

Documentation of Best Practice

Geo-informatics for Forest Rights

November 2010

Researched & documented by



oneworld.net
OneWorld Foundation India

Table of Contents

EXECUTIVE SUMMARY	3
BACKGROUND	4
OBJECTIVE	5
KEY STAKEHOLDERS	5
WORKING DESIGN	5
METHODOLOGY	11
LESSONS LEARNED	11
APPROPRIATE AND INNOVATIVE USE OF TECHNOLOGY	11
DETERMINED PURSUIT OF AN ALTERNATIVE SYSTEM THAT PROMOTES TRANSPARENCY	11
DEVELOPMENT OF AN IMPACTFUL, SUSTAINABLE AND REPLICABLE SYSTEM.....	11
<i>Appendix A- Interview Questionnaire</i>	<i>13</i>
<i>Appendix B- Salient Features</i>	<i>14</i>

Executive Summary

The Government of India enacted The Forest Rights Act, 2006 (Scheduled Tribes and Other Traditional Forest Dwellers - Recognition of Forest Rights – Act) to give forest dwelling scheduled tribes and other traditional forest dwellers the opportunity to claim individual as well as community forest rights of forest land. The Tribal Research and Training Institute (TRTI), Pune has developed a GPS



based system for forest land measurement and a software using satellite imagery for forest rights claim verification under the Act for the intended population in the state of Maharashtra. There are approximately 0.33 million claimants of Forest Rights in Maharashtra.

By leveraging GPS and satellite technology to document and determine the legitimacy of land claims, TRTI has enabled decision makers to take appropriate action based on unbiased evidence. Through persuasive ICT-led evidence, the Maharashtra system provides valuable precursory information to plane table survey forest land plots, expediting and lowering the cost of the entire process. It also reduces unnecessary conflict and corruption in the field that have historically been connected to issues of land rights.

The Geo-informatics for Forest Rights Act implementation programme has succeeded in more ways than one. It has enabled the Committees to take objective decisions through enhanced transparency. Additionally, it has discouraged illegal diversion of forest land for non-forestry purposes through the possible improper use of the provisions of the Forest Rights Act. Public money of over an estimated 100 crores has been saved through the use of technology in lieu of hiring official land surveyors and paying the Department of Land Records for surveying all forest lands on which forest rights were claimed. Coordination of various levels of government - tribal, forest, and revenue departments, technology training, and conveyance of the credibility of the system to officials and claimants were crucial to achieving success.



To date, out of 3.38 lakh claims state-wide, 1.6 lakh cases have been measured by GPS, and a total of 1.05 lakh cases have been decided in favour of the claimants.

Sarpanch – Walunj village, Nagar tehsil, Ahmadnagar district, Maharashtra

Background



Adivasi claimants – Walunj village

Prior to the Forest Rights Act, 2006, approaches towards forest resources did not necessarily reflect a desire to conserve but rather exploit such areas for forest produce. The new Act grants legal recognition of rights to the forest dwelling Scheduled Tribes and other traditional forest dwellers. Specifically, it outlines who is/are eligible for individual/community forest rights and what the specific forest land under forest right's claim can be used for. For the first time, it also empowers the forest dwelling communities to protect the resources around them. It also recognises management rights in favour of communities who have been traditionally managing forest resources for sustainable use in the past. The Act calls for the recognition of habitation and cultivation rights to the eligible claimants if they are in possession of the specific forest land on or before 13 December 2005.

With the authority of the claim scrutiny in the hands of the Forest Rights Committee (comprised of villagers) the process progresses upon the recommendation of the Gram Sabha. This recommendation is later screened by the sub-division and district level committees which is the final adjudicating authority in the matter.

The impact of the Forest Rights Act will depend on its implementation which faces some critical challenges. For one, it is difficult to measure forest land in a timely manner because it is remote and the FRCs, who are made responsible for preparing maps under the Act, lack the expertise. Evidence of cultivation or prior occupation is scarce and hard to come by. Even after the forest land is identified, it is often difficult to grant claims and reject others because evidence is not always straightforward. There are many stakeholders involved in forest land rights and hence it is also difficult to keep all involved actors informed to the extent needed.

To overcome these barriers, the Government of Maharashtra developed a Geo-informatics based system for the forest rights recognition process. The Tribal Research and Training Institute (TRTI) has facilitated GPS-led surveying of forest land from 2009 to assist in determining the validity of (individual land) claims. The TRTI has since pursued capacity building through specific training modules for various levels and also through advocacy. Those who received the training now help in the decision making process through local committees. A website was developed for spreading awareness about the Forest Rights Act, the system of implementation, roles and responsibilities of stakeholders, management of on line information regarding claimants, land measurement, verification process of forest land under forest right's claims, monitoring of progress, and final decision making regarding claims.

The state of Maharashtra has 15,002 Forest Rights Committees and to date, there have been 3,38,679 claim cases in the state. GPS has been used to measure 1,60,785 plots of land. These processes are carried out by a number of stakeholder institutions in around 14,000 villages in the state. Data is uploaded in 110 SDO offices. Measurements are analysed in 28 district collector offices. Reports are viewed by over 200 stakeholders: 28 collectors, 110 SDOs, 31 tribal department offices and 40 forest offices. Overall monitoring is carried out by the TRTI office in Pune.

Objective

To fairly and accurately provide evidence for recognition of forest rights as outlined in the Forest Rights Act, 2006. This is accomplished through GPS measurement of forest land, digital plotting and superimposing of land boundaries on Cartosat 1 satellite imagery, and comparing vegetation cover and land use position between relevant time periods (2005-6 and 2007-8).

Key Stakeholders

1. **Tribal Research and Training Institute, Pune (TRTI)** – conceived, implemented and monitors Geo-informatics for Forest Rights
2. **National Informatics Centre (NIC)** – designed online data flow, monitoring and SMS system
3. **National Remote Sensing Agency (NRSA/NRSC)** – provided satellite imagery system
4. **Authorities appointed under the Act** – includes committees at three levels - village, sub-division and district
5. **District collector office staff** – analyses GPS data in relation to satellite imagery
6. **SDO office staff** – responsible for uploading digital field data and printing forest land measurement report
7. **GPS field workers (Forest/DILR/Revenue Department/ NGO representatives/ village committees)** – conducts GPS mapping by following standardised guidelines

Working Design

TRTI began implementation of the Act through publicity efforts to spread awareness. This included making a movie titled “Somache Swapna” and screening them in villages and on Doordarshan, playing traditional folk song based jingles on Akashwani, posting advertisements on buses, and employing NGOs for mobilisation of student advocacy groups.



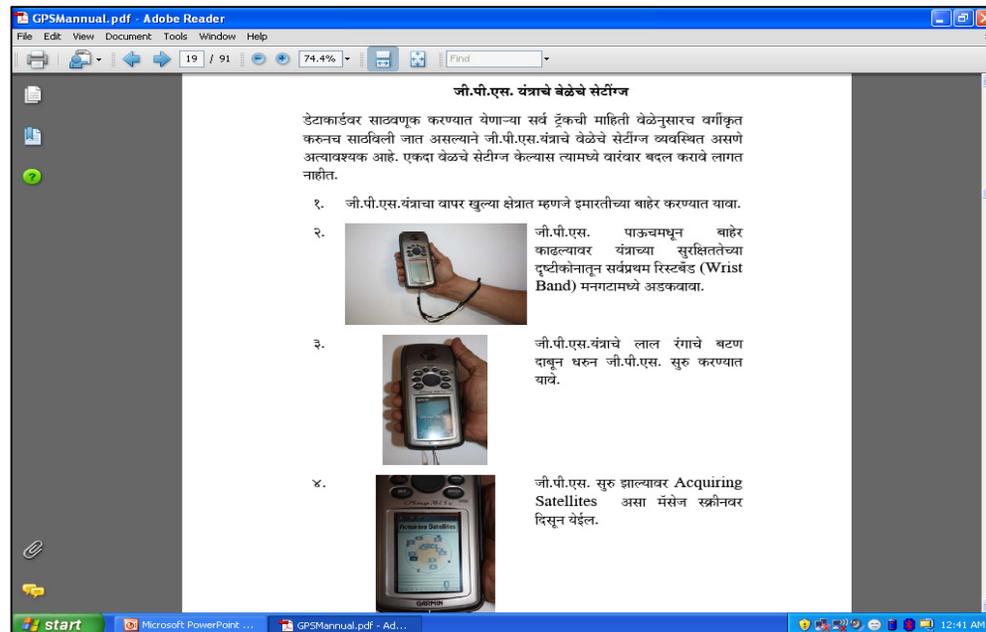
Additionally, a bilingual – Marathi and Hindi - website was created for information dissemination. The website also has the latest information on the implementation system, progress of implementation, and FAQs. The site was later expanded to centralise all claimant related data. The NIC-SDU, Pune has helped to design the architecture of the system and data models, and develop the web system using open

source technology, making the entire project cost effective. The system was tested against vulnerabilities such as cross site scripting, denial of the service attack, CSRF attack and SQL injections which are important for smooth running of the system. Necessary changes have been made in the software for security of the system. Inputs and suggestions required by the users were taken into consideration while designing and developing the system.

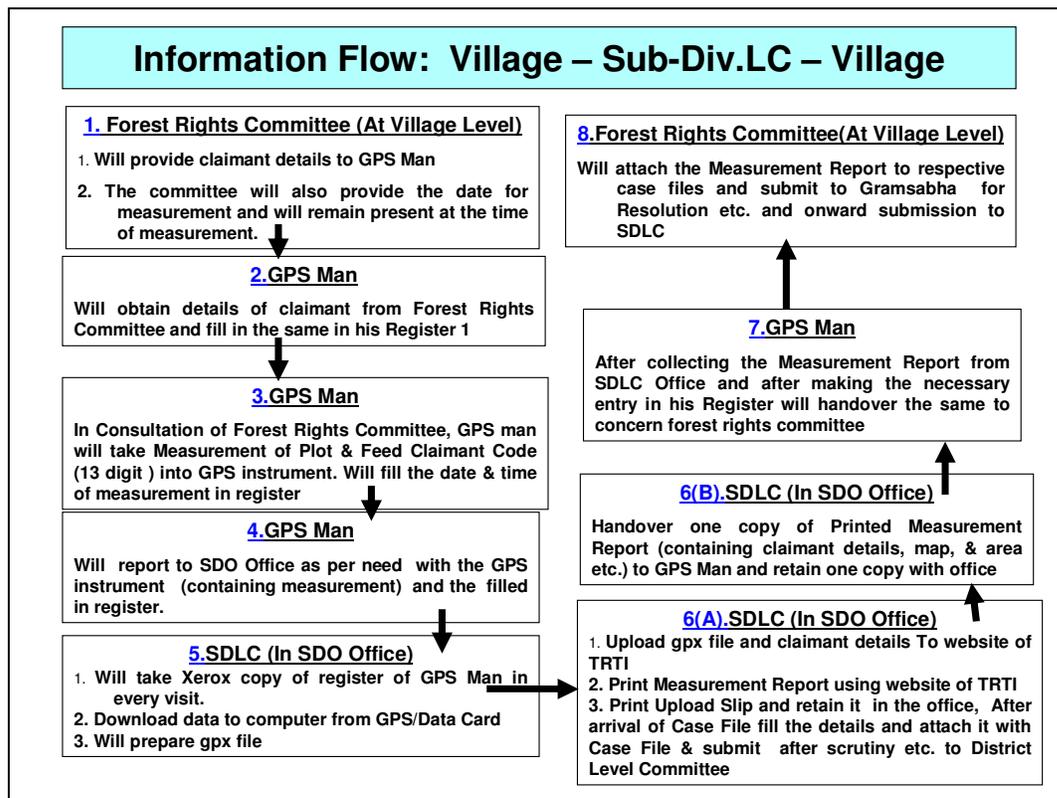
The next step was to develop a process by which land based forest rights could be claimed efficiently and effectively. The result has been a multistage, ICT-led procedure. A thirteen digit alpha-numeric unique ID is assigned to each claimant. The first two digits represent the district, the second two the taluka, the following five the village and the final four the claimant's name. For example: 0106dha01VNP0 means the claimant is Vishnu Nawal Pandu of Dhawalipada village, Nawapur Tahsil (06), Nandurbar District (01).

Traditional survey and demarcation of land is generally done through 'plane table measurement' by the District Inspector Land Records Agency (DILR). This method would have required a lot of manpower and time to survey in remote forested areas where forest right's claims are made. As such, five hundred Garmin GPS machines were procured in two phases and training was given to 'GPS men' across the state. Each GPS runs on MapSource proprietary software. A training manual in Marathi was meticulously created for the common, non-tech-savvy users. A measurement report was generated in English with a fill-in portion that can be hand written in Marathi by the concerned Forest Rights Committees.

Screenshot of GPS manual



Below is the detailed workflow of the field measurement process.

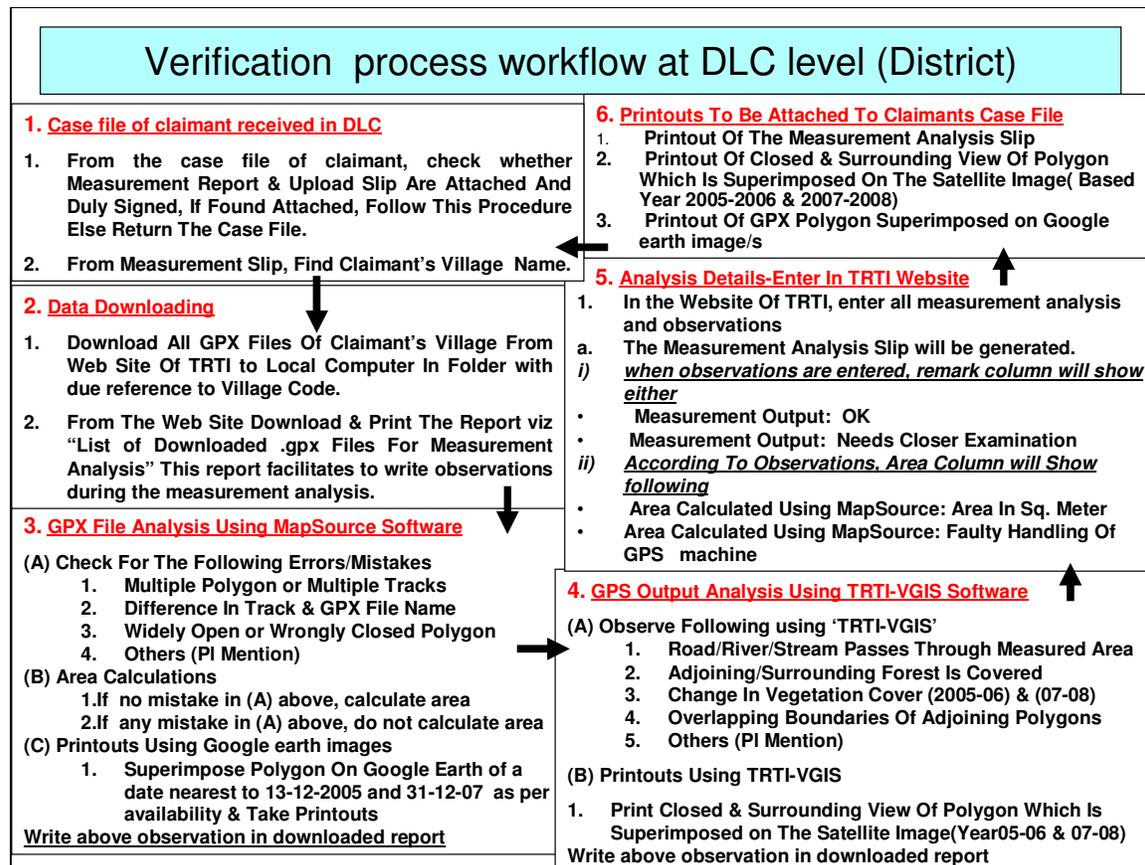


Source: TRTI, Pune

The GPS-generated polygon is uploaded to the sub-divisional officer's computer, where the XML file (GPX File) is used to produce a measurement report in the desired format. The GPX file and related data is stored online in TRTI's web-server. The GPX file is downloaded by District Level Committees (DLC) and superimposed onto Cartosat-I and Google Earth, an open source product, satellite images of two time series (2005-06 and 2007-08). Thus, for every plot there are at least three images of known dates available as evidence. The in-house software, 'TRTI-VGIS', displays the Cartosat-I Satellite images side-by-side which allows for comparative analysis of elements such as land use, vegetation cover, and cultivation signatures. Images are analysed at the DLC level for legitimacy of claiming land based forest rights; e.g. if images indicate a clearance of vegetative cover for cultivation after December 2005 or continued vegetative cover after Dec. 2005 or no signatures of cultivation on or before Dec 2005, the forest right's claim on the land could be dismissed. To expedite this process, the TRTI has conducted sample checking of claim cases on TRTI-VGIS software and sent the outputs to the Tribal Development Department for issuing further instructions to the collectors who are chairpersons of the DLCs.

An online bulk SMS service on the TRTI website runs on BSNL's Sancharnet and is used to disseminate information and instructions to field officers. All monitoring is conducted by TRTI in Pune where access to the central server provides full transparency into claimant related data.

The following is the detailed workflow at the district level – it outlines how field measurement is paired with satellite images to determine Forest Rights claims.



Source: TRTI, Pune

Below are the final satellite images of an eligible claim case. The first image is taken in January 2006 and shows cultivated land as does the 2008 image following it. The measurement report in the designed template with the GPS polygon, as mapped by the GPS field worker, is completed and displayed below.



**The Scheduled Tribes And Other Traditional Forest Dwellers
(Recognition Of Forest Rights) Act 2006 & Rules 2008**
Land Measurement Report of Forest Rights Committee
C/o Office Of The SDLC : Aheri, District : Gadchiroli

1. Claimant's Code : 1209Kas01SRG0 2. GPX File Name : 1209Kas01SRG0.gpx
3. Claimant's Name : Sanjay Rama Gawde

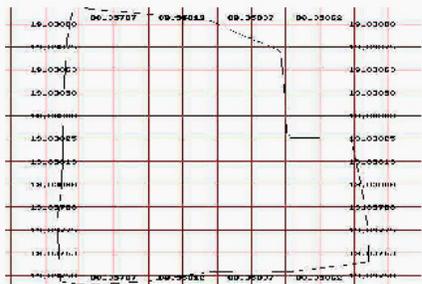
दावेदाराने नाव	
----------------	--

4. Claimant's Gender : Male 5. Claimant Type : Tribal
6. Claim Type : Individual

7. Details of Land measured
7.1 Date of Measurement : 26/05/2009 7.2 Date of .gpx file upload : 22/08/2009
7.3 Compartment/Gat/Survey No. : 29
7.4 Village : Kasansur [Kas01] Tehsil : Etapalli District : Gadchiroli
7.5 Area : [1.538 Hectares] [3.800 Acres] [15378.053 Sq. mtr] [165528.000 Sq. ft]

क्षेत्रफळ	हेक्टर	एकर	चौरस मीटर	चौरस फूट
-----------	--------	-----	-----------	----------

7.5 A Unit used by GPS machine : Acre
7.6 Shape of the land measured (Polygon)



(Signature with date) (Signature with date) (Signature with date)
Name: Name: Name:
Chairman of FRC Member Secretary of FRC GPS Man:
(Designation if any)

Forest Rights Committee, Village : Kasansur [Kas01] Tehsil : Etapalli District : Gadchiroli
Name & Signature / Thumb impression (in case of illiterate) of others present during the measurement
(use back side)

Printout Date : 03/11/2009 Page 1/2

The following images show an ineligible claim case because the image taken in November 2005 (left) shows forested land while the next indicates cleared land.



Methodology

OneWorld researchers identified Geo-informatics for Forest Rights as a best practice in public service delivery due to its one-of-a-kind model - a combination of innovative use of technology and comprehensive coordination for the effective recognition of land based forest rights.

Background research was completed in New Delhi and used to formulate appropriate questions for field interviews. Researchers travelled to Pune to discuss the programme with TRTI experts. A day was spent travelling to an adivasi village in Ahmadnagar (3.5 hours outside of Pune) where field activities - GPS measurement of forest land and gram sabha decision making – were demonstrated and community members shared their thoughts on and experiences with the programme.

Lessons Learned

Despite the daunting task that the programme took on and as a result, the number of challenges that were faced in its design, implementation and monitoring, it has managed to succeed to the utmost degree. Initially, it was difficult to educate all stakeholders and build the capacity of people of varying qualification levels to use the geo-informatics tools. In time, however, the programme was accepted and even hailed for its innovative delivery to the remotely placed forest dwelling target populations as being one of the most empowering factors of well-being – forest rights ownership.

Appropriate and Innovative Use of Technology

The Geo-informatics for Forest rights model leverages cutting-edge technology, but also masterfully deploys simple tools to the field and utilises more complex ones in higher levels of government. This structure allows for easy comprehension of programme benefits by forest right claimants, and simultaneously offers objective evidence couched in a credible and transparent system for efficient decision making and adjudication by the Committees under the Act.

Determined Pursuit of an Alternative System that Promotes Transparency

Implementers managed to convince the Government of Maharashtra of the programme's need and significance by remaining confident in the ability of technology to provide the transparency necessary to pursue rightful policies. At first, government officials were unsure of the programme's credibility; specifically, concerns focused on cases being wrongfully dismissed due to technology errors, and encroachments increasing during the time it would take for the tech-based system to be rolled out. Through perseverance, TRTI obtained the government's approval to take GPS measurements. As a result, 1.6 lakh cases have been measured by GPS to date and the technology is projected to be the standard for state-wide implementation of the Act.

Development of an impactful, sustainable and replicable system

The programme has enabled the timely recognition of forest rights to eligible claimants and rejection of ineligible claims. It has saved forest land from ineligible claimants and it discourages future offenders through increased transparency and

tight monitoring. It has generated a platform that will remain useful for Act implementation but also related policies in the long term. The system is user friendly and simple to operate once proper training is imparted on its users.

The Minorities board in Maharashtra has shown interest in using a similar system to analyse and document encroachment on waqf lands. Additionally, the Government of Karnataka has expressed their interest in the TRTI system and has consulted the TRTI to learn how it functions. TRTI is actively engaged in sharing knowledge regarding its applications with any and all interested parties. It has already made presentations before the MOEF, MOTA, ICFRE, Dehradun and before the forest departments in the states of Chhattisgarh, Jharkhand, Madhya Pradesh, Karnataka and also in various compulsory courses of IFS officers. TRTI's model could very well be leveraged for ultimately developing a common GIS based tribal development framework at the national level.

As a web-based and centralised application, the programme is easy to replicate. Forest Rights Act PLUS, namely an integration of geo-informatics for forest rights and the Mahatma Gandhi Rural Employment Guarantee Act (MGNREGA), is underway. The aim is to channel and consolidate all welfare programmes at the State level so that the target groups under the Act are effectively brought above the poverty line.

Research was carried out by the OneWorld Foundation, Governance Knowledge Centre (GKC) team.

Documentation was created by Knowledge and Research Coordinator, OWFI, Nicole Anand.

For further information, please contact Mr. Naimur Rahman, Director, OWFI.

References

TRTI powerpoint presentation 2010
eIndia. <http://www.eindia.net.in/2010/awards/details/eGov-G2C-Details.asp?PNo=45>

Interviews were conducted with key TRTI officials including Commissioner, Arvind Kumar Jha, and Computer Coordinator, Jitendra Avachat.

Appendix A- Interview Questionnaire

The Tribal Research and Training Institute (TRTI)

1. How was the idea of geomapping/ICT use for land rights conceived?
2. Please explain the working design of the geoinformatics for forest rights programme. How are mobile, GIS, satellite and computer technologies used to achieve the objective of claiming land rights? (perhaps, refer us to someone at NIC)
 - a. Data is captured through GIS and stored in a central database run by a centralised server? How is this beneficial?
 - b. Once the mapping is done, how are the occupants of the land (rural poor/tribes) approached/informed about their entitlements? What are TRTI's methods of interaction with this isolated population?
 - c. How are land rights claimed? Does TRTI work with other government departments, particularly the Revenue department, and NGOs to accomplish this?
3. What is the role of TRTI – implementation, maintenance, and monitoring?
4. How do you deal with users' low awareness about and perhaps, adverseness to learning these new technologies? Does TRTI conduct training sessions, awareness groups etc.?
5. What have been some of the major challenges faced while building and maintaining this programme?
6. What do you think a major advantage of this programme is? What is important/valuable/necessary?
7. How is monitoring and evaluation of work conducted? Are there some statistics you can share that indicate impact

Tribal

1. How were you able to claim ownership over your land?
2. How has your life changed since you became an owner?
3. Are other people in your community able to claim rights as well?
4. Why is land ownership important?

Appendix B- Salient Features

Geoinformatics for Forest Rights: Salient Features				
Sr No	Level	Hardware	Software	Application
1	Forest Land Claimed	GPS Machine	-	<ol style="list-style-type: none"> To measure claimant land using GPS machine To assign 13 digit code to land measured
2	Sub Divisional Level Committee (SDLC)	Computer O.S.-Windows Xp Broad Band Modem Laser Printer	1. Mapsource Software from GPS device manufacturer	<ol style="list-style-type: none"> To acquire data from GPS machine To prepare individual claimant's GPX To check /Verify the area of land measured by GPS
			2. Internet Explorer 7+	<ol style="list-style-type: none"> Web site handling Entering claimant details in web site i.e. Online entry To upload in website the gpx file pertaining to claimant
			3. Adobe PDF Reader	<ol style="list-style-type: none"> Measurement report viewing & printing Viewing details from website
3	District Level Committee (DLC)	Computer O.S.-Windows Xp Broad Band Modem Laser Printer	1. Internet Explorer 7+	<ol style="list-style-type: none"> Web site handling Downloading GPX file uploaded by SDLC Online data entry of measurement analysis of each claimant under consideration which returns measurement analysis report
			2. Mapsource Software for GPS device 3. Google Earth	<ol style="list-style-type: none"> Viewing and analyzing polygon generated using downloaded gpx file To Verify the area of measured land mentioned in measurement report To view polygon in google earth
			4. TRTI-VGIS Tailor made software prepared by TRTI Pune using following components (VB.Net, Microsoft .NET Framework 2.0, MapwinGIS Active-X controls)	<ol style="list-style-type: none"> To superimpose polygon generated using downloaded gpx file on satellite image for the two different time series i.e. Year 2005 & 2008 To create image file consisting of satellite image showing polygon generated by gpx file along with claimant details To analyze polygon superimposed on satellite image
			5. Adobe PDF Reader	<ol style="list-style-type: none"> Measurement analysis report viewing & printing Viewing details from website
4.	State Level	Web Server	O.S.: Linux Database: Postgresql Software: PHP, Mapserver Software	<ol style="list-style-type: none"> Publish the FRA and its Rules on web to public in multi-language Awareness and capacity building on Forest Rights Act implementation Generate centralized database for GPX file along with claimants information and data on progress Implementation progress monitoring Bulk SMS system for implementation Dissemination of Forest Rights 'Plus' Concept