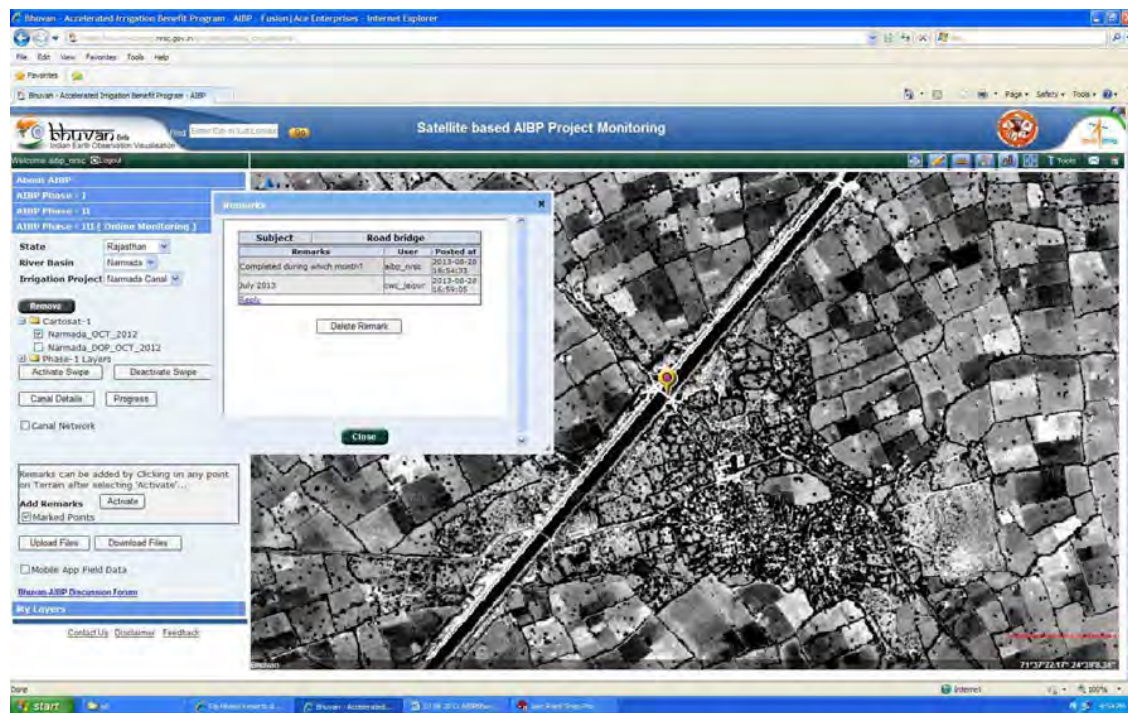
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The table shows latitude and longitude of the location in decimal degrees and the user name. These rows cannot be edited. The other two rows namely 'Subject' and 'Remarks' are editable. The user can enter the necessary information and click on 'submit' button. Click on 'Deactivate' button to close the activation mode.

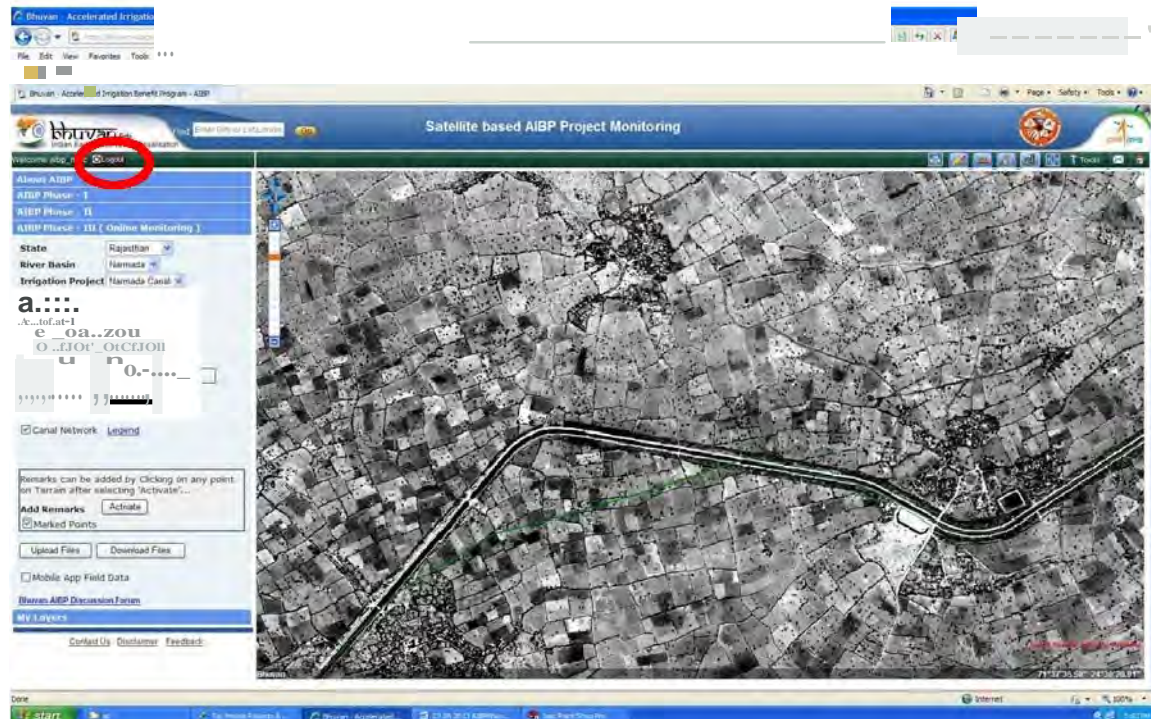
20. To view the remarks added, user should check the 'Marked Points' check box. A yellow colour marker appears. Click on the marker, the remarks appears shown below.

The remarks can be edited by the same user who has posted it, but not after reply posted by the concerned users. The remarks can be accessed by the concerned user and reply can be posted by clicking on the 'Reply' hyperlink as shown below.

The user can remove the 'Marked point' by clicking on 'Delete Marked point'.



21. After finishing the session,click on "Logout".



5 Field Visit for Ground Truth Verification

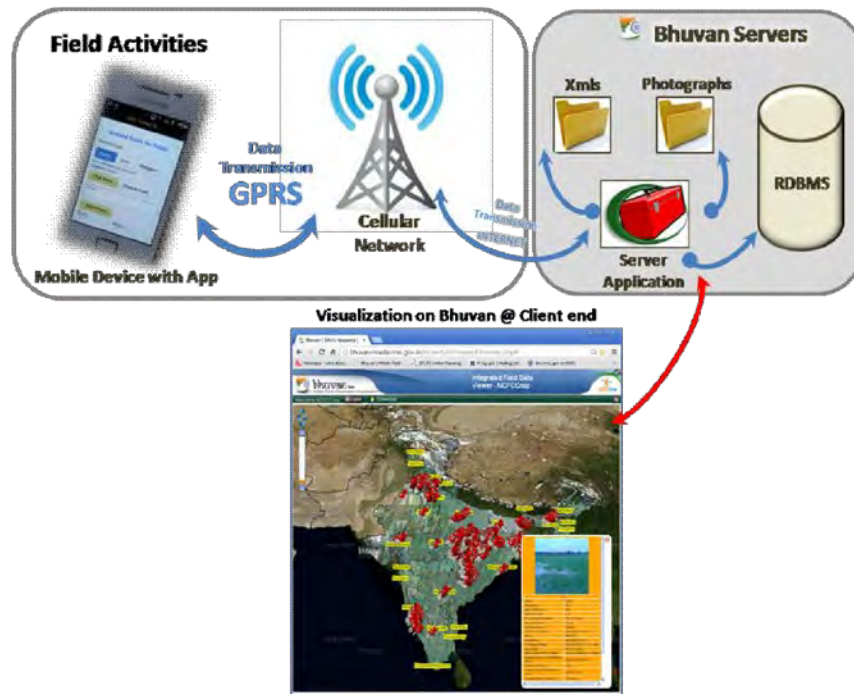
NRSC has developed a mobile application for smart mobile phones which will be made available to CWC officers and project officials. The users need to install this application in their mobile phones to use in the field visit. The mobile application helps in transferring the field photographs taken during field visit for ground truth verification process along with related text information to Bhuvan server automatically. The photographs taken in a specific project at a specified location will be geolocated in the corresponding Cartosat satellite image accurately. The photographs taken in field along with remarks, if uploaded through mobile can be viewed in the Cartosat image with near real time at location where the photograph taken (based on latitude and longitude values).

The salient features of the mobile application are listed below:

- x It is highly configurable, customizable and user-friendly.
- x The spatial as well as non-spatial data for point, line and polygon features can be collected in the field.
- x Multiple field photographs can be collected along with the field parameters.
- x Provision is made to send the data later in the absence of GPRS connectivity at the time of data collection.
- x Server programs are designed to receive the data and populate the database and file system.
- x Visualization mechanisms are provided for the repository with search and query operations and overlaying the data on Bhuvan.

User Manual

Architecture Design



Overall Architecture Design of Mobile App

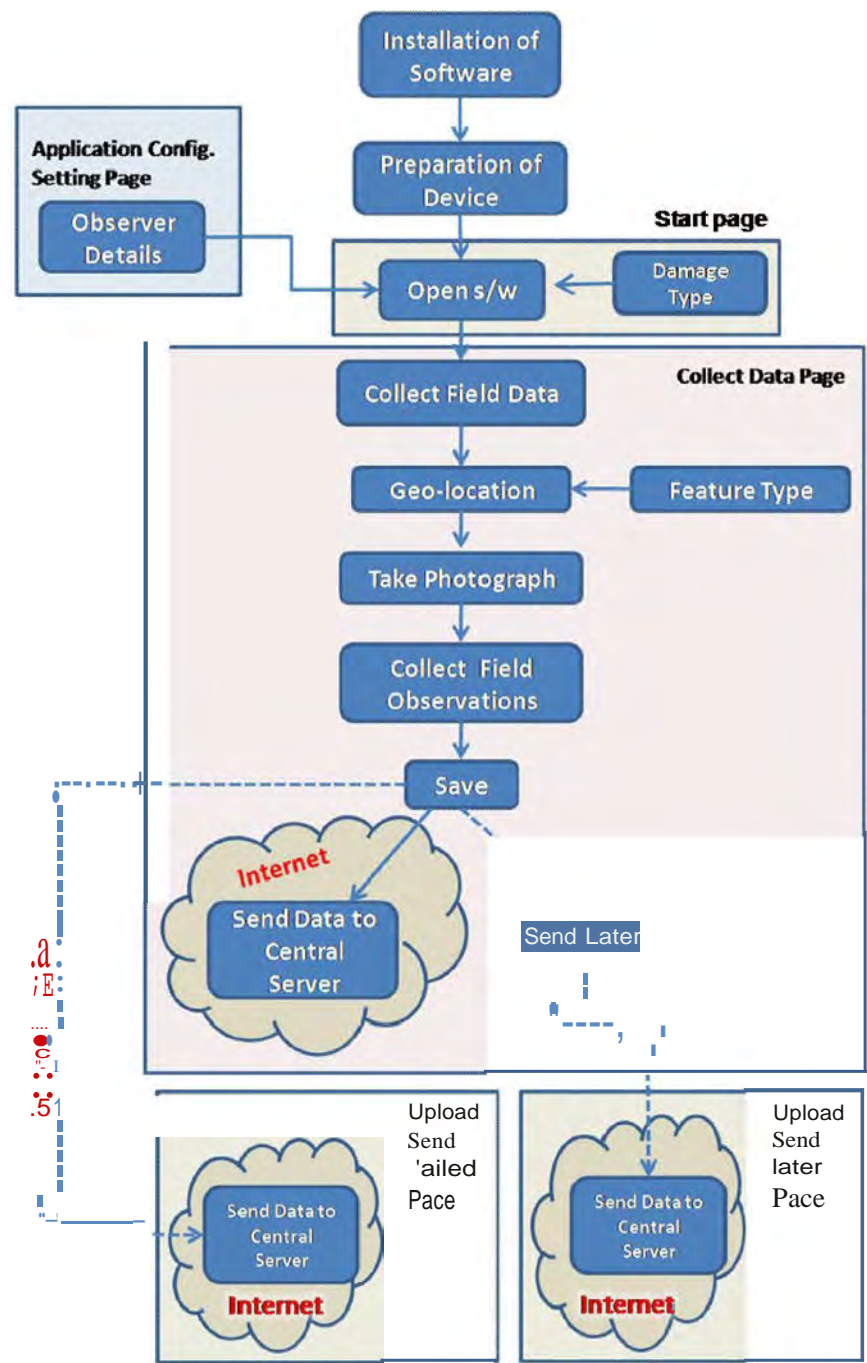
The above figure shows the overall architecture with all salient elements participating in the process from the field deployed mobile device to the server and visualization infrastructure. The data collected by the mobile device using the developed application and in-built GPS and camera, is transferred in near real time using GPRS via the cellular network. The cellular network gateways deliver the data to the central facility via internet in the form of email or http upload protocols. The architecture makes extensive use of XMLs both in configuring the collection profiles as well as encapsulating the collected samples.

The received data including the GIS feature data is organized in RDBMS and files in appropriate formats like PostGIS, Shapefiles and KMLs apart from the original XML format. Suitable software programs enable the integration of field data with visualization vehicles like Bhuvan portal.

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Work Flow

The work flow of field data collection using smart phone (android OS).



5.1 Mobile specifications

The following are the specifications required for mobile phones to be used in ground truth verification

- x GSM Smartphone with 2G and 3G capability
- x Android OS version 2.3 or above
- x 800MHz or higher processor
- x Internal memory of 1GB or more
- x Micro SD card (4GB or more)
- x Capacitive touch screen 3-inch or larger
- x 2G GPRS/ EDGE, 3G, WiFi, Bluetooth
- x Built-in GPS
- x Built-in camera with 2MP resolution or higher
- x USB/ Mini/ Micro-USB interface
- x Standard battery (Li-ion 1350 mAh or better)
- x Required cables and accessories

The following mobiles are tested using the application developed for AIBP project.

- x Samsung Galaxy Y,
- x Samsung S Duos,
- x Galaxy Ace,
- x Galaxy SII/ SIII, or similar models in other brands running Android OS version 2.3 or above

5.2 Procedural Steps for Field Visit using Mobile App

The mobile application developed by NRSC was named as Field Data Collection (FDC) app AIBPFDC version 1.1.

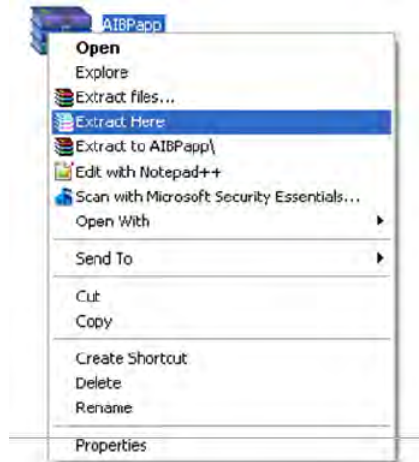
5.2.1 Installation of Software

The mobile app will be provided either through Bhuvan website or CD or any other media consists of a winzip file. Follow the steps given below for installing the mobile app.

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1. Copy the winzip file in to PC and the file can be uncompressed by right clicking the mouse button and select Extract here.

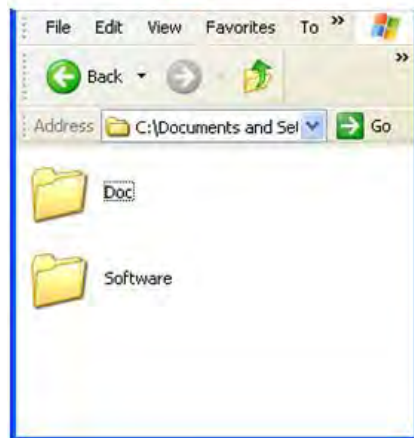
1



2. The FDC app AIBP FDC v 1.1 consist of two folders.

- a. Doc folder – consist of documentation file/ manual.
- b. Software folder- consists of apk file.

2



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3. The 'apk' file is shown below.

3



Connect smart phone to PC using USB cable. The 'apk' file must be copied into the SD Card of the mobile (i.e.) root folder.

4. Scroll the smart phone from top to bottom on the touch screen and tap on the “USB connected” option to connect to the PC.

4



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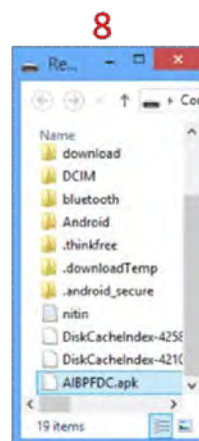
5. Tap “Connect storage to PC” button to connect the smart phone. This connection allows to copy files between the computer and Android's SD card.

6. Click on “OK”. Now SD Card of the smart phone can be accessed as external drive in the PC.



7. Copy the file from PC.

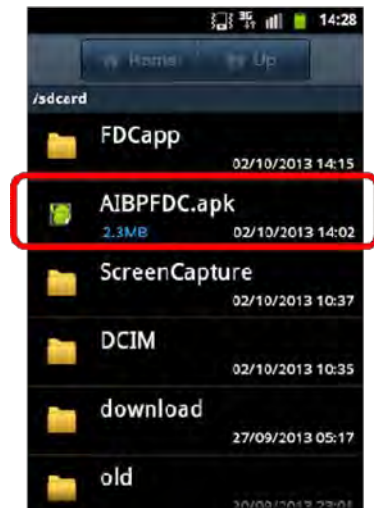
8. Paste into root folder of SD Card of the smart phone. See the figure as given below.



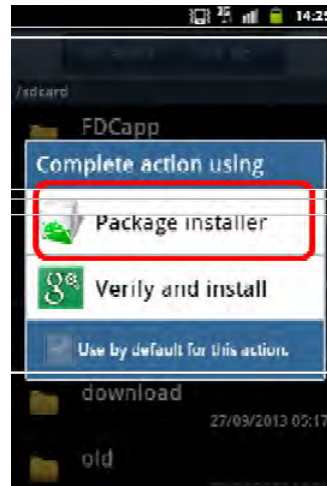
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9. Now, in smart phone click on “Disconnect storage from PC” to disconnect the device from computer (PC).
10. Double click on 'AIBPFDC.apk' file in smart phone to install mobile app.
11. Click on “Package installer”.

10



11

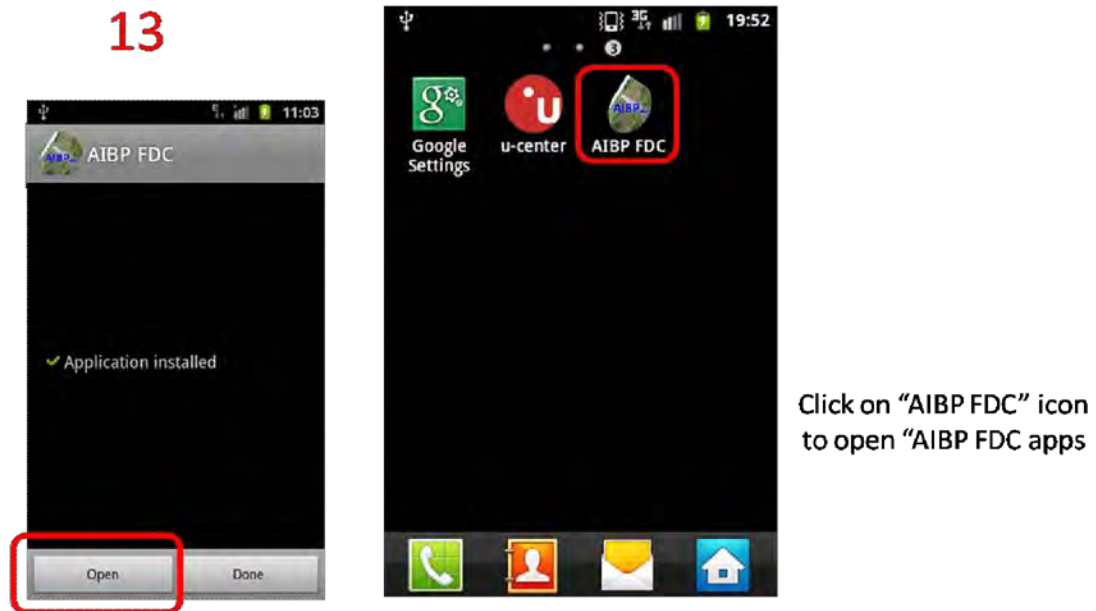


12. Click on "Install" button.

12



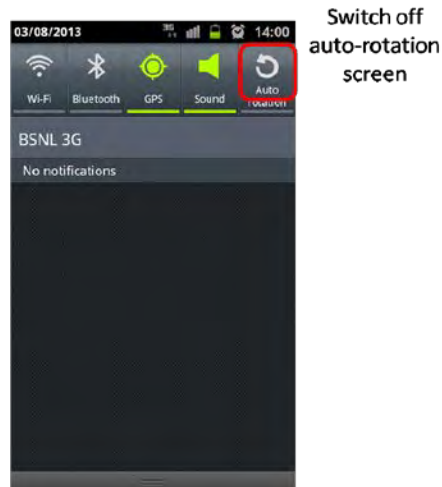
13. After installation, click on “Open” to open the app or click on “Done” (The mobile screen appears as shown on right side image). Now click on "AIBPFDC" icon to open the app.



5.2.2 Preparation of Device

Switch off auto-rotation of the mobile screen:

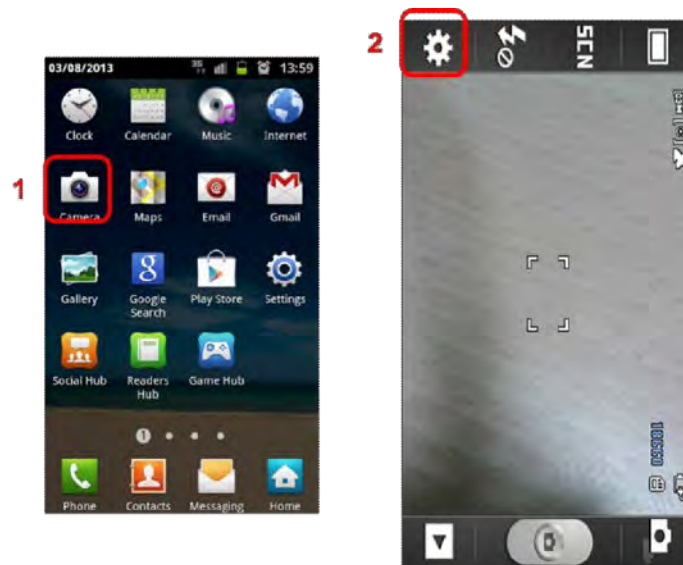
Scroll the screen from top to bottom which opens a GUI with option to switch-off. Tap on the auto-rotation icon to de-highlight (i.e.) switch-off auto-rotation.



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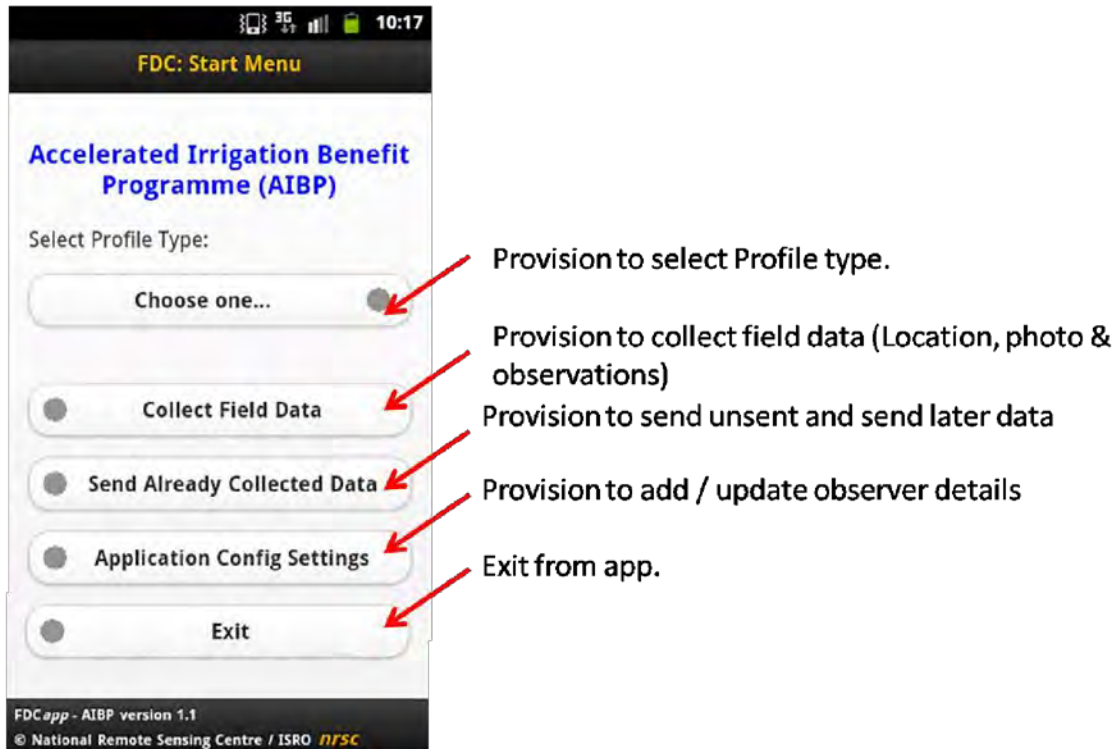
Change camera resolution to 640X480 in mobile's camera:

1. Click on the camera icon on screen.
2. Click on camera setting.
3. Scroll for camera resolution and tap on the resolution icon for drop down menu.
4. set the lowest resolution.



5.2.3 Mobile app Home Page

The mobile app home page (FDC: Start Menu page) appears as shown below.



The process of collection of field photographs with location information and related details involves the following three steps sequentially.

- i) The user has to enter his/her details using "Application Config Settings" button. This entry of user details is one time job for a person for a particular project. These details have to be changed whether person or project changes.
- ii) The user has to choose "select profile type" button and then enter related details such head works, canal, etc.
- iii) The user has to collect field data using "Collect Field Fata" such as GPS (latitude and longitude) reading and capture a photograph. The user has the option of sending the data immediately or at a later time.

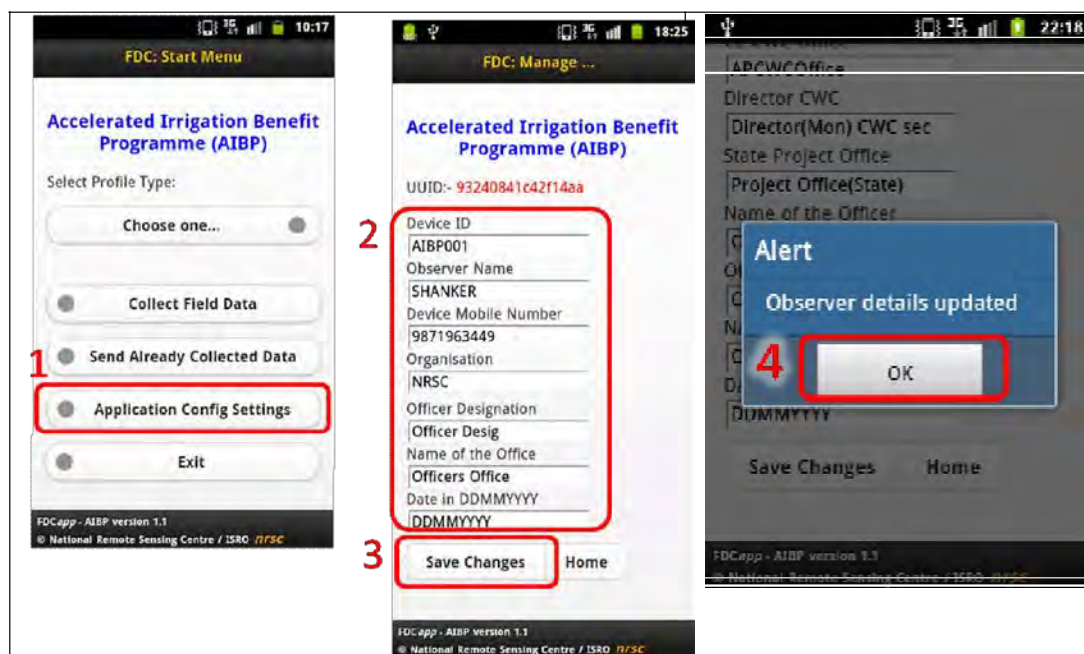
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The steps ii and iii have to be repeated for each point of observation. In the absence of mobile network availability the collected photograph and data can be sent to the server at a later time using "Send already collected Data" button. Use "Exit" button to close the field data collection session.

5.2.4 Application Configuration Settings (User Details)

The user details are part of Application Configuration setting page and they are entered by user and the process is one time job until user or project changes. The details are Device ID, Observer Name, Device mobile number, Organisation, etc that are entered by user.

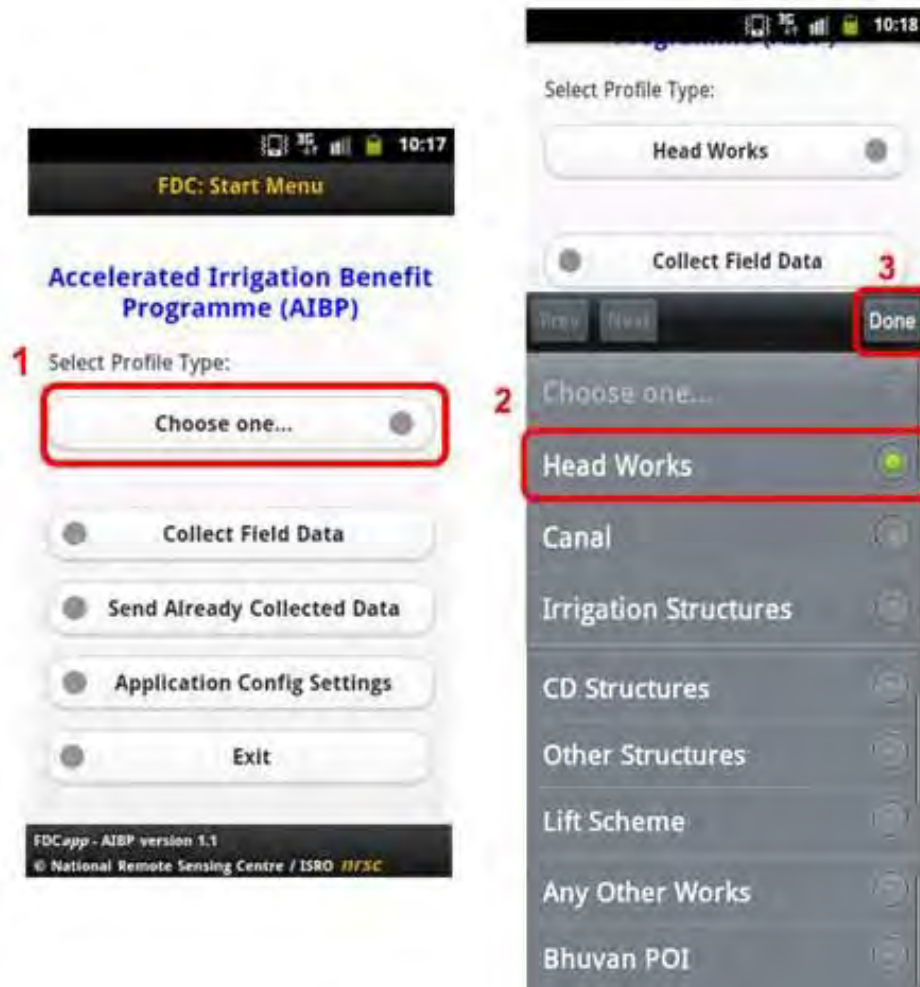
Steps: 1. Application Config. Setting >> 2. Enter the details >> 3. Save Changes



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5.2.5 Profile Type

The user must select the profile type for field data collection categorized into 8 types. They are Head Works, Canal, Irrigation Structures, CD Structures, Other Structures, Lift Scheme, Other works and Bhuvan POI (for details of profiles refer section 5.4). Then tap on "Done".



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5.2.6 Collect Field Data (collection, save and send)

The page of "Collect Field Data" appears as shown below.

The screenshot shows the 'Accelerated Irrigation Benefit Programme (AIBP)' app interface. It includes a 'Feature Type' section with buttons for 'Point', 'Line', and 'Polygon'. Below this, it displays 'Lat:17.46927623645684, Lon:78.53337377141608' and 'Acc:10'. There are 'Pick Point' and 'Unpick Point' buttons. A 'Take Photo' button is also present. Below the photo button, there are two 'Photo' labels. Red arrows point from the text annotations to these elements.

Provision to select different feature type (tap on the button)

Lat/long & accuracy information is displayed, initially this will not appear and wait till it appears.

Click on "Pick Point" button to get geo-location of the point and unpick point button to remove collected point.

The picked points are displayed in the list box.

Take Photo button to capture photograph (limited to 2 nos)

Photo1 & 2 are displayed

The screenshot shows the 'Observation details' form. It includes a 'Note: (*) are mandatory fields' at the top. The form has fields for 'Canal Name (*)', 'Parent Canal Name (*)', 'Type (*)', 'Physical Status (*)', 'Lining', 'View Direction', and 'Remarks'. Red arrows point from the text annotations to these fields.

Type observation using keyboard

Select observation from drop down menu

Observation details

The screenshot shows the bottom section of the app interface. It includes a 'Completed' status bar at the top. Below it are buttons for 'Reset', 'Home', 'Save', 'Send', and 'Send Later'. Red arrows point from the text annotations to these buttons.

Reset the collected observation

Provision to go back to home page

Provision to send later, when internet connection not available.

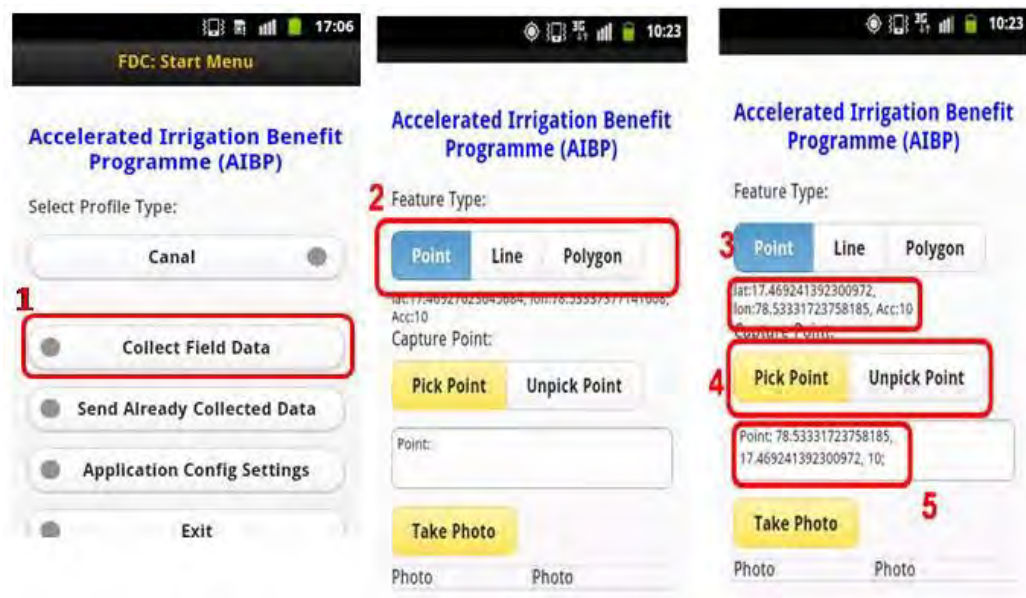
Save the collected observation

Provision to send data to central server

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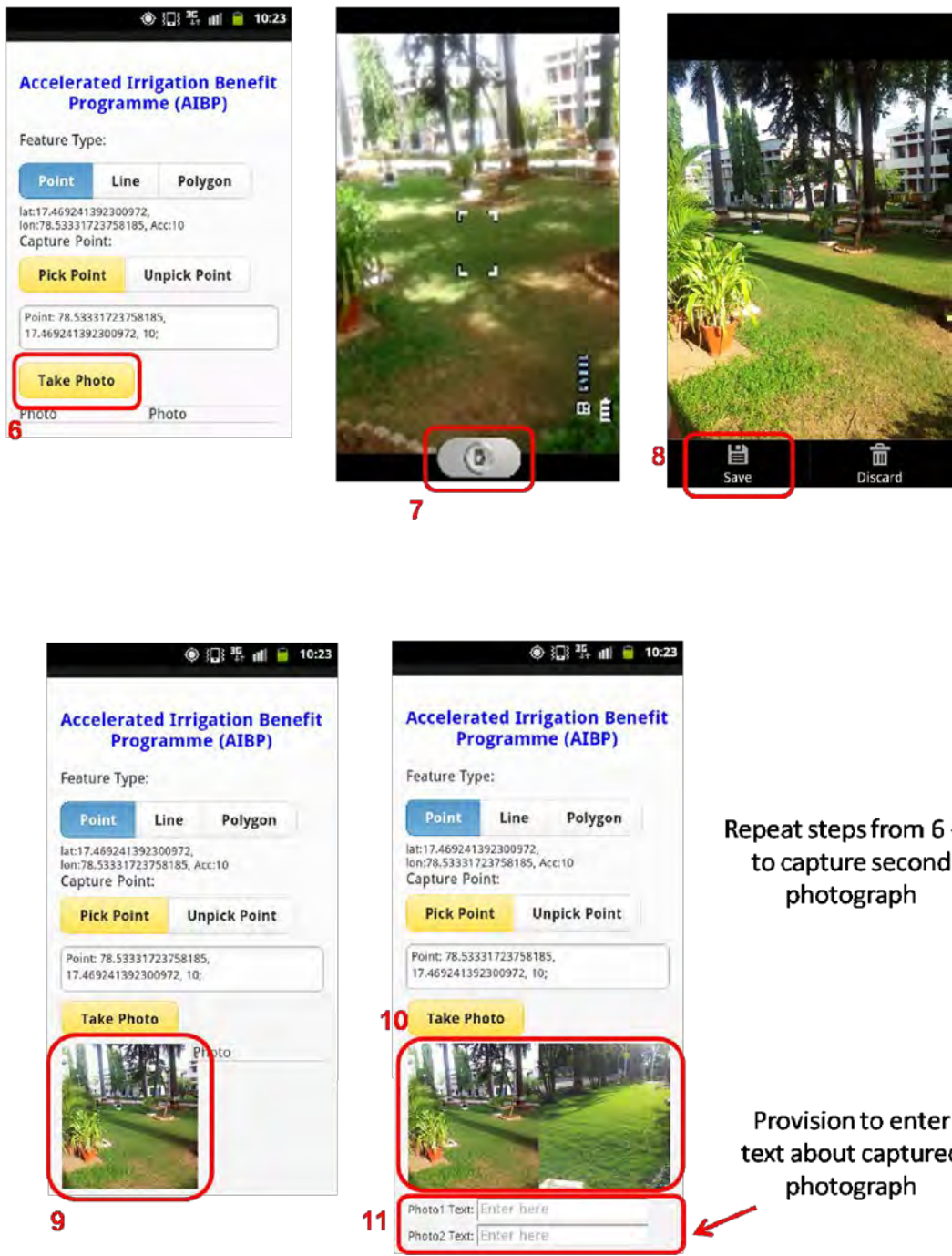
To collect field data following steps to be carried out sequentially (refer figures given below).

1. Click on "Collect Field Data"
2. Select the Feature Type
3. Wait till Lat/Long appears (ensure accuracy value as 10 or below)
4. Pick Point
5. Picked Lat/Long. Info displayed in list box



6. Click on "Take Photo"
7. Click on Capture button
8. Click on "Save" to save photo
9. First Photo is displayed
10. Second photo is displayed
11. Enter the text related to captured photos

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12. Enter the observation details

Note: (*) are mandatory fields

Canal Name (*) :

Parent Canal Name (*) :

Type (*) :

Physical Status (*) :

Lining :

View Direction :

Remarks :

12

The field with (*) are mandatory fields

13. Click on “Save button” to save collected observations

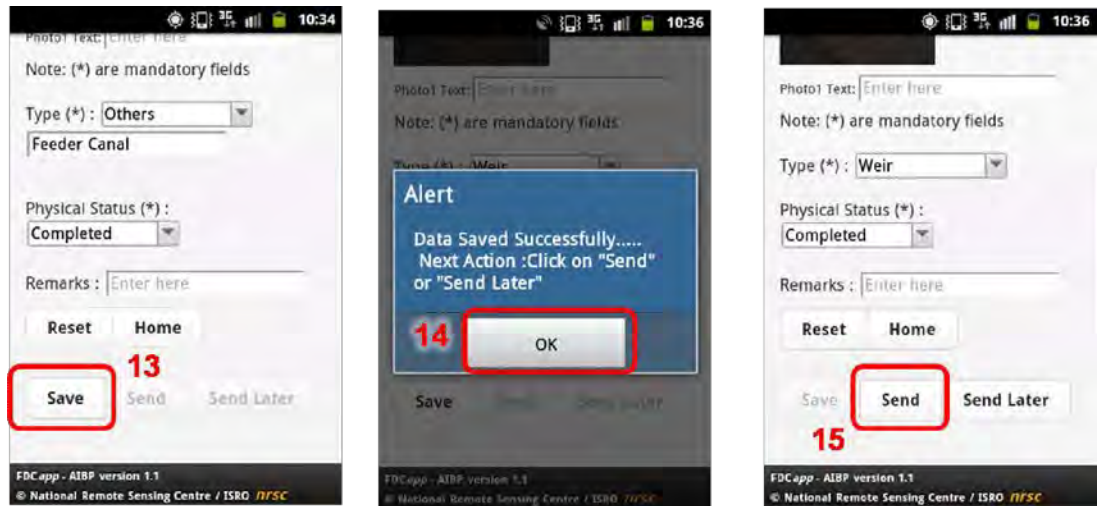
14. Message box appears and click on “OK”

15. The Send button gets enabled to click and click on “Send”

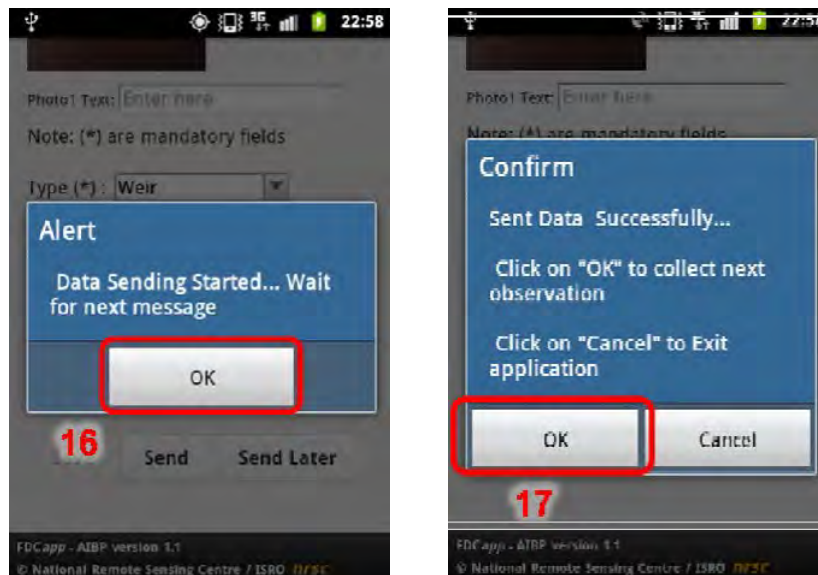
16. Alert appears “Data sending Started”

17. After sending the collected data to central server message box appears, click on “OK” to collect next observation.

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Note: Once Save is clicked, Save button disables for click and Send & Send Later buttons get enabled for click

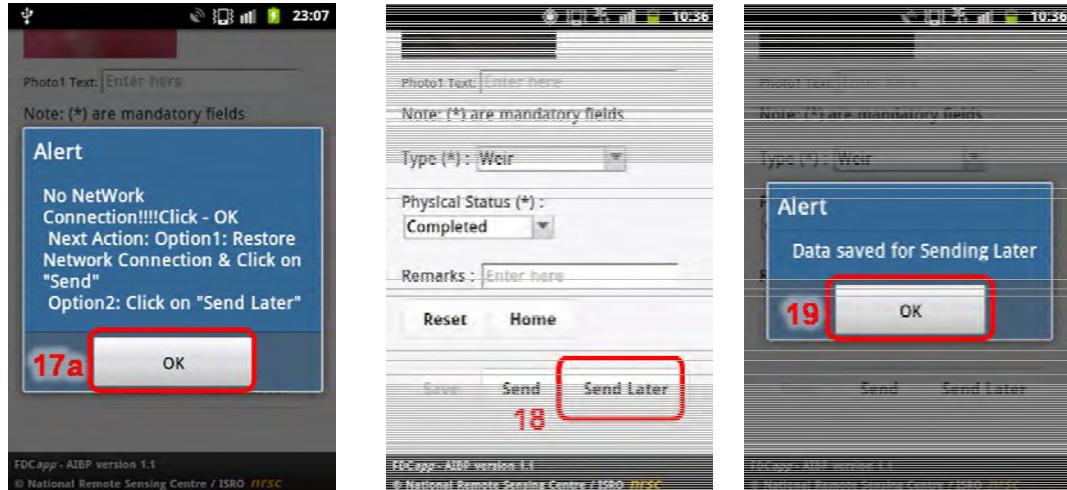


If user does not know about internet connectivity and click on send button, a message box appears as shown below; further user can opt for send later option.

17a. Message appears stating "No NetWork" Click on "OK"

18. Click on "Send Later"

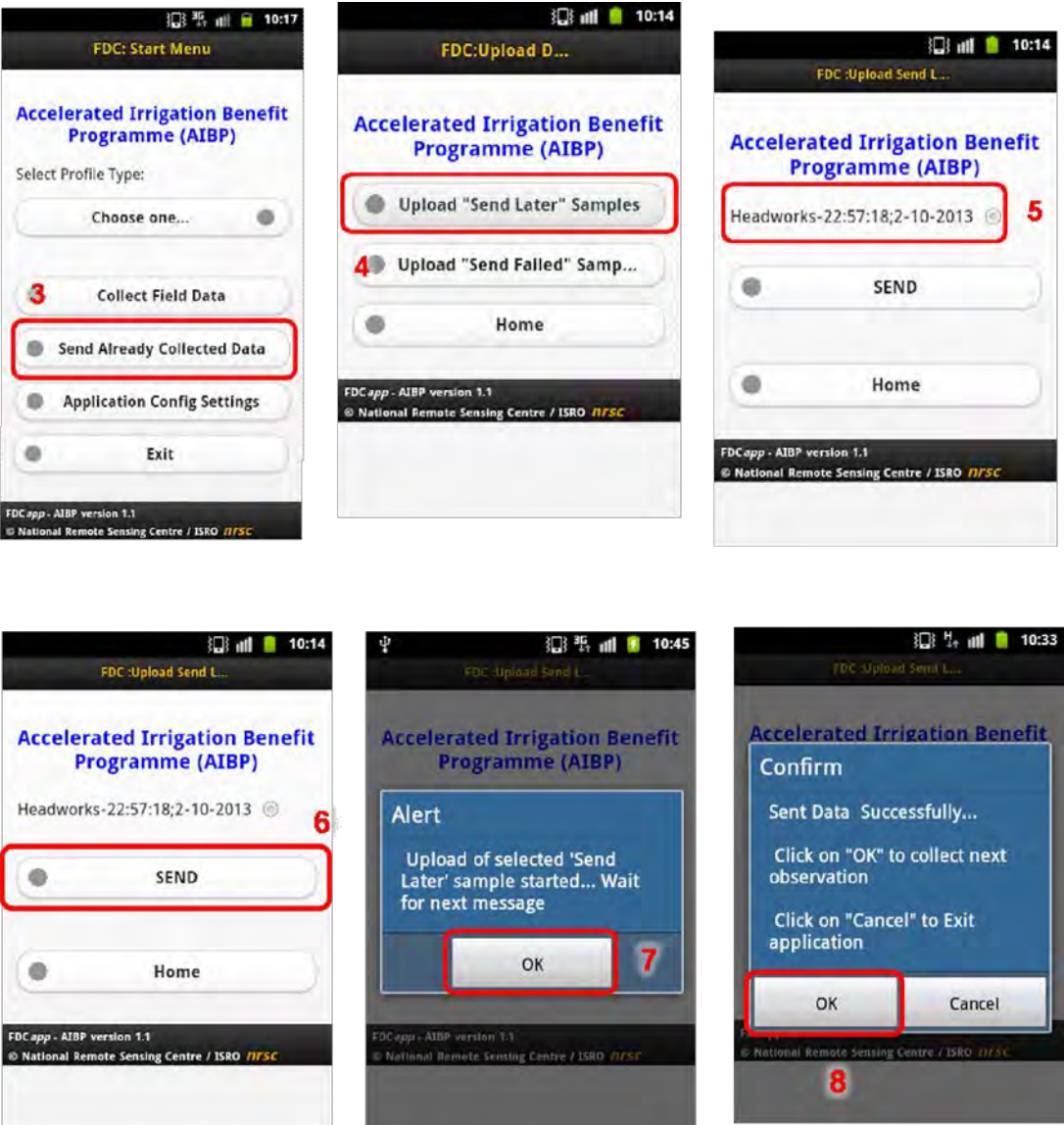
19. Message appears with "Data saved for sending Later".



5.2.7 Send Already Collected Data

Once the internet connectivity is restored, user can follow the step 3 to 8.

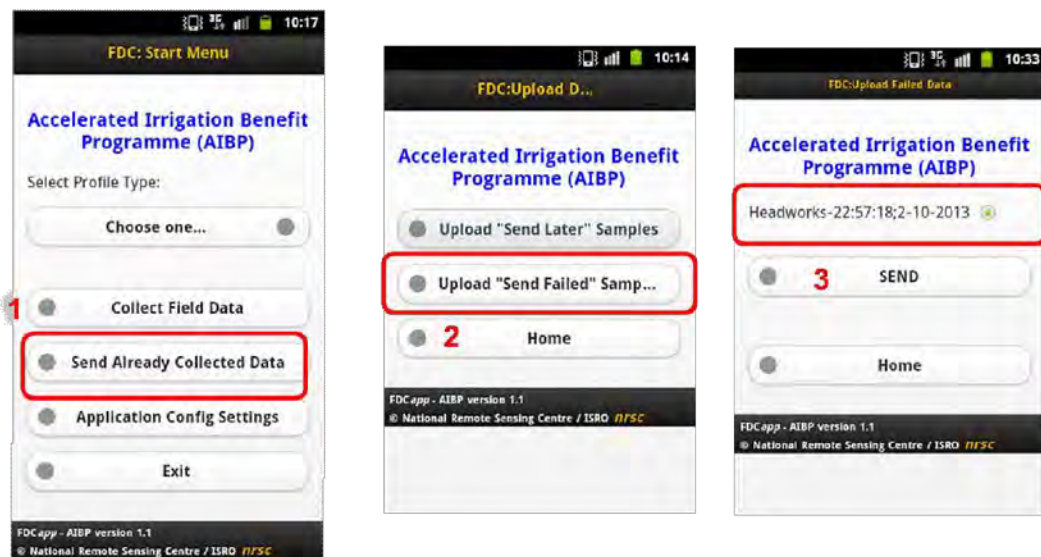
1. If user knows that there is no internet connectivity then Send Later option can be opted, Click on "Send Later".
2. Message box appears "Data saved for sending later", Click on "OK" button.
(as already explained in 5.3.6 steps 18 and 19).
3. Once the internet connectivity is restored click on "Send Already Collected Data" button in startup page.
4. Click on "upload Send Later samples".
5. This page lists send later samples and user can select only one at a time to send collected data to central server, Click on radio button against the sample.
6. Click on "Send" button.
7. Message box appears with "upload started message", click on "OK". Once the data is uploaded into central server message box appears with "Uploaded data Successfully", click on "OK" to send next observation.

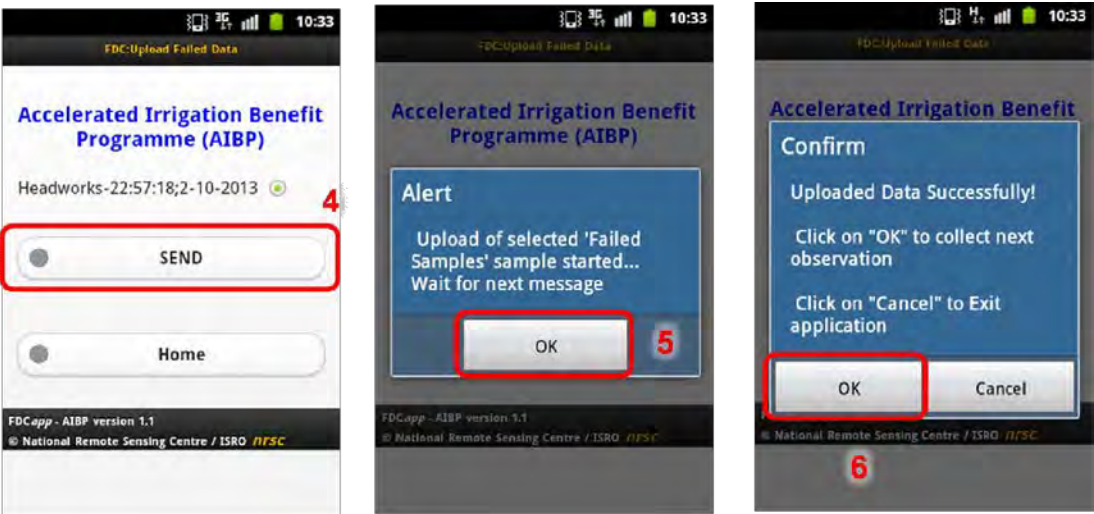


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In case, if there is internet connectivity failure during sending process. The send fail data automatically appear in upload failed data. The following are steps to be followed to "Upload send Failed Samples".

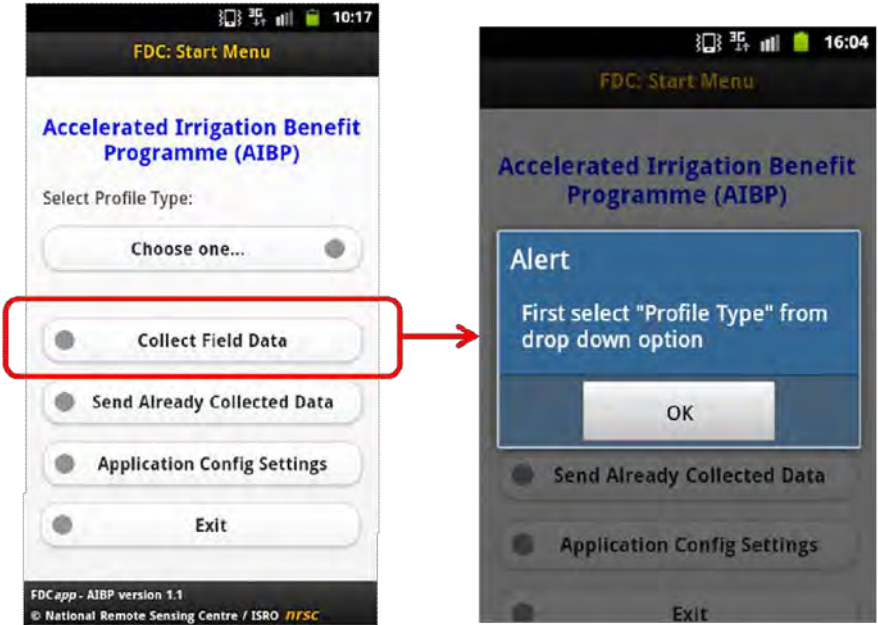
1. once the internet connectivity is restored click on "Send Already Collected Data" button in startup page.
2. Click on "upload Send Failed samples".
3. This page lists send failed samples and user can select only one at a time to send collected data to central server, Click on radio button against the sample.
4. Click on "Send" button.
5. Message box appears with "upload started message", click on "OK". Once the data is uploaded into central server message box appears with "Uploaded data Successfully", click on "OK" to send next observation.





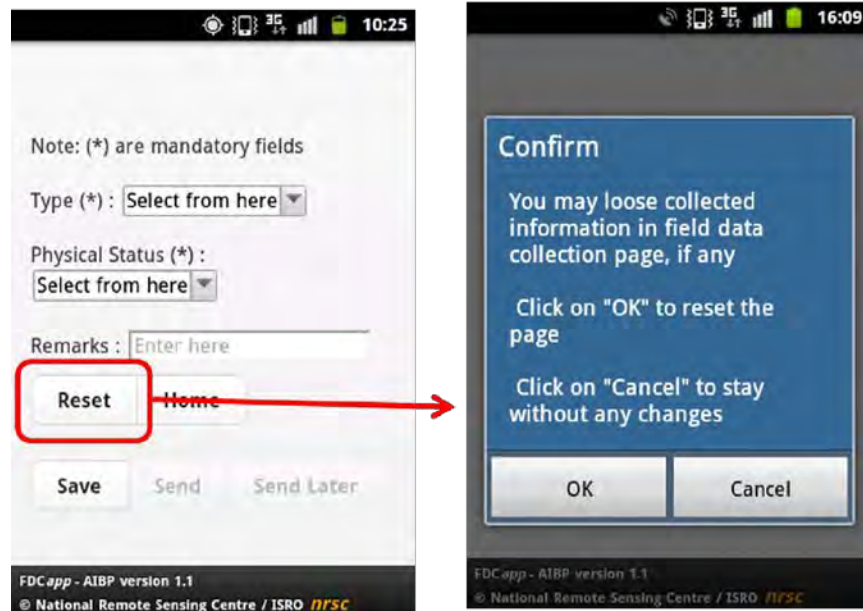
5.2.8 Other Functions in FDC Page

If the user selects "Collect Field Data" button before choosing profile type the following alert message appears.

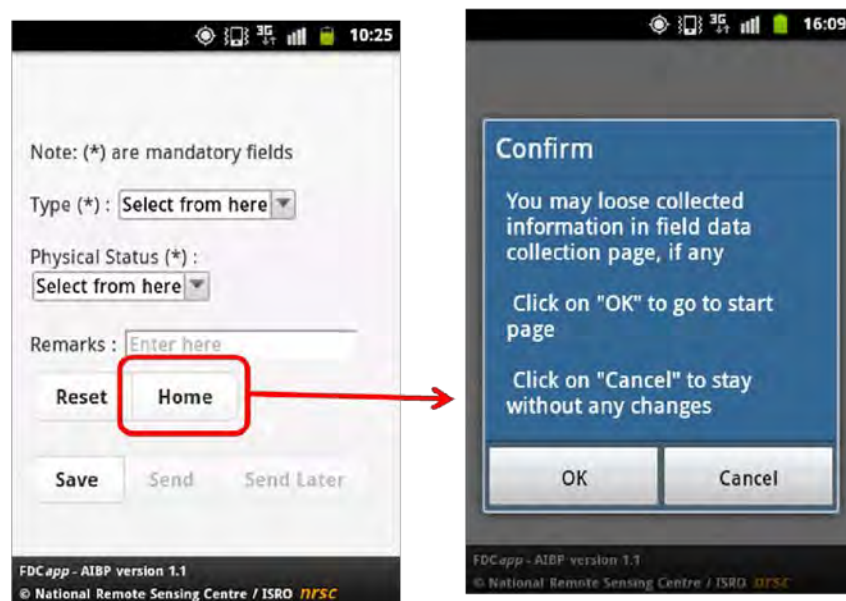


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If the user wants to clear or delete the current point photograph and details, click on "Reset" button.

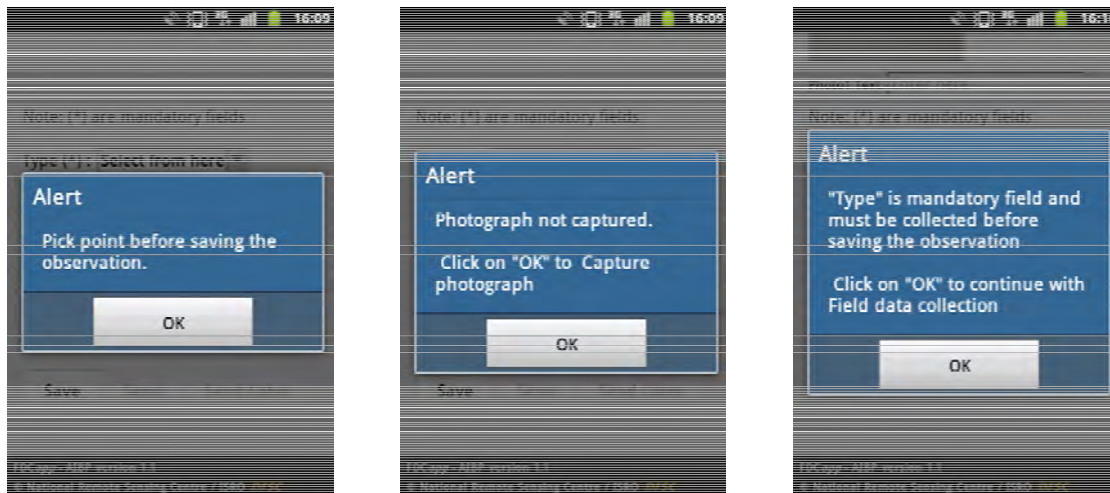


If the user clicks on "Home" button without saving the current point photograph and details will be deleted and Mobile app home page(FDC start Menu page) appears.

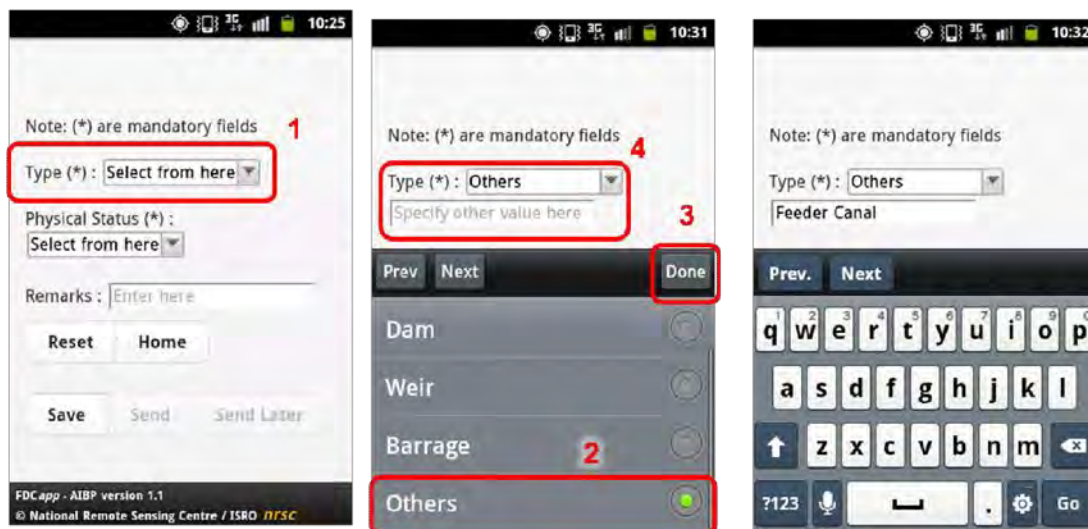


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If the user skips the mandatory steps, the following alerts appear.



If the user wants to enter specific details or name under "others" type, category text box option can be used.



5.2.9 Un-installation of Software

The steps for un-installation of software are given below.

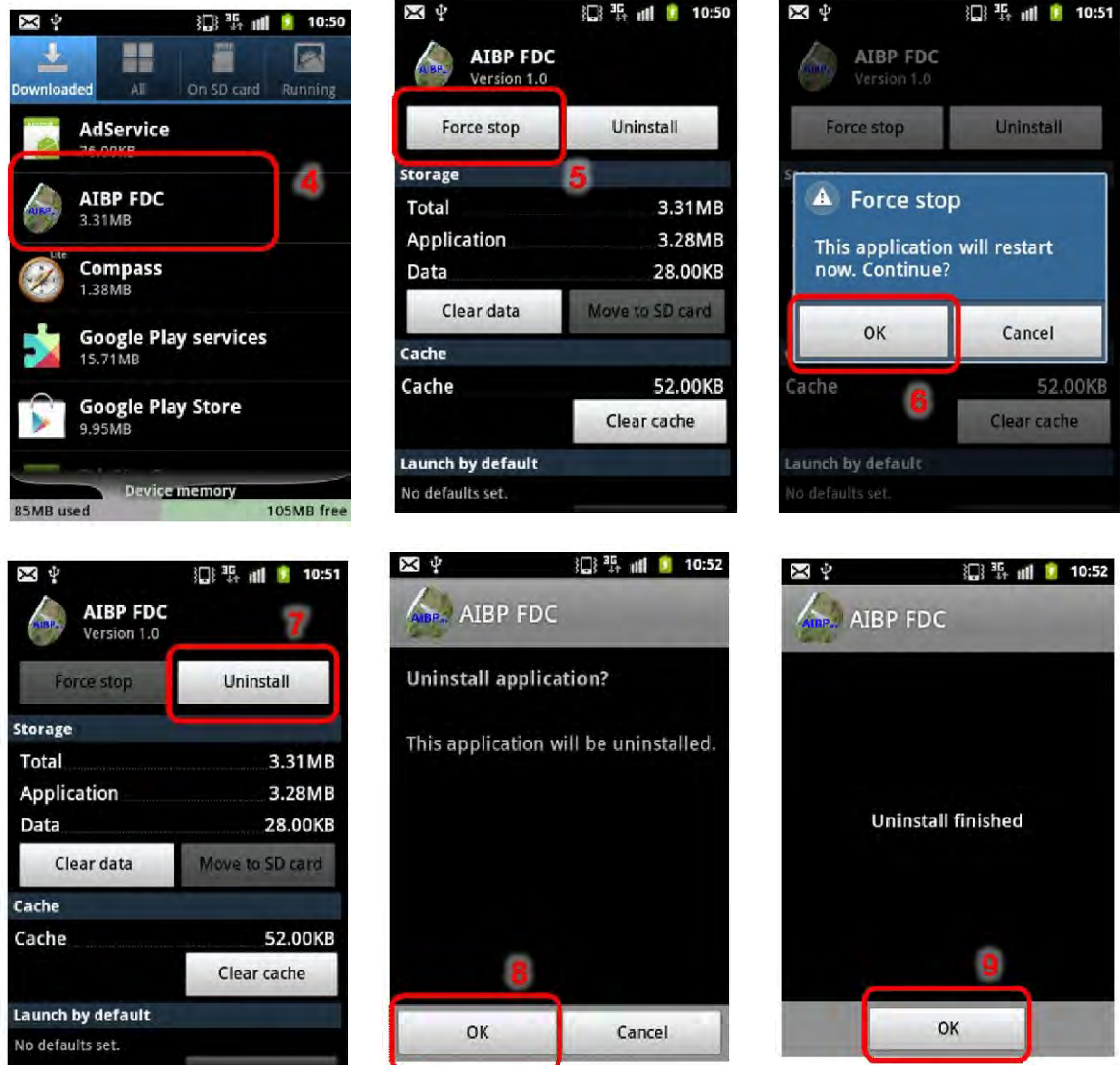
1. Click on “Setup” button.
2. Click on “Applications” button.
3. Click on “Manage Application” button.



4. Select the application, Click on “AIBPFDC”.
5. If the application is not properly close then click on “Force Stop”.
6. Click on “OK” button to restart the application.
7. Click on Uninstall.
8. Click on “OK” button to start uninstall process.
9. After uninstall the application a message box appears with uninstall finish, click on “OK”.

Note: To force stop the application follow the steps from 1 to 6 of uninstall procedure.

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5.3 AIBP Profiles and Parameters

List of profiles available and parameters under each profile in the AIBP mobile application developed by NRSC are as given below.

Profiles

1. Head works
2. Canal
3. Irrigation structures
4. CD structures
5. Other structures
6. Lift scheme
7. Other works
8. Bhuvan POI

Profile 1:Head works

- | | |
|---------------------------------|------------------------------|
| Parameter name: Type | - Dam, weir, barrage, others |
| Parameter name: Physical status | - progress, completed |
| Parameter name: Remarks | - Enter text |

Profile 2:Canal

- | | |
|-----------------------------------|---|
| Parameter name: Name | - Enter text |
| Parameter name: parent canal Name | - Enter text |
| Parameter name: canal Type | - Main canal, Branch canal, Distributory, Branch distributory, sub-distributory, Major, Minor, Lateral, Sub-minor, Sub-lateral. |

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Parameter name: Physical status	- Earth work, sectioning, lining, completed, gap
Parameter name: Lining	- Lined, unlined
Parameter name: View direction	- upstream, downstream
Parameter name: Remarks	- Enter text

Profile 3:Irrigation structures

Parameter name: Type	- Cross Regulator, Head Regulator, Drop, Escape, others
Parameter name: canal name	- Enter text
Parameter name: Physical status	- Progress, completed, pending
Parameter name: Remarks	- Enter text

Profile 4:CD structures

Parameter name: Type	- Aqueduct, Syphon, super passage, canal syphon, under tunnel, box culvert, pipe culvert, others
Parameter name: canal name	- Enter text
Parameter name: Physical status	- Progress, completed, pending
Parameter name: Remarks	- Enter text

Profile 5:Other structures

Parameter name: Type	- Road bridge, Rail bridge, others
Parameter name: canal name	- Enter text
Parameter name: Physical status	- Progress, completed, pending
Parameter name: Remarks	- Enter text

Profile 6:Lift scheme

Parameter name: Source Type	- River, Reservoir, Canal, others
Parameter name: Source name	- Enter text

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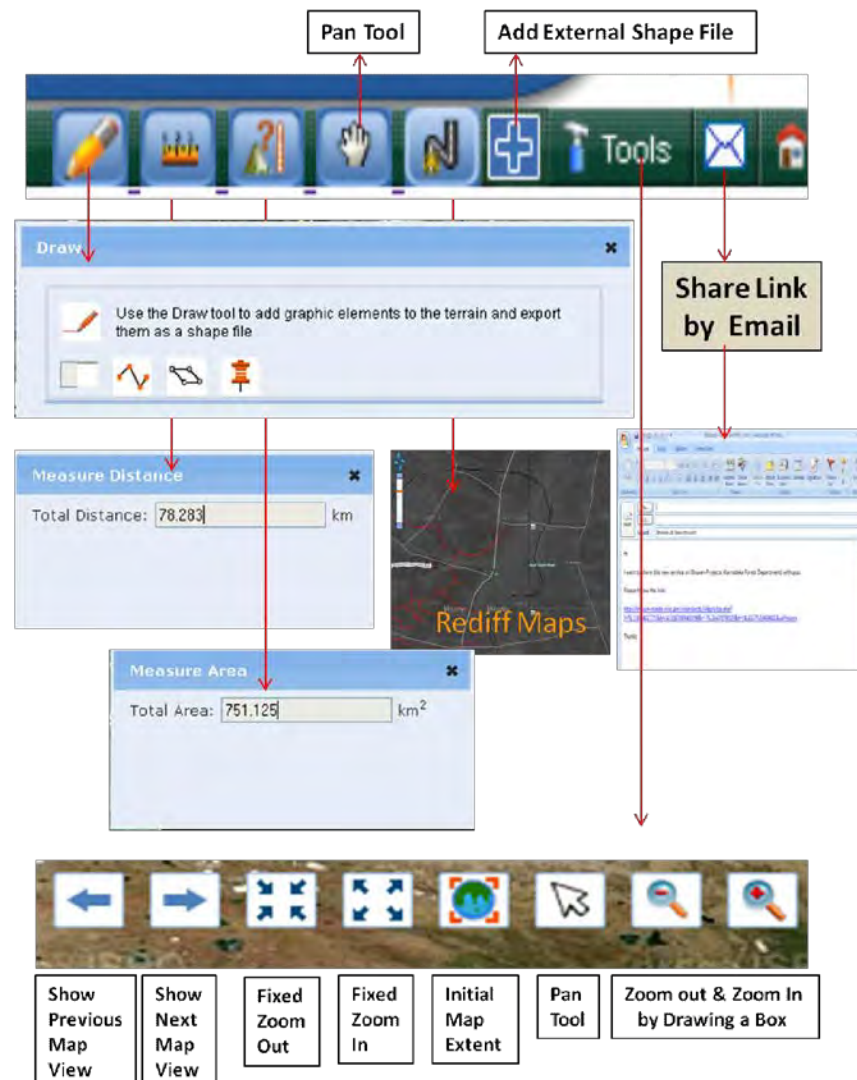
Parameter name: Approach channel	- Progress, completed, pending
Parameter name: Pump house	- Progress, completed, pending
Parameter name: Lift canal	- Progress, completed, pending
Parameter name: Delivery Cistern	- Progress, completed, pending
Parameter name: Remarks	- Enter text

Profile 7:Any other works

Parameter name: Type	- Enter text
Parameter name: canal name	- Enter text
Parameter name: Physical status	- Progress, completed, pending
Parameter name: Remarks	- Enter text

6 Description of Other Bhuvan Tools

2D Bhuvan, a web mapping service application, provides a highly responsive, intuitive mapping interface with detailed imagery and embedded map data. It is based on the OpenLayers Open Source Project which offers powerful, user-friendly mapping technology to organize the satellite data and map data. Some of the functional capabilities of Bhuvan 2D are Map Navigation, Map Panning, its ability to add a point, polygon, line on the terrain, add drawings, measure area and distance on the terrain homepage, from their current location on the Bhuvan geo-portal..



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Home: The 'Home' icon on the top right hand side corner of the page, takes the user back

Help: The 'Help' icon on the top right hand corner of the page gives detailed instructions to the users about using and navigating on Bhuvan 2D.

Tool Button: The 'Tool Button' on the top right hand corner of the page, when clicked, expands to display 7 different tools. These seven tools perform the following functions:

Zoom-In: This tool helps the users to zoom-in to a particular location from their current location on the 2D map.

Zoom-Out: This tool helps the users to zoom-out to a particular location from their current location on the 2D map.

Full- Extent: The Full-Extent tool helps to zoom out of the current location of the user to the maximum extent of the map.

Fixed Zoom-In: This tool helps the users to zoom-in to a particular location in a fixed manner, from their current location on the 2D map. Users can zoom into a location at a fixed level of zoom, at a time.

Fixed Zoom-Out: This tool helps the users to zoom-out to a particular location in a fixed manner, from their current location on the 2D map. Users can zoom out from a location, at a fixed level of zoom, at a time.

Go Back to Previous Extent: This tool takes the users to the immediate previous location accessed by them on the Bhuvan 2D map. With the help of this button, users can go back to all the pages they had accessed, in the backward order.

Go to the Next Extent: This tool takes the users to the pages accessed by them on the Bhuvan 2D Map, in a forward manner.

User Manual

Overview Map: The Overview Map feature displays an additional view of the earth, with a position indicator that corresponds to the user's current view inside the 2D map. This shows a miniature overview of the user's current location on the map, and also reflects the change on the overview map as the user navigates on the 2D map.

Navigational Tools:



1. Left arrow: to change the map direction to the left.
2. Up arrow: to change the map direction upwards.
3. Right arrow: to change the map direction to the right
4. Down arrow: to change the map direction downwards.
5. Zoom controller: to zoom in/out freely on the map.

Navigational Map:

This functionality overlays the WMS layers of rediff map on the Indian boundary. Users need to click on the 'Navigational Map' icon to view the 'Rediff maps' of the Indian region.

Area Measurement :

The 'Area tool' allows you to define an area of map and obtain its exact measurements.

User Manual

- x Click on the 'Area Measurement' tool which is located on top of the 2D map
- x Use the mouse to draw on the map such that it covers the area you desire
- x The area of the selected region is now displayed.
- x To stop selecting points, just double click.

Distance Measurement :

The 'Distance Measurement' tool allows you to measure the horizontal distance between two or more points on the map

- x Mark the measure area using your mouse.
- x Every area marked will then display the distance between the points marked.
- x To stop selection, just double click.
- x This value is displayed in the altitude and distance units
- x Pan :
- x You can use the 'Pan' functionality to view different locations on the plane, in a panoramic effect, by scrolling the map as required.





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Gateway to Indian Earth Observation

