RSPO

Roundtable on Sustainable Palm Oil

New Planting Procedure

PUBLIC SUMMARY REPORT

A Summary of the Socio-Environmental Impact, High Conservation Value and High Carbon Stock Assessments Conducted for New Developments Proposed by: NBPOL -HIGATURU OIL PALMSPOPONDETTA, Oro Province, Papua New Guinea,

May 31, 2016

Table of Contents

List of Figures

List of Tables

Abbreviations

ALS	Assessor Licensing Scheme
AOI	Area Of Interest
BBGI	Biage Business Group Inc
CEPA	Conservation & Environment Protection Authority
DLPP	Department of Lands and Physical Planning
EoI	Expression of Interest
FPIC	Free Prior Inform Concept
GIS	Geographical Information Systems.
GM	General Manager

HCV	High Conservation Value
HCVMA	High Conservation Value Management Area
HCS	High Carbon Stock
HOP	Higaturu Oil Palms
IFMP	Integrated Forest Management Plan
ILG	Incorporated Land Group
LLG	Local Level Government
LO	Landowner
LSS	Land Settlement Scheme
LUCA	Land Use Change Analysis
ME	Mini Estates
MOA	Memorandum Of Agreement
MOU	Memorandum Of Understanding
NBPOL	New Britain Palm Oil Limited
OPLD	Oro Provincial Lands Division
QABB	Queen Alexandra Bird wing Butterfly
POIG	Palm Oil Innovations Group
RSPO	Roundtable Sustainable Palm Oil
SABL	Special Agriculture Business Lease
SEIA	Socio-Environment Impact Assessment
TFT	The Forest Trust
TSD	Technical Services Division
VOP	Village Oil Palm

1.0 Executive Summary

This document is written to summarize in practical terms the methodology, results and recommendations that have come forth from a series of assessments implemented as part of the new planting procedures required by the RSPO for a proposed new oil palm development in Oro Province, Papua New Guinea. This report summarizes the Social and Environmental Impact Assessment, the High Conservation Value Assessment and a High Carbon Stock Assessment.

The studies assessed 31 proposed mini estates ranging in size from 18 to 584 ha / estate, with a total area of 3259.38 ha. The studies were carried out between July and December of 2015, including extensive field work and consultation with the landowning communities. As the proposed developments are an expansion of long established plantations, consultations and verification of land owning communities has long preceded the current assessments which only bolster NBPOL's approach to Free and Prior Informed Consent as the only way to do business in PNG.

The key findings as per the SEIA indicate that NBPOL has and is correctly implementing the principle of FPIC by ensuring the legitimate land owners are duly identified and all landowners are consulted on their terms. Never the less the study stresses the importance to work closely with the verified land owner groups to register their land in order to establish a stable long term business relation founded on the laws and legislation of PNG. The SEIA has delivered an action plan in the form of an impact and aspect register which NBPOL has fully accepted to implement so as to mitigate the negative impacts associated with revenue entering a formerly largely subsistence society.

The HCV assessment identified 504.51 ha of areas containing the following HCVs present with the proposed development areas:

-HCV 1 : which were patches of forest in sufficiently good condition to recover. Unfortunately, PNG trees have not been classified using IUCN and CITES so levels of rarity or threat cannot be determined by these standard measures. There was one ME where QABB caterpillars were sighted and others where *Pararistolachia* vines were present.

-HCV 3 : there were a number of ecosystems in the Popondetta Plains that had little forest remaining. Where these ecosystems overlapped with MEs, any remaining forested area was prioritised as HCVMA.

-HCV 4 : there were many small watercourses that ran through the ME. These would require riparian buffers to be maintained. Large rivers were excluded from the ME, however the buffers between the ME and the banks of the large river would require active management to stop deforestation and erosion of the banks.

-HCV 5 : there is a heavy reliance on forested areas by the community. Many of the forested areas the community has chosen to reserve from development because these areas are required to meet their basic needs.

-HCV 6 : there were occasional cemeteries within the MEs. These would be enclaved. Also in Kokoda the boundary ran up the side of the Kokoda track. The community wanted to preserve 2 tree widths of rubber trees to afford shade to the walkers.

The HCV assessment has provided management and monitoring recommendation to maintain and enhance these HCVs within the proposed areas which NBPOL has fully accepted.

The HCS assessment found 163.1 ha of HCS Indicative Conserve areas in addition to those identified as HCV. All other HCS areas overlapped with HCV areas and for practical purposes are names as such. Stakeholder consultations with NBPOL and the community provided feedback regarding several patches of HCV and HCV. Due to this HCS modifications made were made and provided in the Integrated Forest Management Plan (IFMP) provided by both Daemeter and TFT. In total, nine small and isolated patches (Low Prioirty) were changed from Indicative Conserve to Indicative Develop. The small to medium size of most blocks posed new challenges to adapting the HCS methodology, in particular we recommend raising the minimum area of isolated patches within the block (i.e. >10ha), while reducing the minimum area requirement for physical connectivity to High Priority forest patches (>100ha) outside the block (i.e. <10ha). • All blocks exist in a landscape that is actively used by local communities (High Risk) who own all of the land (customary ownership). This is also a relatively High Forest Cover (>50) landscape. For these reasons it is critical that community are engaged to build a development plan that they respect both within the blocks and on their wider lands to avoid deforestation in the landscape while ensuring community rights and aspirations. All of the HCS management recommendation were integrated with the HCV management recommendations and delivered to NBPOL as an Integrated Management Plan which NBPOL has fully accepted.

The below table summarizes the assessment results in terms of total area assessed, area of High Conservation Value, area of High Carbon Stock Indicative Conserve and area to Develop in hectares. Locations of each proposed location are given as centroids. A full breakdown showing areas of overlap is provided in section 4.2 of this report.

Table 1. Summary of areas proposed to be managed for HCV, HCS and develop into oil palm.

No.	Name	Total assessed (ha)	HCV (ha)	HCS Indicative Conserve (ha)	Develop (ha)	CENTROID Latitude	CENTROID Longitude
1	Akute	58.3	7	0	51.3	- 8° 47' 26.69"	148° 15' 20.15"
2	Aruka	101.3	14.7	3.7	82.9	- 8° 44' 14.09"	148° 26' 10.87"
3	Viviri	38	0	0	38	- 8° 43' 56.55"	148° 25' 38.56"
4	Ase	33.1	12.5	5.3	15.3	- 8° 39' 35.78"	148° 16' 24.11"
5	Bana	58.9	15.2	0	43.7	- 8° 45' 18.39"	148° 21' 0.00"

6	Biage	343.3	21.5	5.3	316.5	- 8° 53' 54.25"	148° 44' 24.51"
7	Boruga Pusute	74.1	0	26.8	47.3	- 8° 40' 49.61"	148° 11' 11.65"
8	Bouga	48.8	1.4	5.3	42.1	- 8° 48' 30.01"	148° 22' 20.65"
9	Hoemba	58.6	0	0	58.6	- 8° 46' 23.37"	148° 21' 29.26"
10	Hoka	31.9	0	0	31.9	- 8° 42' 49.94"	148° 25' 37.43"
11	Hopanda	39.4	1.6	0	37.8	- 8° 48' 3.76"	148° 26' 19.72"
12	Bakito Extension	17.6	0	0	17.6	- 8° 48' 8.91"	148° 25' 59.27"
13	Isatapa	40.8	0	0	40.8	- 8° 44' 41.80"	148° 19' 48.83"
14	Jireka 1	316.5	95.1	0	221.4	- 8° 49' 22.09"	148° 25' 42.47"
15	Jireka 2	147.3	84.6	30.2	32.5	- 8° 48' 50.63"	148° 25' 47.94"
16	Joiha	25.21	0.01	0	25.2	- 8° 45' 30.01"	148° 25' 6.12"
17	Jopare	22.5	0.5	0	22	- 8° 48' 35.59"	148° 21' 42.62"
18	Mena Extension	22.5	0	0	22.5	- 8° 47' 11.62"	148° 14' 29.58"
19	Mohamei	55.8	0	0	55.8	- 8° 48' 32.05"	148° 16' 20.63"
20	Serembe	426.4	32.9	71.7	321.8	- 8° 44' 26.91"	148° 0' 26.93"
21	Sesehota	84	0.3	0	83.7	- 8° 49' 20.05"	148° 18' 30.69"
22	Sigu	47	0	0	47	- 8° 41' 51.00"	148° 12' 46.92"
23	Sipari	70.4	0	0	70.4	- 8° 44' 28.93"	148° 23' 6.75"
24	Soropa	584.1	179.4	0	404.7	- 8° 40' 57.01"	148° 25' 32.61"
25	Darua	69.9	0	0	69.9	- 8° 47' 7.84"	148° 19' 57.18"
26	Takoh	43.3	7.6	0	35.7	- 8° 47' 10.98"	148° 20' 31.15"
27	UKD Extension	22.7	0	0	22.7	- 8° 47' 4.53"	148° 25' 7.52"

28	Sauma	22.6	0	0	22.6	- 8° 47' 20.41"	148° 25' 4.73"
29	Hasina	129.87	0	0	129.87	- 8° 47' 14.94"	148° 25' 57.97"
30	Ufenapa	123.9	14	13.5	96.4	- 8° 46' 33.52"	148° 24' 22.71"
31	Wuria Purofafa	101.3	16.2	1.1	83.8	- 8° 45' 15.78"	148° 23' 53.38"
	GRAND TOTALS	3259.38	504.51	163.1	2591.77		

2.0 Scope of the Planning and management

2.1. Organisational information and contact persons

Table 2. Organisational information and contact persons.

Company Name	New Britain Palm Oil Limited
Subsidiary	Higaturu Oil Palms RSPO Membership Number: 1-0016-04-000-00
Company Address	Higaturu Oil Palms P.O Box 28 POPONDETTA Oro Province Papua New Guinea
Geographical Location	E- 147°43'12'' - 148°27'25'' S- 8°34'28'' - 8°55'30''
Capital Status	Foreign Investment
Type of Business	Oil Palm plantation and milling
Status of Land ownership	Customary land under Lease-lease Back
Contact Person	Sander Van Den Ende – Group Sustainability Manger (svdende@nbpol.com.sg) Paul Maliou – Sustainability Manager (pmaliou@nbpol.com.pg) Mike Jackson – General Manager (mjackson@nbpol.com.pg)
Total Area of new planting	3,261ha total area assessed, 504ha HCV, 152ha HCS, plantable area 2605ha

2.2 Personnel involved in planning and implementation

Planning and implementation plans for new planting involves Lands Department, Sustainability Department, TSD, GIS and New Development as per list below

Table 3. Personnel involved in planning and implementation.

Name	**Position**
Sander van de Ende	Group Sustainability Manager
Paul Maliou	Sustainability Manager
Mike Jackson	General Manager
Richard Tiamu	TSD Manager
Brian Cazalet	Head of Plantations
Pieter Schlesinger	Estate Manager (New Development)
Benjamin Osa	Lands Manager

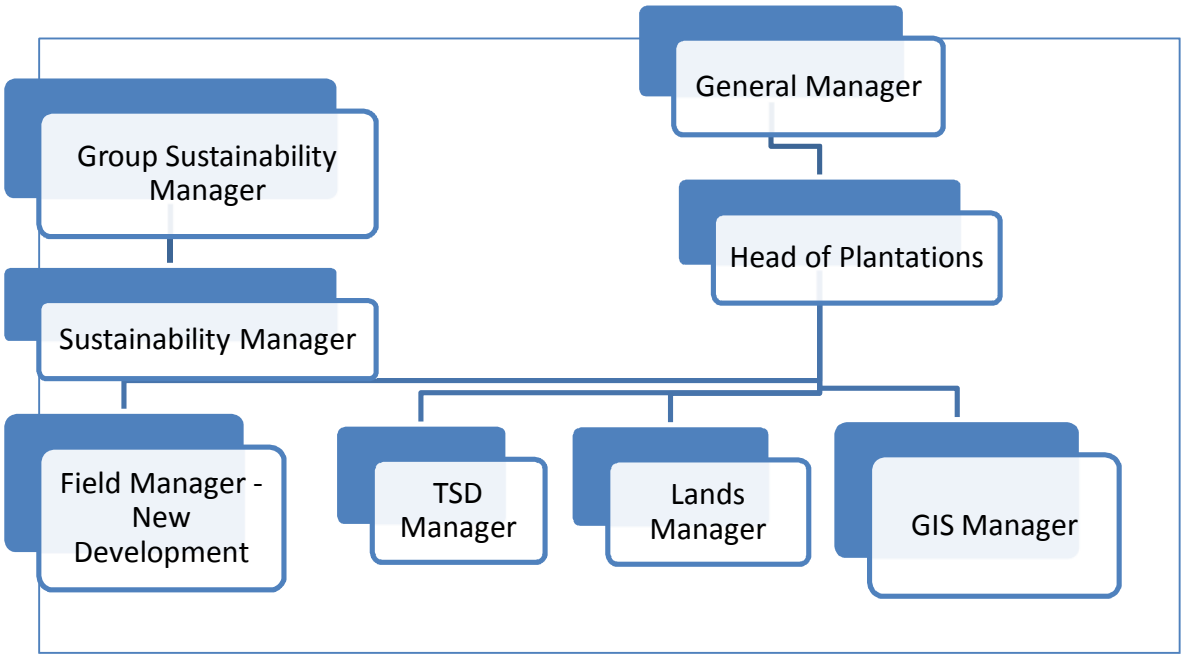

Figure 1. HOP Organisational chart.

2.3 List of legal documents, regulatory permits and reference documents

2.3.1 List of Reports

- Notification of intent to the Conservation and Environment Protection Authority
- Notification of intent to the Local Level Government Local stakeholders including
- FPIC Meeting Minutes
- MOUs with landowners setting out terms and conditions
- HCV Assessment Report by Daemeter Consulting July 2015
- SEIA Assessment Report by Narua Lovai August 2015
- HCS Assessment Report by TfT July 2015

2.3.2. List of Legal Documents

The following legal documents are referenced in this report. The Environmental Authority and Local Level Government has been notified of the proposed developments and NBPOL has been informed that under PNG law, individual developments under 1000 ha do not need permits nor Environmental Impact Statements. All business registration requirements of land owner groups will have to follow due process as required under PNG law.

Table 4. List of legal documents.

No	Legal Document	Issuing Authority	Year
1	Environment Act	Conservation & Environment Protection	2000

		Authority	
2	Environment (Prescribe Activities) Regulation	Conservation & Environment Protection Authority	2002
3	Land Group Incorporation (Amendment) Act	Lands Department	2009
4	Fauna (Protection & Control) Act	Conservation & Environment Protection Authority	2014
5	Papua New Guinea Logging Code of Practiced	Forestry Authority	1996
6	Papua New Guinea Lands Act	Lands Department	1996

2.4 Location Maps

Figure 2 . Location map of Higaturu Oil Palms project sites.

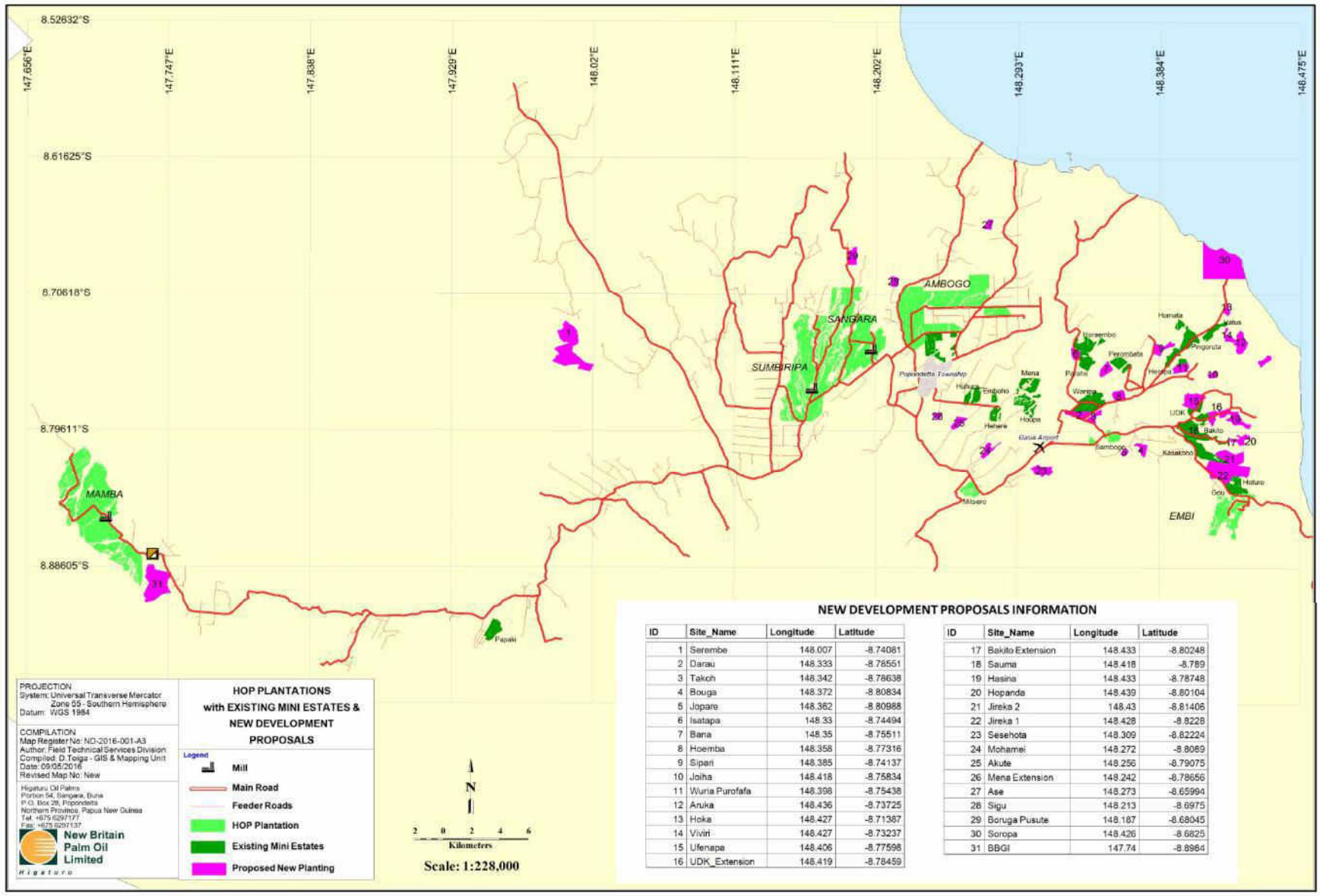

Figure 3. Location map showing proposed mini-estates.

Figure 4. Soil map of proposed mini-estates.

2.5. Area and time plan for new planting

Plantings will only proceed once all the NPP documentation has been approved by RSPO and has passed the 30 day period of public notification. Below is the expected timeframe of the proposed new plantings once the RSPO requirements have been met.

The time bound plan for the development of total proposed area for development is is summarised below.

Table 5. Area and time plan for proposed new planting.

Name	Planting Time Table
Bana, Biage, Hoemba, Bakito Extension, Isatapa, Joiha, Jopare, Mohamei, Serembe, Sesehota, Sipari, UKD Extension	2016
Hoka, Soropa, Darua, Takoh, Hasina, Ufenapa, Wuria Purofafa	2017
Akute, Aruka, Viviri, Ase, Boruga Pusute, Bouga, Hopanda, Jireka 1, Jireka 2, Mena Extension, Sigu, Sauma	2018

3.0 Assessment Process and Procedures

3.1 Assessors and their credentials

3.1.1 HCV Assessors

HCV assessment was conducted by Daemeter Consulting; the team consist of 8 people, a short biography of each person is provided below.

Jules Crawshaw is the report writer on the Daemeter team. He is the Senior Forestry and System Manager at Daemeter. He worked as a private consultant in forestry since 2010, conducting various work such as REDD project and other sustainability projects in forestry. He has a Master Degree in Business Systems from Monash University and a Bachelor of Forestry Science from University of Canterbury. He has been working in forestry since 1987.

Jules is an ALS provisionally licensed HCV assessor (ALS14006JC) and has conducted field work and written reports for in excess of 15 HCV studies throughout Indonesia. He was also responsible for Reporting, Mapping & Project Coordination.

From 2008 to 2010 he worked for APRIL Group as Strategic Planning Manager in Riau Andalan Pulp & Paper. Jules Crawshaw received 1st place in the NSW Premiers Award for Business Management and Financial Performance in 2005 and also received FNSW CEO Commendation for Management of the Carbon Project in 2006.

Surin Suksuwan has more than 14 years' experience in natural resource management and biodiversity conservation, with a particular interest in protected area planning and management, forest landscape management and plant conservation. He has been involved in initiatives related to HCV development and palm oil certification.

Surin is based in the Southeast Asia Office in Kuala Lumpur. Apart from English, Surin is proficient in Bahasa Malaysia and Bahasa Indonesia. He has an MSc in Biodiversity and Taxonomy of Plants from the University of Edinburgh and is a member of the World Commission on Protected Areas.

Mohammed Iqbal is biodiversity expert in Daemeter Consulting and has conducted bird surveys for High Conservation Value Assessments since September 2009 including PT Wahau PT Tania Selatan palm oil plantation (Wilmar group), Ogan Komering Ilir district, South Sumatra (September 2009), PT Asiatic Persada (Wilmar group) Jambi (March-April 2010), APRIL group (Asia Pacific Resources Limited), Pulau Rupat, Riau (June-July 2010), and Swakarsa Group (PT Dharma Satya Nusantara, PT Dharma Agrotama Nusantara, PT Dharma Inti sawit Nugraha, PT Dewata Sawit Nusantara) (October 2011), and PT Dharma Intisawit Lestari (September 2012). He has regularly published work in various internationally journals of Ornithology, including: Forktail, BirdingAsia, Wader Study Group Bulletin, Stilt, Australian Field Ornithology and Kukila.

Tom Vigus is the vegetation expert in the Daemeter Team. After graduating from Bangor University, Wales, with a BSc (Hons) Forestry in 1970 Tom has 45 years experience in working in the fields of Forestry and Conservation in the Pacific Islands and northern Australia, including preparation of Management Plans for Major Australian National Parks, Environmental Impact Assessments/Management Plans for many rural development proposals for the World Bank and FAO and Feasibility/Design proposals for AusAID, including their implementation. Since 2009, Tom has worked HCV assessments for potential oil palm developments in PNG and social/smallholders audits of all the RSPO certified oil palm companies in PNG and the Solomon Islands.

Jeffery Lawrence is the resource manager with the Yumicom Ltd. After graduating from the PNG University of Technology, with a BSc Degree in Forestry in 2004 Jeffery has 11 years experience in working in the fields of Forestry, Forest Industry and Conservation in PNG, namely Western Province, Madang, Milne Bay, Central Province, Popondetta. His work included surveying 10% & 100%, ID of trees species, supervising harvesting, work place safety in which Jeffery is certified safety officer and has level 1, 2 & 3 . Jeffery was involved in Forestry High Carbon Stock Inventory Survey contracted under NBPOL. Jeffery has also been involved in HCVF within some of these provinces he has worked in. Jeffery has had exposure in all forms of forest related operations which include, Forest industries, forest conservation, working with recognised NGO's. He has been involved in input information within a forest logging company in being accredited under the Forest Stewardship Council, his involvement and experience is vast and wide. Jeffery knows his forest and is interested in knowing more about the natural forests, he is very committed to forestry work, whatever the job involved Jeffery will do the job fully and reports all findings accurately as possible.

Clement Bailey is a Freelance Forester and Environment professional in Papua New Guinea. After graduating from PNG University of Technology in Lae, Morobe Province, Papua New Guinea, with a BSc (Hons) Forestry in 2003. Clement has 11 years' experience in working in the fields of Forestry, Conservation and Natural Resource management in PNG, including preparation of Project Management Plans and Project proposals for Provincial Governments, Community and Private organization, and Feasibility/Design proposals including their

implementation. Clement has also attained an Advanced Certificate in Project Management at the University of Queensland in 2011 and has been involved in many project management operations in West New Britain. Since 2009, Clement has assisted in worked HCV assessments with Tom Vigus for potential oil palm developments in PNG on an occasional basis for RSPO certified oil palm companies in PNG. Clement also has vast experience in Forest Certification Audit, Assessment and Implementation for Forest Stewardship Council (FSC) Certified Projects in PNG. He currently providing advisory and consultancies in the management of Public utilities Programs for the West New Britain Provincial Government, specific to Water Supply and Water Resource Management.

Indrawan Suradi is the GIS and Remote Sensing Manager at Daemeter Consulting, with more than a decade of experiences in spatial analysis, geo-information management and remote sensing application.

He graduated from the Faculty of Forestry at the Bogor Agricultural University in 2002 and secured a scholarship from the Dutch Government to attend the Professional Course on Geo-information Management in International Institute for Geo-information Science and Earth Observation (ITC) in Enschede, the Netherlands, in 2005.

Indra has previously worked on spatial analysis using GIS as well as geo-database management in various organisations, including the Center for International Forestry Research (CIFOR), the Nature Conservancy (TNC) in Kalimantan and Sulawesi, Tropenbos International, and Daemeter. Indra's last positions were with UNDP-REDD+ Task Force and FAO-UNREDD programme as REL/MRV consultant, working on issues including spatial analysis related to land cover monitoring, carbon accounting, and the development of reference emission levels.

Aji Sartono is a GIS technician at Daemeter Consulting, with almost a decade of experiences working in a number of consulting firms and research organisations in Indonesia. He has extensive knowledge on mapping across the archipelago as well as in geo-database development and maintenance.

Aji holds a degree and a diploma from the Forestry Faculties at the Winayamukti University in Bandung and Bogor Agricultural University (IPB), respectively. He developed a case study in Tegal, Central Java, and conducted spatial analysis of urban forest as the thesis for his bachelor degree.

3.1.2 SEIA Assessor

Narua Lovai is a Freelance Environment Management and Technical Writing Consultant. Mr Lovai has extensive experience as an environmental management consultant to the private industry and the PNG Government. His expertise and skills include strategic planning, organizational, personnel and financial management, outcomes-based project management, policy formulation and revision, natural resources legislation compilation and revision, baseline environmental data collection, waste management and cleaner technology, water pollution assessment and mitigation, hydrological data acquisition and analysis, integrated catchment management, biophysical environment impact assessment, socio-economic impact assessment, environmental compliance and audit monitoring, stakeholder engagement for community development, and professional writing and editing.

3.1.3 HCS Assessors

Michael Pescott – TFT Program Manager (lead). In his role as Program Manager for the The Forest Trust Mr Pescott has been active in developing practical methodologies for assessing High Carbon Stock for the oil palm industry. Mr. Pescott is an expert in corporate social responsibility; environmental and social assessments and management systems; international trade and development; supply/value chain risk management; natural and plantation forestry; project and program management; environmental and social policy

Michael Hansby – TFT Consultant, Hollow Wood Enterprises (Inventory and GIS Manager). Mr Hansby is a Forester with extensive experience in inventories and GIS mapping. His strengths are in carrying out field work and ensuring data integrity linked into map based applications.

Jeffery Lawrence and **Clement Bailey** provided invaluable field assistance. Their qualifications are mentioned above.

3.2 Assessment Methods

In general the methodology for all assessments included the collection of both primary and secondary data. Secondary data was mostly collected prior to the survey and used to guide the field assessment (which involved the collection of primary data).

The total duration of the assessments was 6 months, between the periods June 2015-December 2015, including desk top study and field work. The following study summarizes the field work portions of each consultancy carried out.

Table 6. Assessment timetable.

Consultancy	Time Period
HCV Assessment	3-14 July 2015
HCS Assessment	3-20 July 2015
SEIA	18-25 August 2015
HCV Consultation	14-21 October 2015

This does not include the extensive data exchange, analysis, review and peer review that took place from June-December 2015 throughout this period.

3.2.1 HCV Assessment Methods

Secondary Data Collection

Secondary data was collected and analyzed during the planning phase of the assessment and included the following:

Land Cover

For the assessment of HCVs 1-4, historical and present forest cover was assessed from satellite imagery. The output of this was land cover maps which gave clear indications of the areas where the survey should be focused during the full assessment. Land Cover mapping was undertaken by "The Forest Trust", this information was shared by both the HCV and HCS surveys.

Land Use Change

Land use change was assessed using a mixture of historical maps, satellite maps and field checks. The following list summarizes the sources.

1) Land use maps: Forest Information Systems (1975)
2) Logging concessions: PNG Forest Authority Logging Concessions (2001)
3) Satellite Imagery: Google Earth (2003)

4) Field investigation: Site visits, interview with landowners and government officials.

Topographical data

The Digital Elevation Model (DEM) produced by the Shuttle Radar Topography Mission (SRTM) was used for defining general topography and slopes throughout the estate. HCV 4.2 utilizes this secondary data set to model erosion potential.

Ecosystem Mapping

For the identification of HCV 3 (*Rare or Endangered Ecosystems*), Daemeter use the land system mapping undertaken by the CSIRO, Australia (H. A. Haantjens et al, 1964) as a proxy for eco-systems.

Species Data.

Secondary data on species potentially present in the assessment area were extracted from references, field guides and supporting data for indirect/direct identification. A species list including their conservation status was then cross-referenced and augmented by experts that joined the field survey and by consulting community groups with knowledge of the area and species likely present.

Social Cultural Data

Secondary data for assessment of HCV 5 and 6 were available from EIAs and Interim HCV Assessment reports provided by the company, these described a range of social and economic classes, livelihoods, and village infrastructure.

Primary Data Collection

The best source of information is provided by the field work. The field work was based around the following taxonomic groups and disciplines required to identify the HCVs:

Plant surveys

Remaining natural forest areas were surveyed using a rapid assessment method that relied on informal transects. Rapid semi-structured plant observations were made of trees and juvenile regeneration in all the MEs with forest areas.

Mammals

The survey of mammals and other vertebrates of concern under HCV 1 was conducted using rapid assessment techniques, combining (i) un/structured interviews with hunters, (ii) assessment of habitat quality (in combination with the botany team), and (iii) direct (visual) and indirect (prints, calls, scat) sightings whilst undertaking habitat assessments.

Community interviews were conducted at the village level (7 villages in the area of Kararata, Dobuduru, Bapuhi, Ahora, Serembe, Kokoda). Interviews were conducted by showing Higaturu biodiversity pictures and photos (Daemeter Consulting, 2015) to selected relevant respondents e.g. hunters and villagers. Respondents were asked to point at available species, to indicate those that potentially exist and that never existed in the surrounding area. An unstructured interview method was used to get accurate information for particular species.

Figure 5. People from Kokoda Village discussing mammals they sighted in the area.

Birds

Bird surveys aimed to identify features of the bird community relevant to HCVs 1.3 and 2.3 (HCV 1.2 was deemed very unlikely present for birds given geographic location and land cover). Survey methods included walking transects, opportunistic observations during the survey, and interviews with local hunters. The combination of these methods ensured a holistic bird inventory and increased the likelihood of detecting key species that deserve conservation interventions.

Social and Cultural Surveys to assess HCV 5 and 6.

Using the HCV Toolkit as a reference, questions were prepared for meetings at the village level to evaluate the dependency of community members on natural ecosystems to fulfill basic needs (HCV 5) and identify presence of any important cultural sites (HCV 6).

The MEs were very spread out and there were a huge number of villages to be surveyed. It was not possible in the time available to physically visit every village. For this reason, HOP contacted all villages several days before the survey and invited the people to a central visit location. In all cases the clan leader and several other interested parties attended. In each interview a general introduction to the purpose and context of HCV was made. This was followed by a Focus Group Discussion (FGD) in order to collect data on social and cultural aspects.

The interviews all took place in English, which is widely spoken in the area. Occasionally questions were translated into Tok Pisin (the PNG lingua franca).

Additionally, clan members joined the HCV survey team when they were surveying the MEs. During this time, informal discussions took place about a range of topics (e.g. land ownership, resource use, population expansion, cultural identification with natural areas) this was very useful information as background to the survey.

Figure 6. Focus group discussions underway.

The Land Groups and Villages that were represented at each central venue. Representatives were brought to central venues because the villages were too numerous to undertake separate interviews.

Table 7. Locations of village interviews.

Central Venue	Land Group(s)	Representative Village
Kararata	Hasina Clan	Hanau
	Jirekapa Bapera Clan	Koruta
	Ufenapa Clan	Kararata
	Bakitopa Clan	Kararata
	Sauha Clan	Burususu
	Jirekapa Clan	Poro
	Bouga Clan	Bututu
	Jopare Family	Emboho
Siremi	Hojekari Clan	Siremi
	Senani Clan	Siremi
	Aruka Clan	Siremi
	Soropa Plantation Inc.	Siremi
Dobuduru	Umotaha Clan	Efia
	Haugapa Clan	Penji Pejari
	Hoemba Clan	Dobuduru

	Bana Ombari Clan	Parahe
	Jangorapa Clan	Hombiriri
	Sipari Clan	Ango
	Javiripa Uhepa Clan	Ango
	Sorupa Clan	Ango
	Purofafa Clan	Barisari
	Joiha Clan	Barisari
Bapuhi	Vevehupa Kendata Clan	Hetune
	Kahopa Mohamei Clan	Ahire/Ijika
	Vevehupa Sumita Clan	Isuga
Ahora	Sigu Clan	Omba
	Ase Clan	Haveve
	Barunapa Clan	New Warisota
Serembe	Arehu Clan	Serembe
	Ihogane Clan	Serembe
	Oga Clan	Serembe
	Ombora Clan	Serembe
	Saruva Clan	Serembe
Kokoda Station	Biage B. Group Inc.	Kokoda

3.2.1.1 HCV Peer Review

In the HCV context, peer review is the process whereby an HCV assessment is evaluated by HCV expert(s) to identify any shortcomings of the assessment process and output. The reviewer checks that:

- The HCV toolkit is used appropriately,
- HCV identification has been carefully evaluated by experts in the appropriate field and the logic explained,
- Management and monitoring recommendations follow current best practices and are fitting for the landscape and social context,
- Appropriate stakeholder consultation has taken place, and

All of these are reflected in the HCV Assessment Report.

Upon receipt of the peer review, edits are made to address comments by the reviewer and a final draft is produced. Daemeter used the ALS peer reviewer pool to assess our integrated HCV and HCS reports. The peer review took place 1 -10 December 2015 and was signed off 17 December 2015. The peer reviewer was DWI R. MUHTAMAN.

3.2.2 HCS Assessment Method.

Community engagement – FPIC, rights and Participatory Mapping

While the HCS methodology basis most its results on biometric methods, it stresses the importance of community engagement with regards to HCS, in particular:

- Inform community of the purpose, involvement and potential outcome of HCS prior to field assessment
- Ensure community land ownership/customary rights boundaries are clearly identified through participatory mapping
- The right of local peoples to give or withhold their free, prior and informed consent

Community land use, values and livelihoods are recognized through participatory mapping to ensure HCS conservation does not adversely affect these rights/values and or HCS within the boundary and outside is not impacted upon by community.

Inform and discuss the findings with the community prior to completion of integrated conservation land use plan to ensure appropriateness and ongoing recognition and participation in management.

These activities were agreed and understood to be completed primarily by NBPOL and supported also by the HCV assessment. TFT reviewed the progress of this during our assessment.

NBPOL have an established central procedure for new developments, including FPIC and community engagement. This is adapted to each mill-plantation cluster, and for HOP is outlined in the 'Higaturu Oil Palm Mini Estate Project Implementation', last amended 20-11-2014. The key steps in this process include;

- Initial unsolicited contact with land owners
- Land owners make an official invitation (expression of interest) to NBPOL
- Formal reply from NBPOL and a working committee is established with names and boundaries recorded
- Proposed area inspected and mapped by NBPOL together with land owners

The HCV assessment included a review of HCV 5 (community needs) and HCV 6 (cultural values), identified through engagement with local communities or indigenous peoples. In addition, throughout the HCS assessment local community members accompanied the field teams to assist with navigating to the plots, which also provided an opportunity learn more about FPIC, rights and livelihoods.

Vegetation classification

Land-use / vegetation cover maps and tables

The area was classified according to the observed vegetation cover using a Geographical Information System (GIS), ArcMap 10.0. Three main types of imagery were sourced and utilised for the initial vegetation classification:

- 5m resolution :RapidEye˘imagery supplied by NBPOL
- 30m resolution (panchromatically sharpened to 15m) Landsat 8 satellite imagery
- Georeferenced aerial imagery extracted from Google Earth Pro.

This imagery represents a range of ages (time since capture) and a range of cloud cover percentages. Subsequently no single data set was entirely suitable for the initial vegetation classification, and all three datasets were utilised during this initial process.

RapidEye

The RapidEye imagery supplied by NBPOL was the primary source used for the initial vegetation stratification. This imagery is three band (R,B,G) and had undergone false colour processing prior to being supplied by the client for use on this project. Further supervised classification was performed in order to extract forest cover from the image, aiding in the delineation of vegetation type boundaries.

Landsat 8

The study area was fortunate enough to be wholly contained on one image tile, minimising the need for the raster pre- processing functions used to 'match' multiple tile images for the purposes of analysis, such as histogram matching. The tile used for this project was Path 95, Row 66, captured on 11/05/2014. This image possessed the least amount of cloud cover.

Landsat 8 imagery has a multi-spectral pixel resolution of 30m and a panchromatic a pixel resolution of 15m. The multi-spectral nature of Landsat 8 imagery allows an array of band combinations (or composite bands) to be created, specifically enabling land cover and vegetation analysis to be undertaken.

The following composite datasets were created using Landsat 8 bands;

- Natural Colour ¯ panchromatically sharpened to 15m (Bands 2, 3, 4 and 8)
- 4 Band Natural Colour ¯ (5, 4, 3 and 2)
- Colour Infrared (Bands 5, 4 and 3)

A NDVI (normalised differential vegetation index) was created using the 4 band natural colour dataset using the standard equation where;

$$NDVI = (NIR - Red) \div (NIR + Red)$$

Google Earth Pro

Google Earth Pro is a licenced version of Google Earth that allows high resolution images to be exported from the software. Much of the study area was covered by high quality aerial photography, which was extracted and georeferenced in ArcGIS. Although the resulting image tiles were mostly of high quality, this data was of little practical use, being captured in 2010. In situations where comparison of all three image sources showed little or no change in vegetation boundaries, the high quality images sourced from Google Earth Pro were used to aid in vegetation boundary delineation.

The imagery acquired for this project were analysed to stratify the project by vegetation cover types. Stratification involves classification of vegetation cover into areas of similar composition. The characteristics used to differentiate strata were:

The remote sensing technicians implemented visual classification of the satellite images. This involves visually assessing spectral frequency, image texture and reflectance characteristics. To assist in classification, the images

were processed / enhanced using various techniques to increase the contrast within the images allowing easier definition of stratum boundaries. Due to the high level of heterogeneity in species composition and tree size distribution within the forested areas, visual interpretation of the images was the primary means of initial stratification.

Following the site inspection, the initial stratification was verified and adjusted according observations made in the field (as explained further in Chapter 4 of this report), including:

- Actual vegetation types observed at designated plot locations.
- Plot measurements of tree diameters, heights and species.
- Photographs taken at plot locations.
- General observations of vegetation types and condition from field inspection.

Forest Inventory Methods

Definition of carbon pools

High carbon stock (HCS) inventories measure the following carbon pool of above-ground biomass of large plant species (defined as having diameter at breast height greater than or equal to 5cm). This includes both tree and non-tree species.

The measured carbon pool includes stem, stump, branches, bark, seeds, and foliage. It excludes forest understory including small diameter plant species (below 5cm diameter breast height), vines, epiphytes, and other non-tree vegetation components such as:

- Below ground biomass, i.e. living biomass of roots.
- Deadwood.
- Litter.
- Soil organic matter.

The HCS is a rapid carbon assessment methodology. Its purpose is to provide reasonably robust carbon estimates with minimum measurement activity. Hence the focus is on measurement of large plant species which usually comprise the large majority of biomass carbon. The other forest carbon pools are not measured because they are either relatively small in size (e.g. forest understory) or difficult and expensive to assess (e.g. below ground biomass).

Precision and accuracy targets

The recommended precision targets for the HCS assessment are:

Forest carbon stock inventories are planned for the purposes of attaining carbon stock estimates with 90% confidence intervals to within 10% of the total carbon stocks for the designated above ground carbon pools[1].

[1] For example, if the total estimated forest carbon stocks were 600,000 tonnes, then the target precision levels would be 90% confidence intervals of 60,000 tonnes.

Variability within stratum may exceed the overall carbon precision target, provided the precision target for the total carbon estimate is achieved.

Plot size, sampling intensity and navigation

Carbon levels within the landscape were estimated from plots located within various vegetation cover types. Prior to going to the field, random plots were located on preliminary vegetation cover maps. The factors taken into account for planning plot locations were as follows:

The plot locations were planned to only pass through areas of predominately natural forest vegetation types, i.e.

- Medium density forest
- Low density forest
- Young regenerating forest
- Scrub

No High Density Forest areas were observed in image analysis, however, some was discovered during the fieldwork (see below).

Based on experience in similar forest types and upon imperial prediction given the area and estimated variance from the literature as well as experience in similar forest types, we can estimate the number of plots per strata. This is a minimum of 5 plots and maximum of 50 plots per vegetation cover type, with an approximate target of 20-30 for each.

The plot shape used was concentric circular plots with areas of 0.05 and 0.01 hectares respectively. Small diameter trees (<15cm DBH) were measured in the small plot. Large trees (>=15cm DBH) were measured in the large plot.

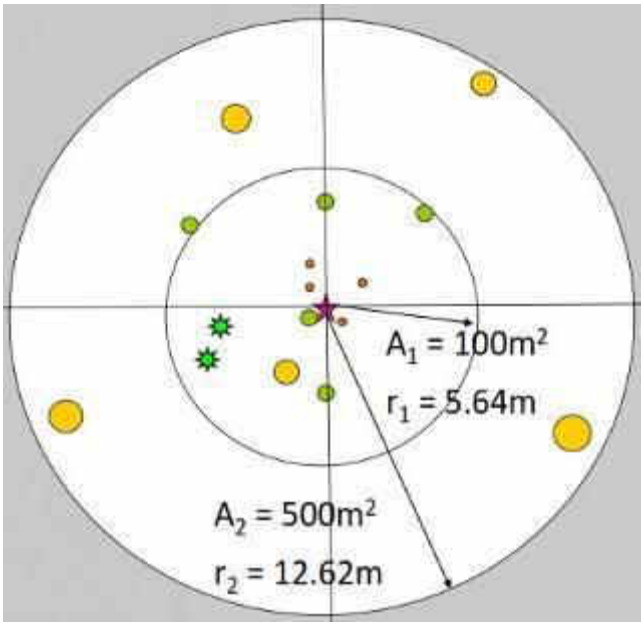

Figure 7. HCS plot design.

The measurement of plots were performed by two teams consisting of one person from TFT, two people from NBPOL (surveyors and planning) and between 3 to 6 day workers from the local villages. Plot measurements were complied into an MS Excel and then to MS Access database for further analysis.

A total of 108 plots were measured.

Tree measurement and carbon estimation methodology

DBH: All trees greater or equal to 15cm DBH were measured in the large plot. In addition to the large trees, all trees greater than or equal to 5cm and less than 15cm DBH were measured in the small plot.

Species: All trees inside the plot were assessed for species.

Species were identified in the field according to their common (local name) name or botanical (scientific) name if known

The common species names were classified into commercial timber groups.

The average specific gravity of commercial timber for each commercial group was obtained using global wood density databases, including;

Ref: Zanne et al. Global wood density database.

Citation for the database: Zanne, A.E., Lopez-Gonzalez, G.*, Coomes, D.A., Ilic, J., Jansen, S., Lewis, S.L., Miller, R.B., Swenson, N.G., Wiemann, M.C., and Chave, J. 2009. Global wood density database. Dryad. Identifier: http://hdl.handle.net/10255/dryad.235.

Stems per hectare:

Stems per hectares were extrapolated based on the plot size. The equation used is:

Stems per hectare = (Count of trees in the plot) / (Plot size in hectares)

Carbon content: The HCS assessment process uses allometric equations to estimate biomass and carbon. Allometric equations help estimate characteristics of a tree that are difficult to measure by measuring correlated attributes of the tree. Field sampling at Oro Bay areas measured DBH, which was then used to determine the biomass of the entire plant above ground using allometric equations.

Allometric equations are typically developed from large samples to ensure they are accurate. Many allometric equations exist around the world, some are specific to one forest type or tree species, whereas others are more generic to cover a broader range of situations. Similarly there are global allometrics developed from tree sampling around the world and locally developed allometrics.

Two equations for estimating carbon mass were used for comparison:

S. Brown (1997). “Estimating biomass and biomass change of tropical forests: A primer”. FAO Forestry Paper 134. ISBN 92-5-103955-0. Moist equation 3.2.3:

AGB = (42.69-12.8000*(DBH)+1.242*((DBH)^2))/1000

Chave, J., C. Andalo, S. Brown, M. A. Cairns, J. Q. Chambers, D. Eamus, H. Folster, F. Fromard, N. Higuchi, T. Kira, J. P. Lescure, B. W. Nelson, H. Ogawa, H. Puig, B. Riera, and T. Yamakura (2005). "Tree allometry and improved estimation of carbon stocks and balance in tropical forests". *Oecologia*. 145: 87–99.

AGB=Exp(-1.499+2.148*ln(DBH)+0.207*ln(DBH)^2-0.0281*ln(DBH)^3))/1000*(Wood Density)

See http://ctfs.arnarb.harvard.edu/Public/pdfs/MakanaConditEtAl.JTE2011.pdf

Palms have a different density and carbon function and therefore require a different calculation:

Palm Carbon (tonnes) = [Specific gravity] * DBH^2/40000*(Palm height)*(Carbon conversion factor)

Note:

The specific gravity measures the bone dry density of the wood. For tropical tree species this value is an average of 0.55 tonnes / green m3. For palms, specific gravity is assumed to be 0.247 tonnes / green m3.

'Black palm' density is known at 0.860139 and coconut is estimated at 0.6.

The carbon conversion factor estimates the carbon component of the vegetation biomass. This can be derived for specific forest types or the IPCC standard value of 0.47 can be used.

The equation for estimating tree carbon mass per hectare is:

Total Carbon (tonnes/ha) = Σ ([Tree Carbon]) / [Plot size in hectares]

The specific gravity was derived by species. The wood density ranges we are grouped into three generic categories; low (<400kg/m3), medium (400-600 kg/m3) and high (600 kg/m3). Where the genus/species is unknown we use medium range – or about IPPC average equal to 0.55.

3.2.3 SEIA Assessment Method.

Secondary Data

The data collection, analysis and report writing was entirely carried out by Narua Lovai a social scientist with many years of experience carrying out assessments for the mining and oil palm industry both for government and voluntary standard compliance, including RSPO. The environment impact component of this assessment was based on secondary data, and the consultant's accumulated knowledge and experience with environmental issues typically related to the development of an oil palm ME. In comparison, the social impact assessment component was carried out using secondary data, relevant information from the environment component as well as field data gathered through consultative meetings, discussions and interviews with the interim ILG committee members, IGL community members, and Oro Provincial Administration officers. Literature searches were conducted to collate material relating to the biophysical and human environment of the location, latest RSPO information on new plantings and operation of MEs in Oro and other oil palm growing provinces.

Primary Data

Three sets of questionnaires were prepared to obtain environmental and socio-economic data from landowners and other stakeholders. One questionnaire was for the land owner group committees, another questionnaire was

for land owner group members and the third one was for notable stakeholders within the area. The questionnaires were primarily designed to assemble a basic outline of the predevelopment situation which both HOP and the respective ME landowners intend to improve over time. In preparation for the fieldtrip the HOP Lands Unit sent out formal notification on the SEIA to all the interim ILG committees and relevant Provincial Government officials. After the fieldtrip, the data acquired was processed with relevant information from literature searches, inputs from consultation with stakeholders as well as the knowledge and experience of the consultant on MEs in the oil palm industry to compile the SEIA report. The land group meeting programme is shown in the Table below, the list of attendees who participated in those meetings is provided in Appendix 1.

Stakeholder consultation was carried on the 14th – 20th of October 2015 at various sites, consultation with local landowners was held at each respective local meeting venues making easier for all the members to attend. On the 19th of October 2015 consultation was held at the HOP Training Academy and was attended by relevant stakeholders, cooperatives and government agencies representatives. The consultation was to provide feed back on the results of the HCV assessment and provide opportunities for communication and sharing the information, opinion and suggestion between the company, stakeholders and government bodies.

Table 8. Land Groups meeting Program.

Date and Time	Central Venue	Proposed Estate	Land Group	Village	Division
Tuesday	Kararata	Hasina	Hasina Clan	Hanau	Embi
18-Aug-15		Sauma	Jirekapa Bapera Clan	Kararata	Embi
9:00am		UDK Extension	Ufenapa Clan	Kararata	Embi
		Ufenapa	Ufenapa Clan	Kararata	Embi
		Bakito Extension	Bakitopa Clan	Kararata	Embi
		Jireka I	Jirekapa Clan	Poro	Embi
		Jireka II	Jirekapa Clan	Poro	Embi
		Bouga	Bouga Clan	Bututu	Embi
		Jopare	Jopare Family	Emboho	Embi
Wednesday	Siremi	Hoka	Hojekari Clan	Siremi	Embi
19-Aug-15		Viviri	Senani Clan	Siremi	Embi
9:00am		Aruka	Aruka Clan	Siremi	Embi
		Soropa	Soropa Plantation Inc.		Embi
Thursday	Dobuduru	Takoh	Umotaha Clan	Efia	Embi
20-Aug-15		Darau	Haugapa Clan	Dobuduru	Embi

9:00am		Hoemba	Hoemba Clan	Dobuduru	Embi
		Hopanda	Sauha Clan	Dobuduru	Embi
		Bana Ombari Ext.	Bana Ombari Clan	Parahe	Embi
		Isatapa	Bana Ombari Clan	Parahe	Embi
		Sesehota	Jangorapa Clan	Hombiriri	Embi
		Sipari	Sipari Clan	Ango	Embi
		Wuria Purofafa	Purofafa Clan	Barisari	Embi
		Joiha	Joiha Clan	Barisari	Embi
Friday	Bapuhi	Mena Extension	Vevehupa Kendata Clan	Hetune	Dobuduru
21-Aug-15		Mohamei	Kahopa Mohamei Clan	Ahire	Dobuduru
9:00am		Akute	Vevehupa Sumita Clan	Isuga	Dobuduru
Saturday	Ahora	Sigu	Sigu Clan	Omba	Ambogo
22-Aug-15		Ase	Ase Clan	Haveve	Ambogo
9:00am		Boruga Pusute	Barunapa Clan	New Warisota	Ambogo
Monday	Serembe	Serembe	Saruva Clan	Serembe	Sumbiripa
24-Aug-15			Arehu Igohane Clan		Sumbiripa
9:00am			Arehu Oga Clan		Sumbiripa
			Arehu Ohogo Clan		Sumbiripa
			Arehu Ombora Clan		Sumbiripa
			Arehu Aembara Clan		Sumbiripa
Tuesday	Kokoda Station	Biage	Biage B. Group Inc.	Kokoda	Mamba
25/8/2015 2015 10:00am					

Besides the consultations with primary land owners, there were meetings held with government and business stakeholders. These are listed below.

Government Departments

- Eddie Malaisa - Provincial Wildlife and Environmental Officer
- Sebastian King – Provincial Forestry Officer
- Champion Avediba – Acting Agricultural Advisor
- Ward Councillors and Council Officials – from Popondetta Urban LLG and Oro Bay Rural LLG
- Sam Vegogo – Provincial Administrator
- Willie Paul Purari – Deputy President of Higaturu LLG
- Ishmael Koneha – CEPA representative
- Mary Fay Karong & Claire Tarawa – Provincial Office of Conservation and climate change
- Silas Orowari – Provincial Government Extension Officer
- Hon Evaurtius Bori – Higaturu LLG President/Deputy Governor
- Merire Dubo – Provincial Customary Lands Officer

Biage Business Group Representatives

- Chairman: David Soriu
- Director: Pastor Graydon Osivio

3.4 List of legal, regulatory and other guidance referenced

3.4.1 References Used in the SEIA

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International Association for Impact Assessment, May 2003, *Social Impact Assessment International Principles*, Special Publication Series No.2

Interorganizational Committee on Guidelines and Principles for Social Impact Assessment 1994, '*Guidelines and principles for social impact assessment*, Impact Assessment, vol.12, no. 2, pp.107 – 152.

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Haantjens, H.A., S.J. Paterson, B.W. Taylor, R.O. Slatyer, G.A. Stewart & P. Green. 1964. Geology, Geomorphology, and Land Systems of the Buna-Kokoda Area, Papua (with inset maps of Physical Regions, Regional Land Use Potential, Lamington Land System-Distribution of Units, and Traverses and Sample Sites) *Land Research Series No. 10*. Commonwealth Scientific and Industrial Research Organisation, Melbourne, Australia.

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European Space Agency and Word Bank, EO World Study: New Guinea Oil Production Operational Document in Support of the Smallholder Production in PNG. 2011

3.4.3 Reference Used In HCS

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Havel, J. 1975. Training Manual for Forestry College. Volume 3. Forest Botany. Part 2. Botanical Taxonomy.

Paijmans, K. 1975. Explanatory notes to the vegetation map of Papua New Guinea. No. 35. Commonwealth scientific and industrial research organization

4.0 Summary of Assessments

4.1 Summary of SEIA Assessment

Awareness sessions where held by the company at all Villages within each separate area and including other stakeholders on stakeholder related matters (dispute settling, environmental issues etc.). Hereby the customary traditions were recognized by involving the communities' representatives and clan leaders. There are clans which reside or have interest in each of the expansion areas. Files are available showing the involved discussion process, decision making process and if needed a settlement process and the consent process of involved stakeholders.

Established boundaries are marked physically by pegs and on maps. This is also a requirement of RSPO P & C to which HOP is already certified.

All the stakeholders are informed with regards to ongoing negotiations in regards to the proposed development of the expansion.

Records indicate that presentations were made to the Local Provincial Administrations and LLG Representatives from each separate area. This is included for all areas which will be part of the New Plantings.

There are records of meetings and includes participants from HOP and community representatives for each area. There are also records of the history of communication on the proposed development and all meetings held with the local communities.

A number of awareness sessions were also held with Land Groups and other local people forming the ILG from December 2013 and March 2015. Altogether a large number of members of the local communities including Land Groups attended these sessions. Both the benefits and negative impacts were discussed at each of these meetings as well as explaining the ILG Process. There are attendance lists provided for each meeting with local people in each extension area.

Observation: Copies of the meeting minutes were not included in the SEIA report however it is understood that each meeting was minuted.

Of the proposed New Planting areas two are on state land these are Soropa and Biage (BBGI), all other extension areas are customary land and owned by the local clans.

All ILG's can demonstrate ownership of land being developed through history of tenure and community agreement to enter into lease_arrangements once it has been decided to continue. State leases are held by both Soropa and Biage (BBGI).

Boundaries of customary land are normally demarcated by natural features such as Roads, Rivers, trees, stones, mountains etc. Boundaries for each expansion are identified and are located and marked via GPS and also included in maps for all areas involved in the expansion.

There have been no known disputes with regards to the land involved in the proposed New Planting extensions.

HOP has a participatory conflict resolution method by first talking to involved parties and also recording minutes of these meetings as per 2.2.4 The Company tries to implement the conflict resolution process by the involvement of the Company Lands Officer dealing with complaints of the communities. He keeps track of the complaints and visits the ILGs to settle any dispute. When conflict resolution in relation to state land cannot be settled accordingly it becomes a process for the DLPP or the courts to settle. There are no conflicts recorded at this stage.

In all cases for ILG's it can be demonstrated that acceptable conflict resolution has taken place. Customary land owners are able to obtain legal title as allowed under customary land registration (2009 amendment) act to their clan owned land and then enter into lease agreements with HOP.

Maps are available (current) showing occupied state land, vacant state land and customary land. Maps are available which indicate the extent of recognised customary rights and there are copies available of negotiated

agreements detailing the process of consent in relation to the state land that was compensated for when bought by the state and with current customary land in relation to the establishment of ILG's.

HOP is in the process of negotiating with customary landowners to acquire land for plantation expansion under the Customary Land Registration (2009 amendment) act and Incorporated Land Group (2009 amendment) act Process with regards to the land not under state leases. This process commenced in April 2015 and is ongoing as a lease agreement has not yet been finalized and signed with each ILG. The FPIC component will be integrated into the land lease process (the description of the awareness session on both positive and negative aspects of development), with cooperation of an independent neutral party in this case Local Level Government (LLG) who have appeared reluctant to be involved at this stage. However, Provincial Customary lands officers have been involved in the land acquisition process for customary land.

Each concession put forward for New Planting expansions is very keen to start the process as soon as possible. Some have expressed an interest in planting Oil Palm back in 2011.

Since April 2015 HOP commenced work on the Incorporated Land Group process with the landowner groups. The initial step in the process was for the landowners to invite HOP to develop their land. HOP representatives meet with the landowners and inspect the land to ensure it is suitable for oil palm cultivation. Awareness sessions have been held with the landowners in the villages and hamlets or at a suitable location where all interested parties may attend. A number of Local Government representatives were invited to attend the awareness sessions to verify that FPIC is followed and also to explain possible negative environmental and social impacts to the landowners. Three awareness sessions are held with the ILG. Following the awareness sessions consent is given by the landowners for the company to assist in the formation of the ILG and to obtain title over the land. HOP representative provides assistance to the landowners. The SEIA carried out indicated that Local communities were in favor of the expansion due to the benefits it can bring to the local community/ies.

Observation: The SEIA presented did mention some of the ongoing issues which development of Oil Palm may help to alleviate – all areas and villages to some extent have similar problems. These include poor quality housing, no fly/insect or odour control, no water tanks, poor pit latrines and suffer from a number of illnesses such as malaria, intestinal and skin infections. Most have very poor access to health facilities in the area – however the benefits from the development of Oil Palm were not positively identified within the SEIA.

Observation: There did not appear to be any Cost Benefit Analysis completed nor any financial data provided. Although the report did mention that due to time restraints a full socio – economic has not yet been carried out. MOU not yet prepared.

The minutes of any meetings are to be kept and are a tool to follow up on the awareness that is forwarded and to check the FPIC component. (See observation above) This indicates that these agreements are entered into voluntarily as minutes of any meetings are recorded. This information is to be recorded in English and Tok Pisin.

The Customary Land Registration system is a legal process under the Customary Land Registration (2009 amendment) act whereby customary landowners can form an ILG and obtain customary land title to their land. By holding a recognised legal title the ILG can then enter into a Lease agreement with a company to develop that land. HOP has a documented procedure to assist customary landowners to obtain leasehold title to their land. The DLPP is the government department responsible for administering the Customary Land Registration (2009 amendment) act and the Customary Land Registration process ensuring that the rights of the customary landowners are protected.

At this stage the ILG's have not been formed officially. HOP has conducted formal meetings with Land Groups to obtain information on membership of land owning clans and boundary mapping. This is jointly done with government lands officers.

SEIA and HCV forest evaluations have been completed prior to the signing of lease agreements. All land under evaluation for Leasing by customary landowners and sublease by state lessees does not include significant amounts of identified HCV areas. Any areas that may contain HCV are mapped and set aside and will not be developed for Oil Palm development. Any such areas are included in the HCV report.

Maps showing potential areas for Lease and subleases have been produced. Areas of vacant State owned land are also identified on these maps.

A Social and Environmental impact Assessment has been conducted in relation to the areas of the proposed expansion areas. This was completed by a local organisation (Narua Lovai). This assessment was completed and report submitted in October 2015. This assessment includes a comparison of existing situation and impacts as a result of expansion.

There were a number of concerns expressed by members of each group – these included perceived unequal sharing of the income generated between HOP and the ILG'S. There were also concerns with regards to lack of improvement of living conditions. They were also worried with regards perceived social deterioration with the improvement of income and having more money available. This included use of alcohol and substance abuse near the Mini Estate.

Other issues raised included contamination of water sources used for drinking, cooking and other practices by residues from fertiliser and pesticide use.

This also included details of impacts and risks including the significance of the impacts/risks.

Through the existing RSPO system in place Environmental Aspects and Impacts are assessed and reviewed at least annually for all areas under the control of HOP.

The environmental impact assessment included the development of infrastructure such as building new roads, introducing drains and disposal of waste.

An Environmental Management plan has been prepared with regards to the submission for an application for an Environmental Permit. This was prepared as a requirement of the RSPO P & C certification process.

Social Impacts are identified in part via the grievance process, ILG's and other parties for negative impacts and through social interaction for positive impacts as reported in 6.5.

An action plan has been proposed in the SEIA and actions will be taken, time frames and responsibilities and records in relation to any changes to procedures or implementation will be maintained.

As a result of the SEIA the following recommendations were made with regards to mitigating potential environmental impacts.

- Conduct RSPO awareness in all ILG'S
- Ensure Buffer zones are clearly marked and left intact
- Enrich species diversity in the buffer zones

- Include cultivation of QABB vines in Buffer Zones
- Carry out water quality monitoring prior to site preparation
- Ensure proper disposal of all waste generated.
- There were also recommendations with regards to potential socio-economic aspects.
- Undertake full genealogy study of members of land owning clan
- Conduct base line household socio-economic survey of each community
- Verify that all clan members are kept informed of agreement negotiations (FPIC).
- Determine how clan members with VOP blocks on proposed ME will be handled
- Evaluate increases in land rental and FFB royalty rates would improve socio-economic welfare within the ILG communities
- Ensure all members of each ILG understand the agreement prior to signing.
- Ensure priority for employment and contracts is given to the ILG community
- Investigate means of improving living conditions
- Arrange project planning and financial management training for ILG's
- Organise training and awareness on budgeting and saving
- Organise awareness sessions on alcohol and substance abuse as well as HIV for ILG and nearby communities
- Promote sporting activities within ILG and nearby communities

HOP is aware about the FPIC and transparency in relation to dealings with customary landowners and has incorporated this in its procedures.

The communities are represented by ILGs and also Local Administrators. Also the communities have given their consent based on a full understanding of the matter/proposal and sufficient information is provided.

Each ILG has appointed a spokesperson to address these issues and to discuss on behalf of the ILG.

All documents are in English (the official language of PNG) but can be translated into local languages as necessary.

The above findings are e presented in the form of an aspect-impact plan with mitigation measures, indicators, monitoring framework and responsible persons assigned. This detailed table is presented in the Summary of the Management Plans which is also part of the NPP documentation.

4.2 Summary of HCV Assessments.

National / Regional Context

PNG has large expanses of pristine habitat, high levels of biodiversity, and low human population density. PNG encompasses some of the world's last great tracts of mature tropical rainforest and largest coral reefs, including a unique array of species that have evolved here in isolation. This has made PNG one of the world's most important biodiversity hotspots.

The study area extends from Kokoda in the west to Oro Bay in the east, a relatively flat landscape where the vegetation was once dominated by Lowland Rainforest. Some parties believe that the kunai grassland were present thousands of years ago (as was the case in other areas in PNG), while others believe these are caused by recent human influence. Today, the landscape is a mosaic of grassland areas, oil palm plantations, logged-over regenerating forests and areas of remnant rainforest.

Through a review of official data sources, satellite imagery, field inspections and interviews the HCV study verifies that the entire area has been logged prior to November 2005. Based on the findings of this study there is no liability of clearing HCV if the recommendations of this study are followed.

The area was once heavily forested and has been deforested by a mix of industrial logging and subsistence agriculture. Industrial forestry continues in the area, although at considerably lower levels than in their heyday in the 1970s. The major land use pattern throughout the area is the clearing of forest for subsistence agriculture using fire; after several years of agriculture use, the gardens are now abandoned as the fertility has declined. The kunai grassland (*Imperata cylindrica*) is the pioneer species, which is frequently burnt, destroying the seed source for forest trees. Hence the forest is not able to recover and recolonize the ex-agricultural areas. As a result, the forest area is shrinking quickly in the region.

The area to the east of the Kumusi River to Oro Bay is one of the three ecosystems that provide habitat for the world's largest butterfly, *Ornithoptera alexandrae*, Queen Alexandra's Birdwing Butterfly (QABB). QABB is only found in three areas of the Oro Province and is featured on the provincial flag. Adult butterflies feed on many nectar sources but the caterpillar's only food source is the *Pararistolochia dielsiana* vine. The importance of this butterfly underscores the need to preserve its forest habitat.

Landscape Context

Physical Regions

The proposed mini estate development sites are spread out to the southeast, northeast and west of Popondetta town and are part of three physical regions (Haantjens, 1964):

the Kumusi-Mambare lowlands,

the Mt. Lamington-Hydrographers Range volcano region and

the Mambare River valley (where Kokoda is located) between the Main Cordillera of the Owen Stanley Range and the Ajule Kajale Range.

Additionally, the Mambere Foothills region is located nearby, but does not have any MEs located within it. In general, the area has great variation in land form and relief, while the detailed land forms are characterised by erosion from numerous streams and very sharp crested ridges formed by landslips on irregularly steep slopes.

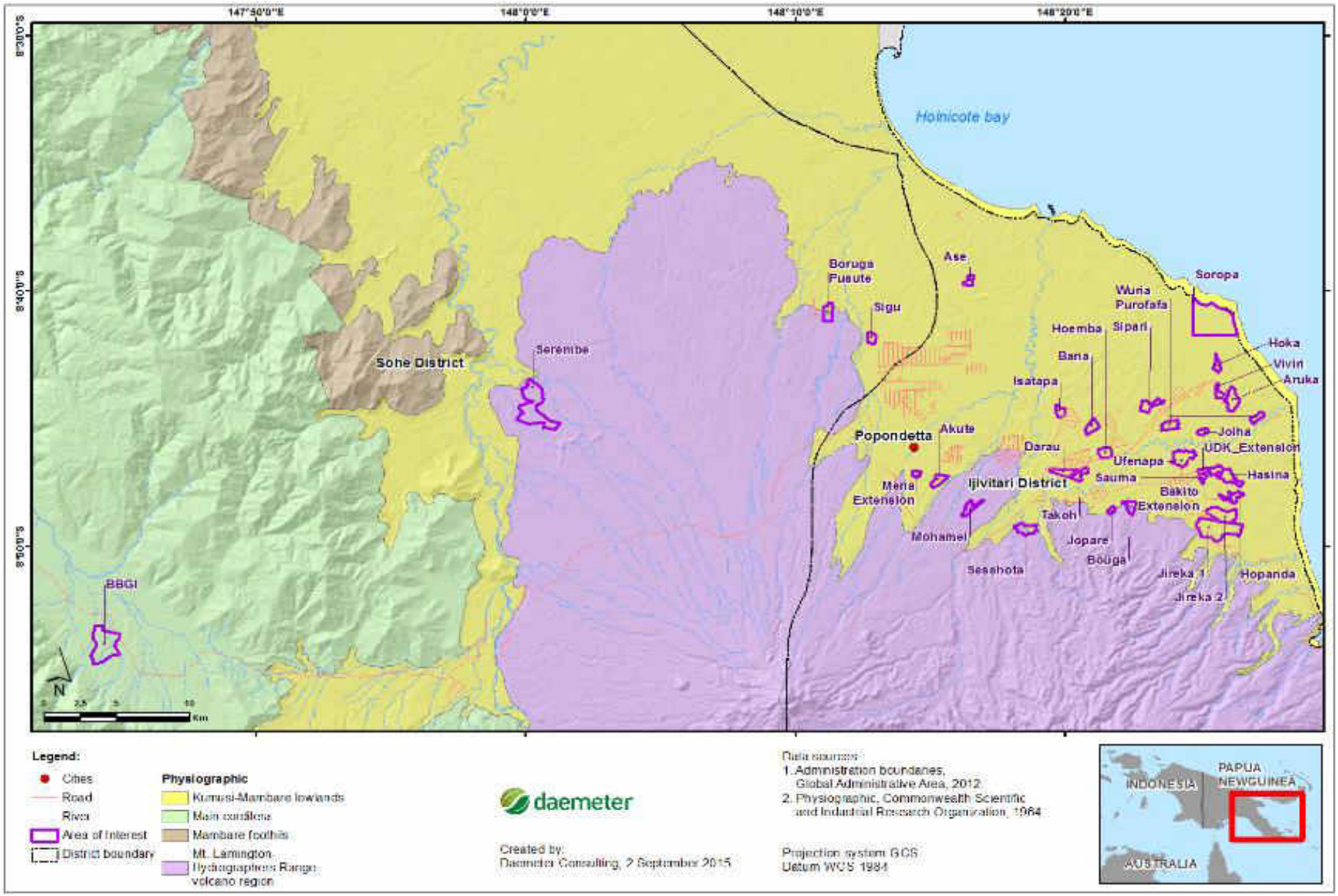


Figure 8. Physical regions (CSIRO 1964)

Alluvial plains of volcanic origin occupy large funnel-shaped areas north-east of Mt. Lamington, within the Kumusi-Mambare lowlands. Their upper parts form sandy, high, and markedly dissected outwash fans that consist of successive deposits from numerous eruptions of Mt. Lamington which is situated 21km south-west of Popondetta town. The lower parts, including the area eastward of Popondetta Town to the coast and south-eastward to Oro Bay, have a more normal flood-plain character and include waterlogged distributaries plains where rivers draining from Mt. Lamington are unable to develop proper river mouths and discharge much of their water and silt load via a system of distributary channels.

Mt. Lamington is a volcanic mountain with a summit of over 1500 m and is characterised by gentle, but strongly dissected middle slopes of ash and lahar deposits between 120 and 900 m, and shallow but densely dissected volcanic plains between 30 and 240 m altitude.

Elevation and Slopes

All the areas are on gently sloping areas at low elevations. Both these factors are prerequisites for oil palm suitability.

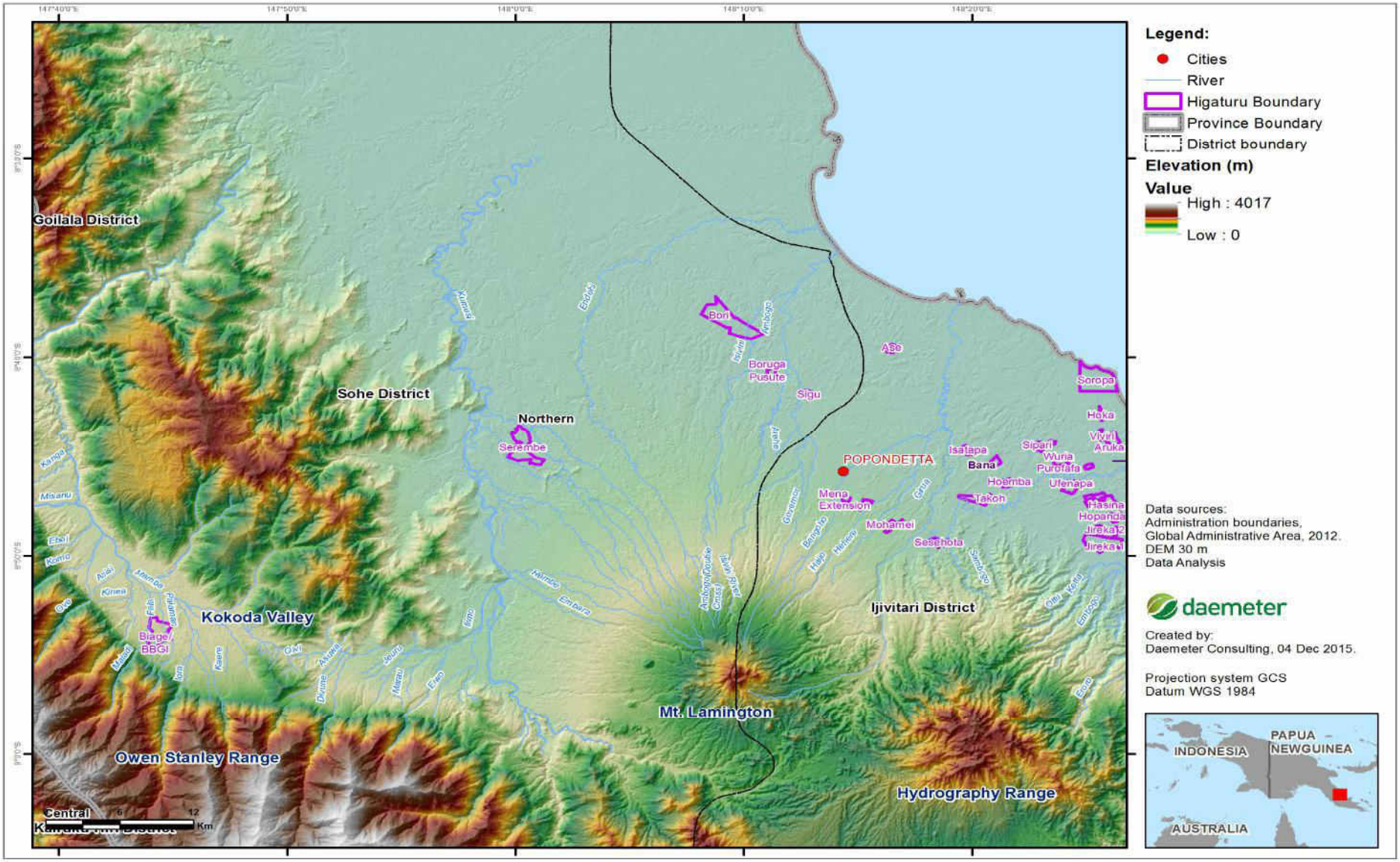


Figure 9. Elevations map showing project area

Rivers

Rivers are mapped in in the figure above. The main rivers originating from the slopes of Mt. Lamington and dissecting the Popondetta plains in a south-easterly direction from nearest to Popondetta and progressing eastward are Banguho, Haijo, Hehere and Girua. Banguho, Haijo and Hehere connect into the Girua River farther downstream and the latter then empties into the Solomon Sea coast 20km north-east of Popondetta.

Land Cover

Today, the landscape is a mosaic of grassland areas, oil palm plantations, logged-over regenerating forests and areas of remnant rainforest.

4.2.1 HCV Outcomes and Justification

HCV 1 Concentrations of Biodiversity Values

HCV 1.1 Protected areas

Findings in the AOI

There are no Protected Areas in the AOI, therefore HCV 1.1 is deemed to be Not Present

HCV 1.2 Concentrations of rare, threatened and endangered species

Findings in the AOI

Although there were HCV 1.2 mammals potentially present in the AOI. These wide ranging species could not be attributed to any individual MEs.

The only HCV 1.2 bird species that was sighted was the Palm Cockatoo *(Probosciger aterrimus)*. This was external to the MEs and in reasonable quality forest. The forest that was in the adjacent ME (Bakito Extension) was very degraded and therefore unlikely to be important as a bird habitat.

PNG plant species that were observed were all data deficient. The botanical team considered all these species to be common in the area and unlikely to be considered HCV 1.2.

The confirmed presence of QABB in and around Ase ME indicates that HCV 1.2 is Present in the AOI.

HCV 1.3 Concentrations of endemic species

Findings in the AOI

The bird survey observed 23 species which are included in HCV 1.3.

In general PNG tree species have not been comprehensively classified into system other than their commercial value. For this reason, forest areas were classified as HCV 1.3, where there was good regeneration of species that are typically found in primary forest. There were many such areas in the MEs.

There are a number of endemic mammal species that are likely present in the AOI. These appear to be disturbance tolerant species capable of making use of secondary forests (e.g., giant bandicoot, grey dorcopsis, papuan forest wallaby).

For this reason, HCV 1.3 was deemed present in many MEs and are mapped and presented in the Notification.

HCV 1.4 Critical temporal concentrations of species

Findings in the AOI

Pararistolachia spp. vines are common throughout the lowland rainforest of the AOI. These vines are an essential element of the QABB life-history The reduction in the extent of this habitat is seen as the major threat to QABB survival. HCV 1.4 is therefore deemed Present in all forested areas within the AOI.

HCV 2 Landscape Level Ecosystems and Mosaics

Both the HCV and HCS study have concluded that all of the proposed areas are not within landscape level forests. The entire area has long been converted to its current day mosaic of grasslands and secondary forests. A detailed study carried out by EO World and financed by the World Bank and European Space Agency in 2011 has concluded the area has no primary forests left and is currently a relatively stable patchwork of grasslands and secondary forests. A detailed land use change analysis of each of the proposed areas conducted as part of this NPP confirms this.

Land Use Change Analysis

- A detailed land use change analysis of 31 proposed areas to be planted by NBPOL in Oro Province was carried out. The analysis analysed land cover and tree cover loss within the proposed areas between the period of 2000-2015.
- The study found that all of the areas are anthropogenic and have been converted to a mosaic of grasslands and secondary forests of varying ages before the time frame of the land use change analysis. Thus this study concurs with the HCV analysis conducted by Daemeter which claims the area to be converted does does not contain primary forest.
- A detailed study conduct by EO World, financed by the World Bank, also found no primary forests present in the overall study area.
- The study found that the areas proposed to be converted are grasslands, scrublands and young secondary forests including old garden areas and it is shown to be as such before the start of this analysis (2000)
- The study detected low levels of disturbance, a global average of - 3.8%, as indicated by tree cover loss, with exceptions within the Ufenapa, Hopanda and Hasina where higher percentages of tree cover loss. Subsequent analysis with high resolution imagery, Rapid Eye (5m) suggests that these tree cover losses were due to traditional shifting agriculture and took place mostly in areas classified as “young secondary forest”.
- The study found a high correlation between lack of tree loss and medium and high density forest which the HCV and HCS studies have earmarked for protection.
- The study suggests an array of GIS and satellite imagery analysis tools to monitor the efficacy of protection of these areas once the remaining areas have been converted to oil palm.
- All maps are available for viewing in Appendi 2.

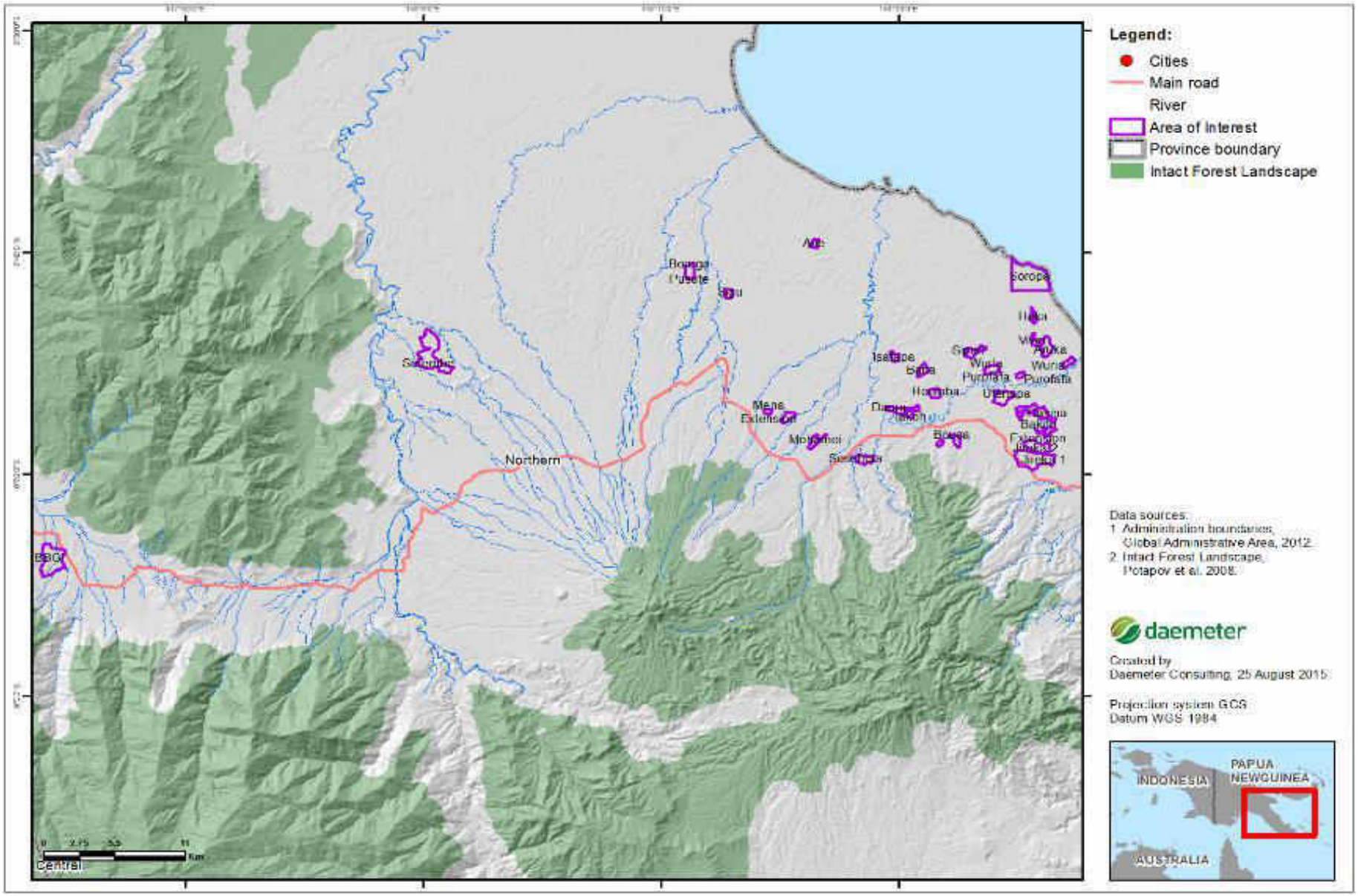


Figure 10. Landscape-level forests within the proposed areas,

As a first step the PNG toolkit suggests mapping the AOI and its connection to Intact Forest Landscapes (IFL). In this map the IFL are confined to the mountain tops and there is no connectivity with the AOI.

Findings in the AOI

There is no intersection between the AOI with intact forested landscapes. For this reason, HCV 2 is deemed Not Present.

HCV 3 Ecosystems and Habitats

HCV 3 requires systematic ecosystem mapping across a very wide area and in a manner that is comparable among sites and by different assessment teams. In PNG, the distribution of ecosystem types is defined by climate, soil/hydrological characteristics, human influences and landform features within a biogeographical unit. The Land Research mapping program conducted by the Australian Government in the 1970s defined and mapped land systems in PNG that that describe topographical, geological, climate, and hydrological factors, as well as soil and resident species. These land systems are used by Daemeter as a proxy for ecosystems.

To classify ecosystems as "Endangered" Daemeter analysed past and expected future forest loss on the land systems within the MEs.

To classify ecosystems as "Rare," Daemeter analysed the area of forest in each land system compared with the area of forest in the whole physiographic region. If the area of forest in a given land system is less than 1% of the forest in the physiographic region[2] then it is classified as "Rare."

Findings in the AOI

Rare ecosystems are not extensive in the AOI landscape, but do exist. Rare forest ecosystems, which are threatened because of agricultural expansion, exist in the Akute and Soropa MEs. No endangered ecosystems were identified. HCV3 is therefore deemed Present based on the presence of rare ecosystems in the AOI. These have been mapped and presented in the Notification.

HCV 4 Critical Ecosystem Services

HCV 4.1 Areas critical to water catchments

Findings in the AOI

Numerous small rivers are present throughout the AOI and a couple of MEs border large rivers. Communities are dependent on all of these rivers. HCV 4.1 is therefore Present.

HCV 4.2 Areas critical for soil erosion

[2] Physiographic Regions are discussed in Section 0.

Figure 11. River bank erosion of Sambogo River.

The AOI (Wuria Purofafa ME) is on the LHS.

Findings in the AOI

Sesehota and Wuria Purofafa MEs are located next to large rivers where river bank erosion could impact downstream communities. For this reason, HCV 4.2 is deemed to be present.

HCV 4.3 Areas critical for fire prevention

Findings in the AOI

HCV 4.3 is deemed Potentially Present based on the known capacity of forests with intact canopies and wetland forests to resist fire. Although fire has not been a major issue in the region, it is thought that these forests could become more important barriers to the spread of fire during extremely dry years.

HCV 5 Basic Needs of Local Communities

The Common Guidance considers the following as indicators of HCV 5:

- Access to health centres or hospitals is difficult,
- Most houses are built from, and household tools made from, locally available traditional/ natural materials,
- There is little or no water and electricity infrastructure
- People have a low capacity to accumulate wealth (living `day to day_)
- Farming and livestock raising are done on a small or subsistence scale
- Indigenous hunter-gatherers are present
- There is presence of permanent or nomadic pastoralists
- Hunting and/or fishing is an important source of protein and income
- A wild food resource constitutes a significant part of the diet, either throughout the year or only during critical seasons

Almost all these indicators are present in the villages around the AOI.

The community in this area is extremely reliant on the environment for meeting their basic needs. Most people are subsistence farmers and there are very few people that earn their living in a cash economy (e.g. few people worked in shops in town or as government employees). Purchased food and materials tend to be very expensive.

Findings in the AOI

The communities living in and around the AOI are heavily reliant on natural areas for meeting their basic needs. Just about every basic need is sourced from the environment. Therefore HCV 5 is deemed Present.

HCV 6 Cultural Values

Findings in the AOI

Cemeteries located inside proposed development areas and the WW2 site at Soropa are considered HCV 6, therefore this HCV is deemed to be Present.

Table 9. General HCV Findings.

HCV	Description	Present	Potentially Present	Not Present
1.1	Protected areas			
1.2	Concentrations of rare, threatened and endangered species			
1.3	Concentrations of endemic species			
1.4	Critical temporal concentrations of species			
2	Natural ecosystems or ecosystem mosaics which are large in extent, un-fragmented, form a significant components of the landscape or are of significant importance at a local, regional of national level, and which contain most of the naturally occurring species.			
3	Ecosystems that are naturally rare, have become rare due to historical processes, or threatened by present or future processes.			
4.1	Areas critical to water catchments			
4.2	Areas critical for soil erosion			
4.3	Areas critical for fire prevention			

5	Sites and resources fundamental for the basic necessities of local communities or indigenous peoples.			
6	Cultural values critical to the traditional cultural identity of local communities, including areas of cultural, ecological, economic, religious or archaeological significance.			

4.2.2 HCS Outcomes and Justification

The HCS assessment found 163.1 ha of HCS Indicative Conserve areas in addition to those identified as HCV. All other HCS areas overlapped with HCV areas and for practical purposes are names as such. Stakeholder consultations with NBPOL and the community provided feedback regarding several patches of HCV and HCV. Due to this HCS modifications made were made and provided in the Integrated Forest Management Plan (IFMP) provided by both Daemeter and TFT. In total, nine small and isolated patches (Low Prioirty) were changed from Indicative Conserve to Indicative Develop. The small to medium size of most blocks posed new challenges to adapting the HCS methodology, in particular we recommend raising the minimum area of isolated patches within the block (i.e. >10ha), while reducing the minimum area requirement for physical connectivity to High Priority forest patches (>100ha) outside the block (i.e. <10ha). • All blocks exist in a landscape that is actively used by local communities (High Risk) who own all of the land (customary ownership). This is also a relatively High Forest Cover (>50) landscape. For these reasons it is critical that community are engaged to build a development plan that they respect both within the blocks and on their wider lands to avoid deforestation in the landscape while ensuring community rights and aspirations. All of the HCS management recommendation were integrated with the HCV management recommendations and delivered to NBPOL as an Integrated Management Plan which NBPOL has fully accepted.

Table 10. Summary of HCV and HCS Assessments.

Proposed Mini Estates	HCV	HCV & HCS Conserve	HCV and Indicative Conserve	HCS Indicative Conserve	Plantable	Total
Akute	0	7	0	0	51.3	58.3
Aruka	3.1	11.6	0	3.7	82.9	101.3
Viviri	0	0	0	0	38	38
Ase	0	12.5	0	5.3	15.3	33.1
Bana	0	15.2	0	0	43.7	58.9
Biage	13.9	7.6	0	5.3	316.5	343.2
Boruga Pusute	0	0	0	26.8	47.3	74.1
Bouga	0	1.4	0	5.3	42.1	48.9
Hoemba		0	0	0	58.6	58.6
Hoka		0	0	0	31.9	31.9

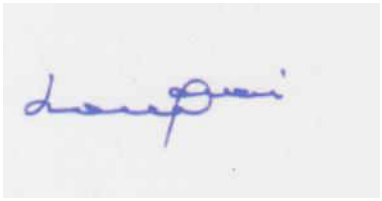
Hopanda	1.6	0	0	0	37.8	39.4
Bakito Extension	0	0	0	0	17.6	17.6
Isatapa	0	0	0	0	40.8	40.8
Jireka 1	0	95.1	0	0	221.4	316.5
Jireka 2	0	84.6	0	30.2	32.5	147.3
Joiha	0	0.01	0	0	25.2	25.21
Jopare	0	0.5	0	0	22	22.5
Mena Extension	0	0	0	0	22.5	22.5
Mohamei	0	0	0	0	55.8	55.8
Serembe	0	30.9	2	71.7	321.8	426.4
Sesehota	0.3	0	0	0	83.7	84
Sigu	0	0	0	0	47	47
Sipari	0	0	0	0	70.4	70.4
Soropa	179.4	NA	NA	NA	404.7	584.1
Darau	0	0	0	0	69.9	69.9
Takoh		7.6	0	0	35.7	43.3
UDK Extension		0	0	0	22.7	22.7
Sauma		0	0	0	22.6	22.6
Hasina		0	0	0	129.87	129.87
Ufenapa		14	0	13.5	96.4	123.9
Wuria Purofafa	0.9	15.3	0	1.3	83.8	101.3
Totals	**199.2**	**303.31**	**2**	**163.1**	**2591.77**	**3259.38**

The above table is presented in detail below specifying the exact designation per proposed area and supported by a GIS map overlaid onto satellite imagery. These maps have been presented to all stakeholders in the Notification of New Plantings and will be utilized for management and monitoring purposes throughout the project.

5.0 Internal Responsibility

This document is the public summary of the integrated SEIA, HCV & HCS management for new developments of Higaturu Oil Palms and has been approved by the management.

Signed by Narua Lovai, Independent Consultant for Social Environmental Impact Assessment:

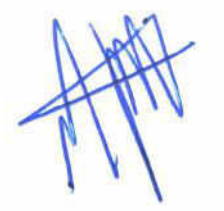


30/05/15

Signed on behalf of Daemeter Consulting by Jules Crawshaw:

30/05/15

Signed on behalf of Tropical Forest



30/05/15

Signed for on behalf of Higaturu Oil Palms by:

31/05/2015…… …31/05/2015……

Mike Jackson Paul Maliou

General Manager –NBPOL-Higaturu Sustainability Manager

Appendix 1 List of Participants in Community Meetings

VENUE	KARARATA	SIREMI	DOBUDURU	PARAHE
DATE	18/8/2015	19/8/2015	20/8/2015	20/8/2015
ATTENDEES	Marie Thomas	Marie Thomas	Marie Thomas	Marie Thomas
	Marcellina Korike	Genesius Abbah	Morris Eruga	Simi Sakalia
Angelus Palik	Marcellina Korike	Mathias Arura	Edrick Penunu	
Simi Sakalia	Lindsay Esi	Hillarian Arura	Arston Kouma	
Champion Sorari	Harold Hangosa	Carson Jove	Romas Oriri	
Gibson Sorari	Verni Esi	Wilson Evari	Bevan Wawata	
Narua Lovai	Augustin Jajata	Kingston Joiha	Genesius Abbah	
Paul Maliou	Justus Jajata	Judy Gomba	Eliuda Pilake	
Lawrence. B	Hamilton Toki	Moses Oreuepa	Charlie	
Tasman Eko	Dickson Huari	Brian Garoja	Jenifer	
Isaac Hainta	Victor Kekerapa	Nathaniel Pisaembo	Nancy Komba	
Philip Nigel	Alkin Siwua	Mark Philip Sohupa	Gabriel Chris	
Donald Uveva	Nickot Siwua	Alfred Sanko	Helen Kaepa	
Alexander. U	George King Owatia	Andrew Sohupa	Maria Ambo	
Nigel King Upena	John Siwua	Nelson Sohupa	Hanson Bororiba	
Ronney Jowopa	Ramsay Siwua	zechias Ajase	Jairus Akiapa	
George M Uneva	Jauva Siwua	Euthycus Hopanda	Adread	
James Jri	Mariwec Siwua	Kati Arura	Evelyn Aigapa	
Judah	Daniel Siwec	Erick Boruga	Hamphrey Hotopu	

VENUE	KARARATA	SIREMI	DOBUDURU	PARAHE
DATE	18/8/2015	19/8/2015	20/8/2015	20/8/2015
Isaac Tugon	Homsy Owata	Hollan Joraripa	Taylor Ford Aigapa	
Genesius Abbah	Sam Usai	Kipas Panduru	Javii	
	Moses Porepa	Joseph Herove	Allan Okaja	
	Kaven Hopata	Regina Pami	John Sehopa	
	Romas Usai	Elfreda Pami	Marcellina Korike	
	Narua Lovai	Edward Pami	Angelus Palik	
	Angelus Palik	Clay Pami	Narua Lovai	
		Jance Hoemba	Pol Toki	
		Henking Utari	Genesius Abbah	
		Charley Hamps		
		Angela Hamps		
		George Hamase		
		Donah Hamase		
		Mary Arura		
		Eliuda Pilake		
VENUE	HETUNE	AHIRE	ISUGA	OMBA
DATE	21/8/2015	21/8/2015	21/8/2015	22/8/2015
ATTENDEES	Cesilia Koija	Marie Thomas	Eliuda Pilake	Nicholas Ungajo
Angelus Palik	Simi Sakalia	Marie Thomas	Wilson Barunapa	
Daphne Koija	Allan Virou	Simi Sakalia	Malcolm Barunapa	
Eliuda Pilake	Hayward Baruna	Narua Lovai	Winston Barunapa	
Simi Sakalia	Philemon Viori	Angelus Palik	Humphrey Sireka	
Mavis. P	Genesius Abbah	Genesius Abbah	Thomas Tovera	

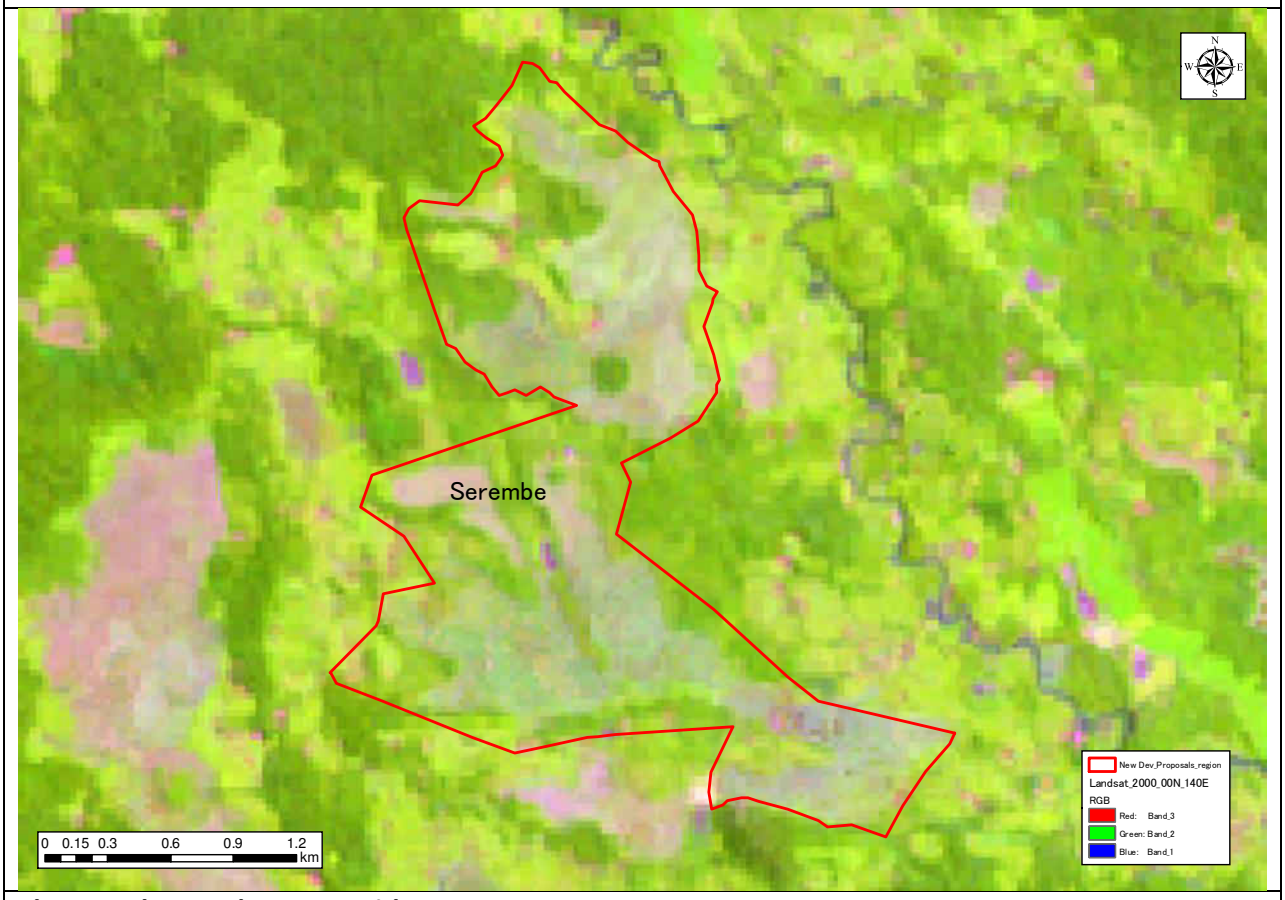
VENUE	KARARATA	SIREMI	DOBUDURU	PARAHE
DATE	18/8/2015	19/8/2015	20/8/2015	20/8/2015
Marcellina Korike	Dedra Viori	Marcellina Korike	Nicodemus Ungajo	
Judith	Blasius Viori	Millen Upaiga	Daphney. B	
Josephine Hohoro	Grayson Viori	Princess Kerohopa	Rondy. B	
Ethel Imbi	Marcellina Korike	Delvin Akute	Neonu. B	
Josephine Hohoro			Marcellina Korike	
Ethel Imbi			Eliuda Pilake	
Marie Thomas			Angelus Palik	
Narua Lovai			Marie Thomas	
Lawson Sindapa			Narua Lovai	
Oris			Osborne Ita	
Jimmy			Gabriel Chris	
Daniel				
Morris				
Oswald Jangiri				
VENUE	HAVEVE	SEREMBE	SEREMBE continued..	
DATE	22/8/2015	24/8/2015	24/8/2015	
ATTENDEES	Marie Thomas	Marie Thomas	John Anite	
	Marcellina Korike	Narua Lovai	Roby Javiso	
	Narua Lovai	Godwin. E	Edrick Ohogo	
	Arinius Onjete	Jerom. O	Hankin Sesevo	
	Aaron Dabadaba	Hilford.U	Harold Tahero	

VENUE	KARARATA	SIREMI	DOBUDURU	PARAHE
DATE	18/8/2015	19/8/2015	20/8/2015	20/8/2015
	Ronny Dabadaba	Kingsley. E	Planton Tithe	
	Robinson Omise	Sebestian. E	Susie Sesevo	
	Gibson Tinga	Ahansis. U	Dephney Tehera	
	Ricky Onjete	Morica. E	Hansley Sesevo	
	Nancy Onjete	Esther. U	Dulcie Sesevo	
	Simi Sakalia	Elvi Pusembo	Gelond Tehera	
	Edith Onjete	Carson Pusembo	Mackenton. O	
	Julie Onjete	Enoch Pusembo	Robertson. E	
	Gabriel chris	Ray Daupa	Murray. H	
		Beverly Suma	Zebron. O	
		Remingius Eri	Mathilda. O	
		Boney Eri	Stella. E	
		Robray Eri	John Schort. S	
		Boney Eri	Andy Esege	
		Rubby Eri	Diwos Egimbari	
		Priscilla Eri	Sibeth Urevo	
		Robo Eri	Shirley Egimbari	
		Alie Eri	Benson Pusento	
		Danybray Kione	Dura Pusento	
		Napoleon Ogapa	Marcellina Korike	
		Jairus Haita	Angelus Palik	
		Benjamin Haita	Eliuda Pilake	
		Florence Ogapa	Genesius Abbah	
		Rachael Haita		

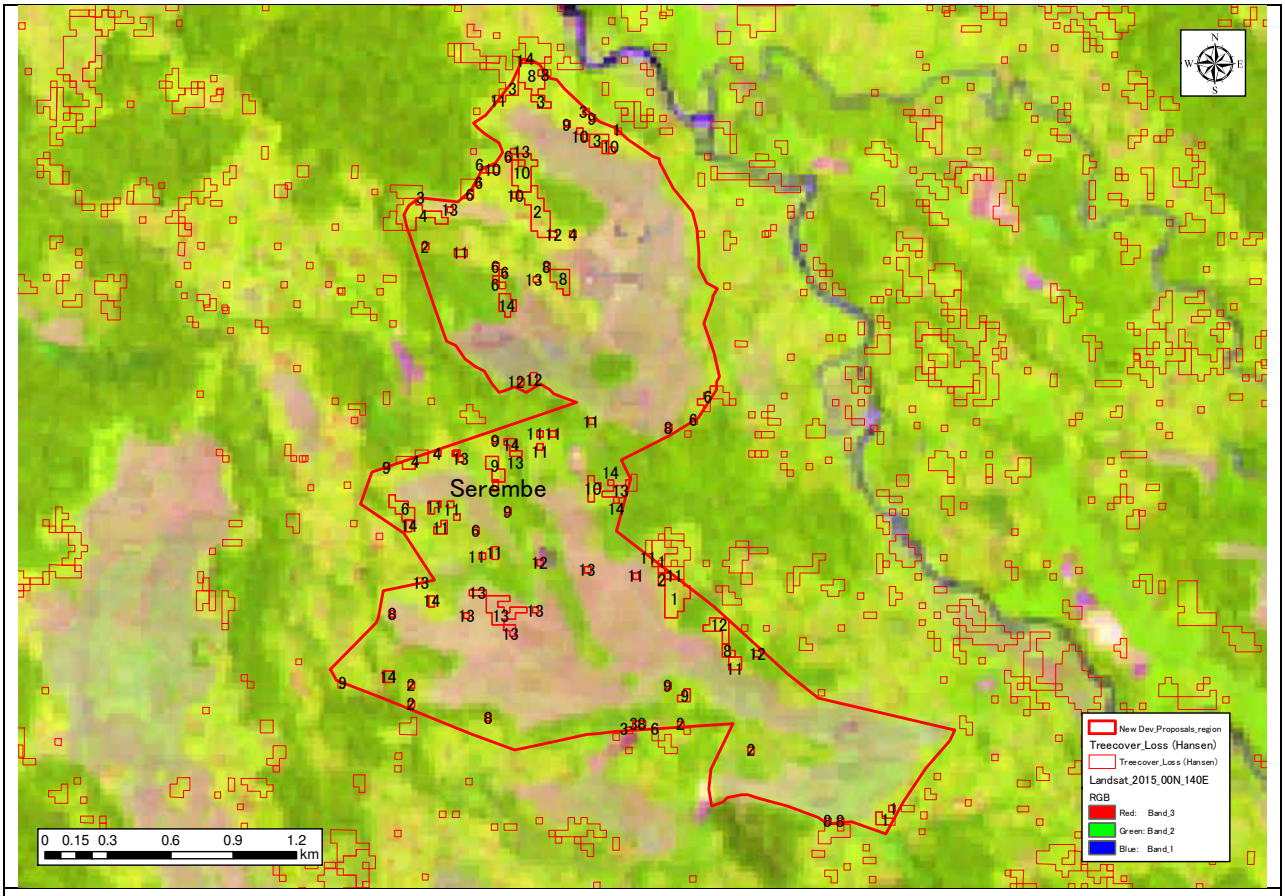
VENUE	KARARATA	SIREMI	DOBUDURU	PARAHE
DATE	18/8/2015	19/8/2015	20/8/2015	20/8/2015
		Benard Suvaki		

Appendix 2 Land Use Change Analysis Maps

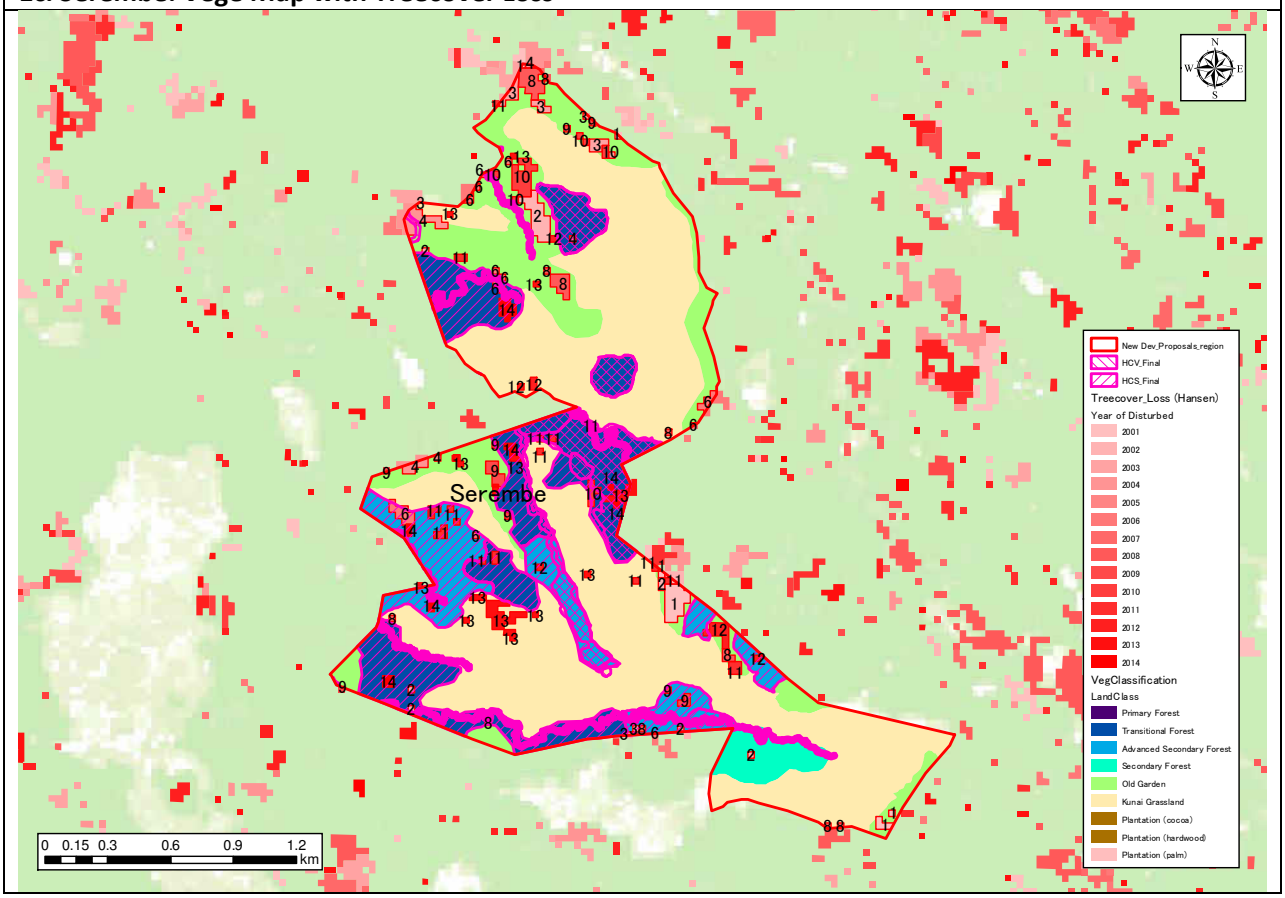
1a.Serembe: Landsat 2000 as Baseline Data



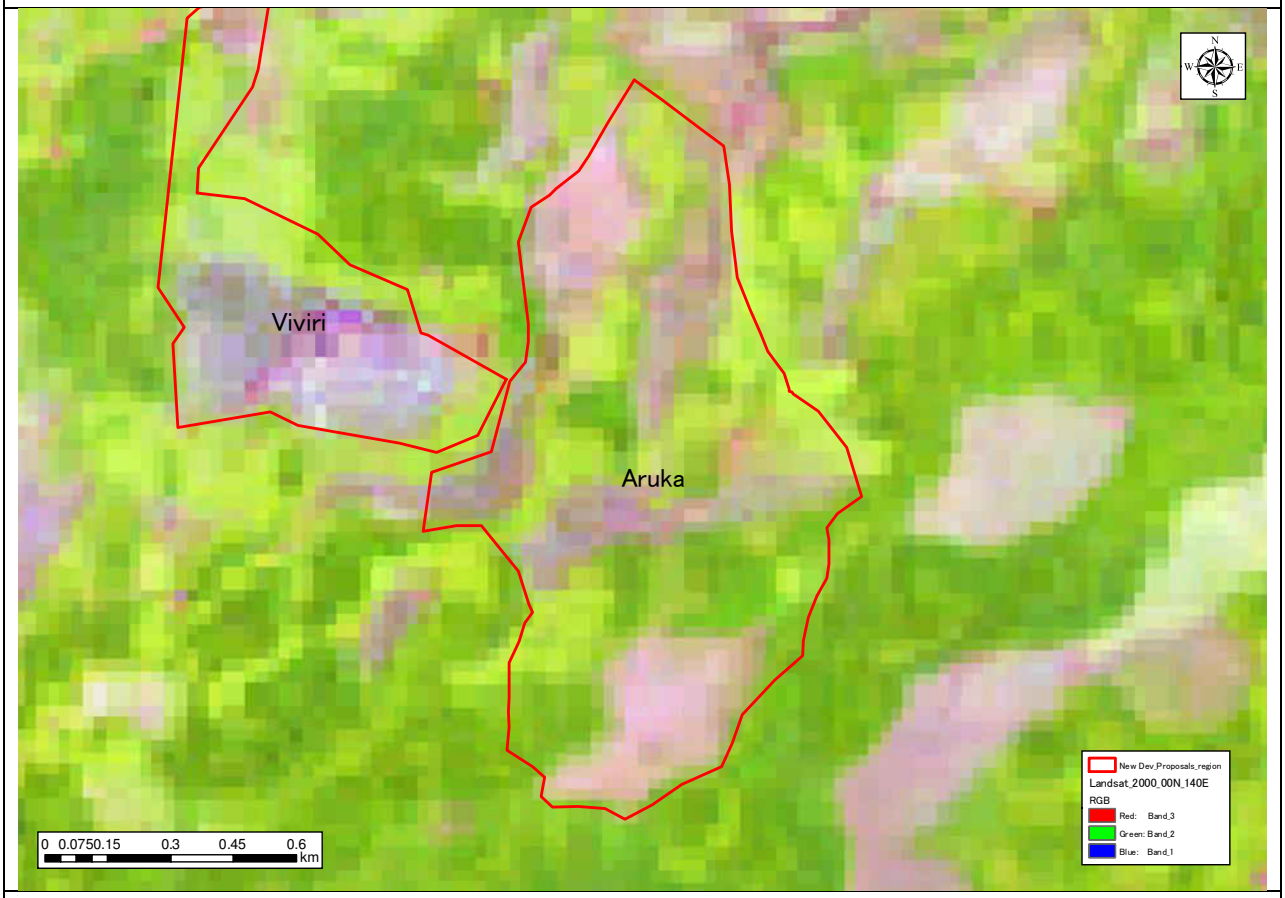
1b. Serembe: Landsat 2015 with Treecover Loss



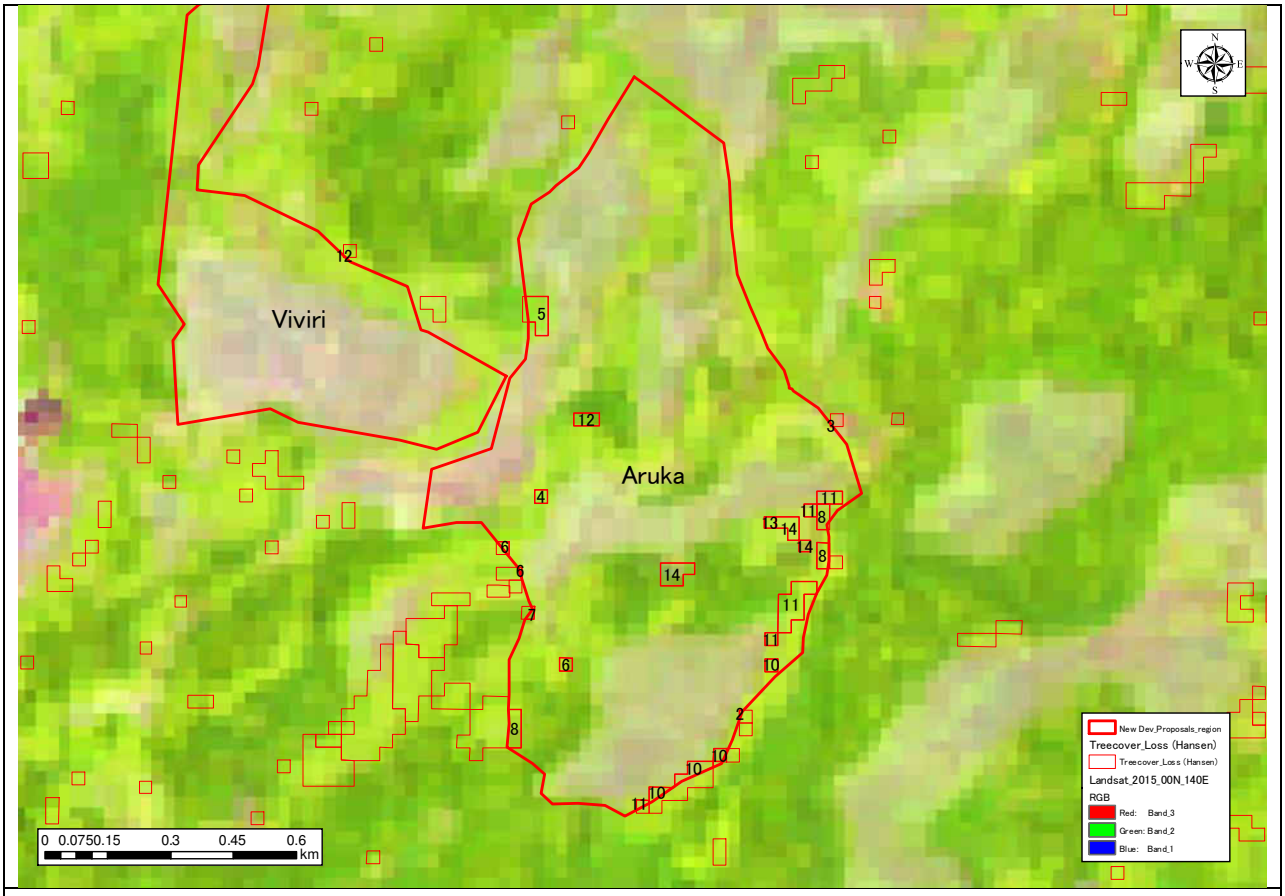
1c. Serembe: Vege Map with Treecover Loss



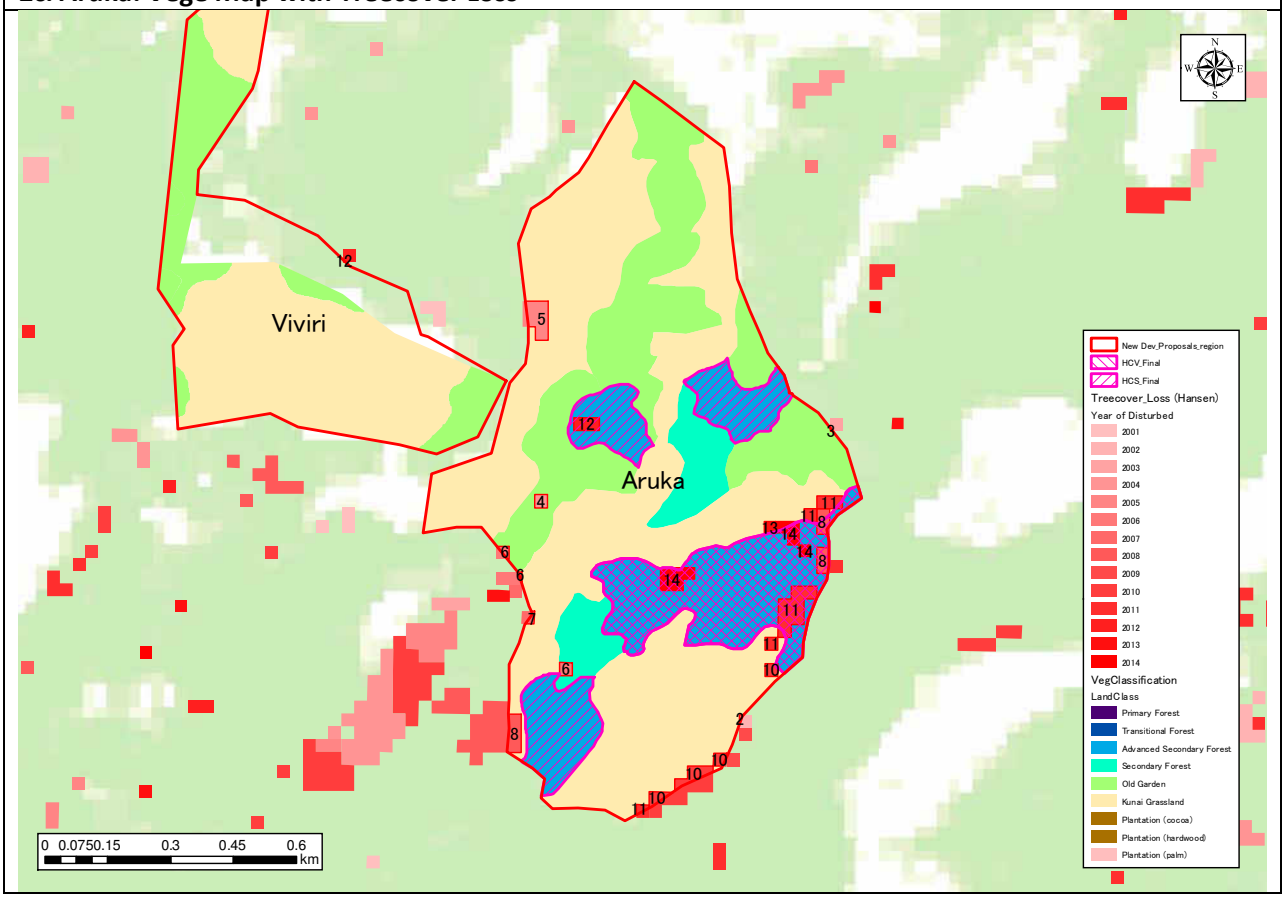
2a. Aruka: Landsat 2000 as Baseline Data



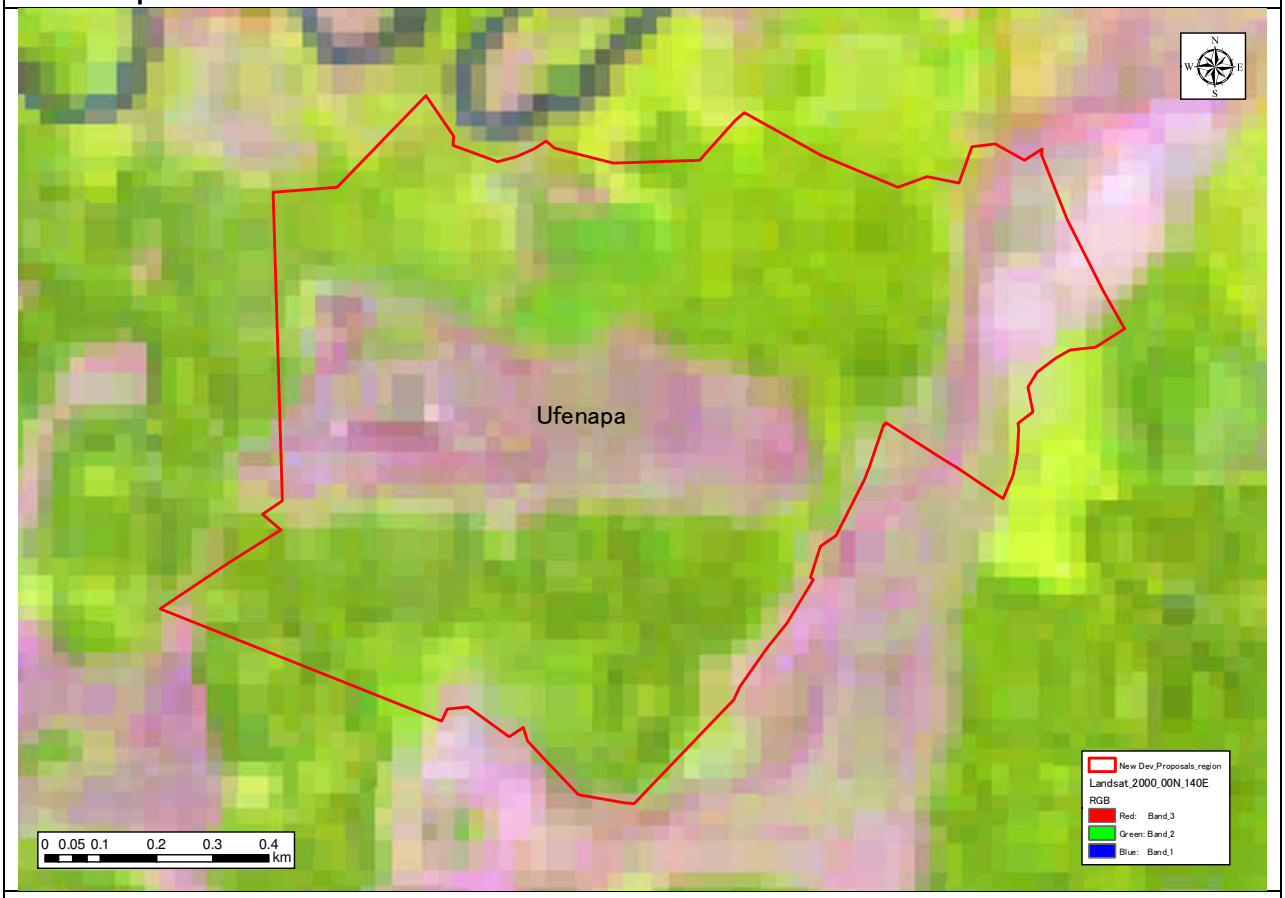
2b. Aruka: Landsat 2015 with Treecover Loss



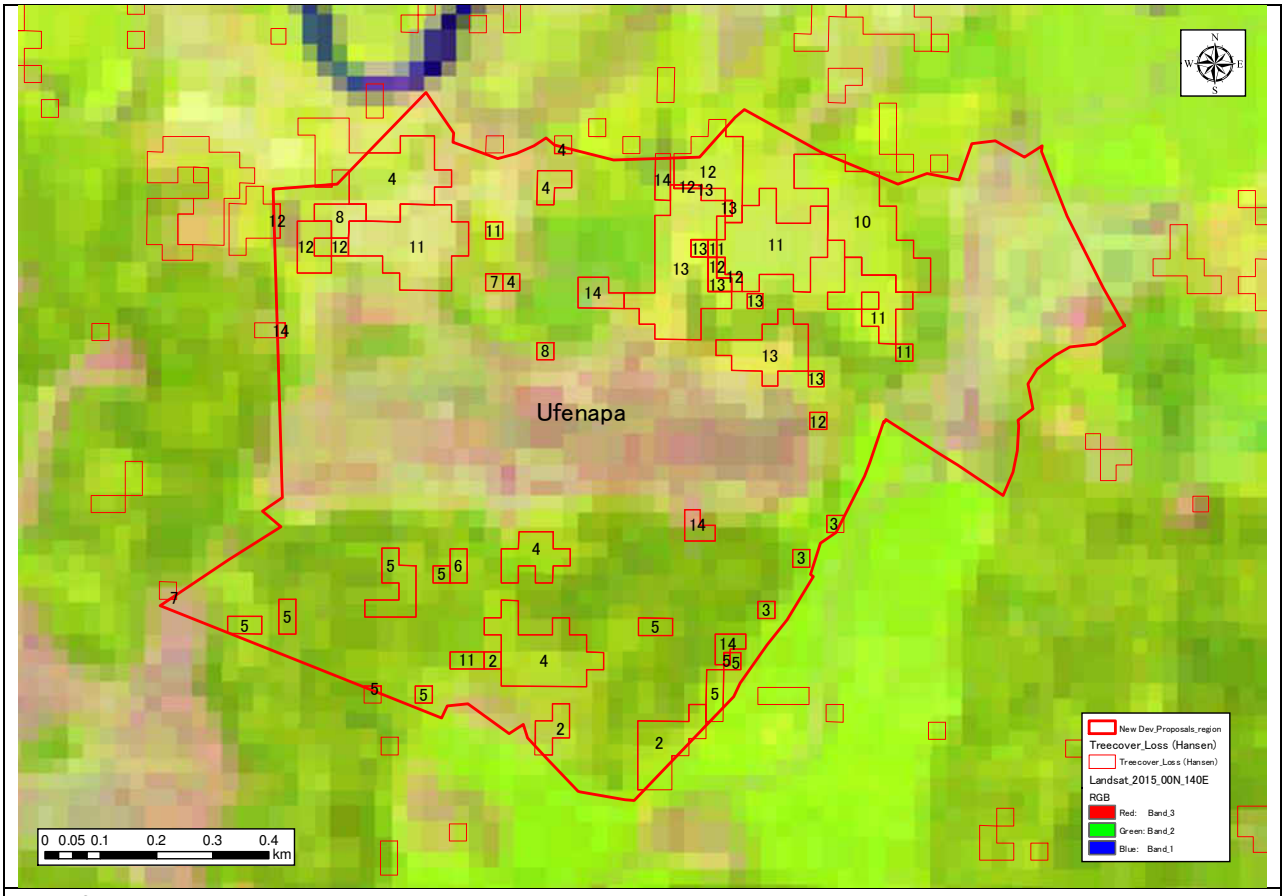
2c. Aruka: Vege Map with Treecover Loss



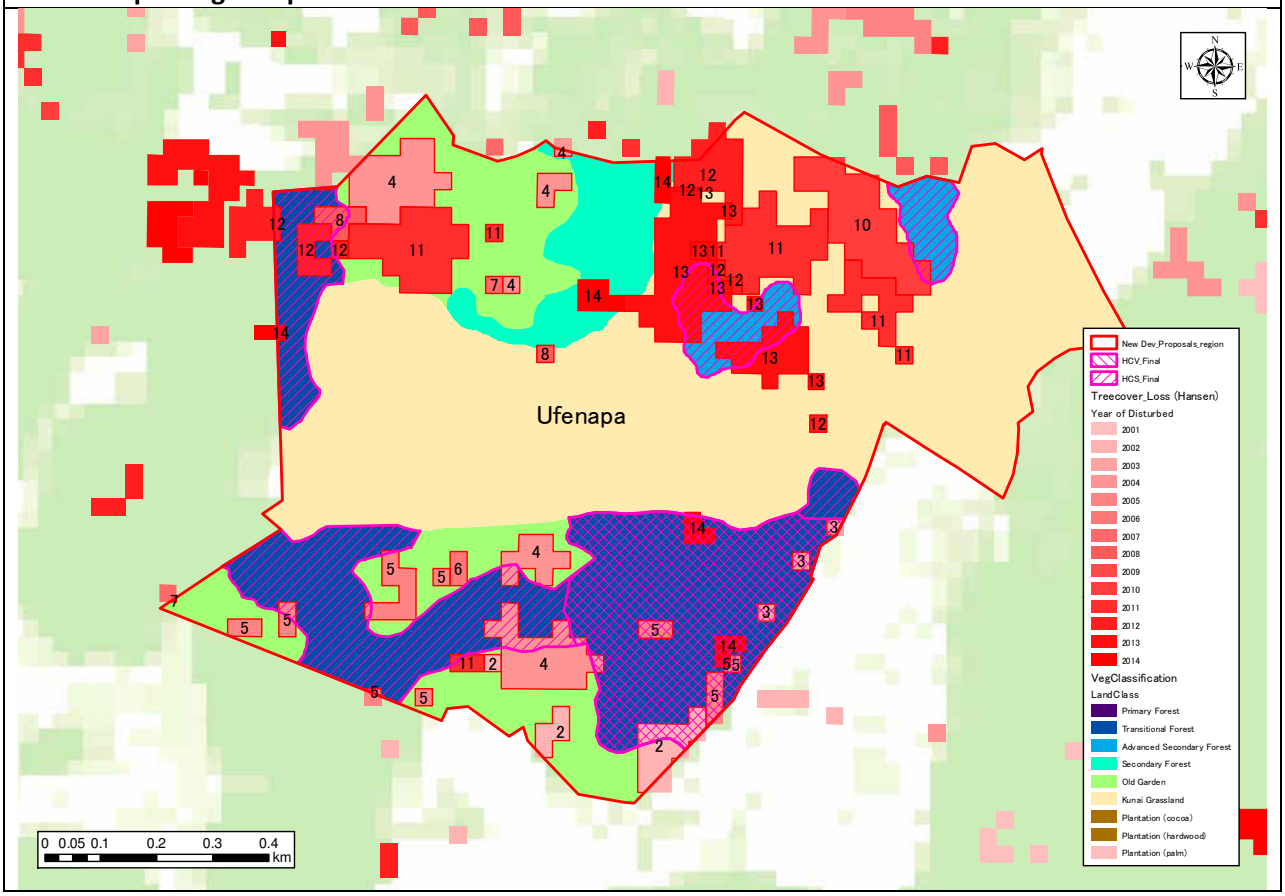
3a. Ufenapa: Landsat 2000 as Baseline Data



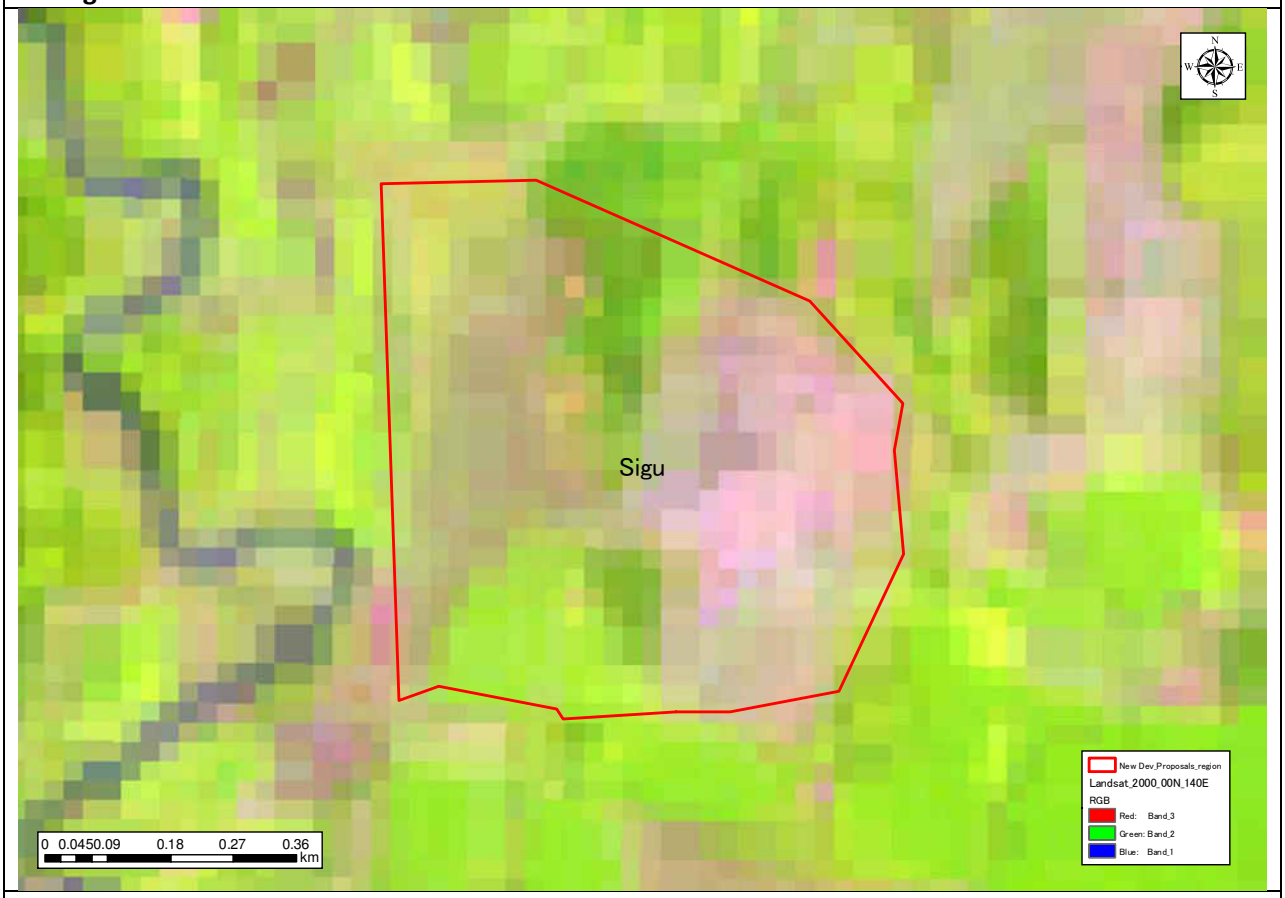
3b. Ufenapa: Landsat 2015 with Treecover Loss



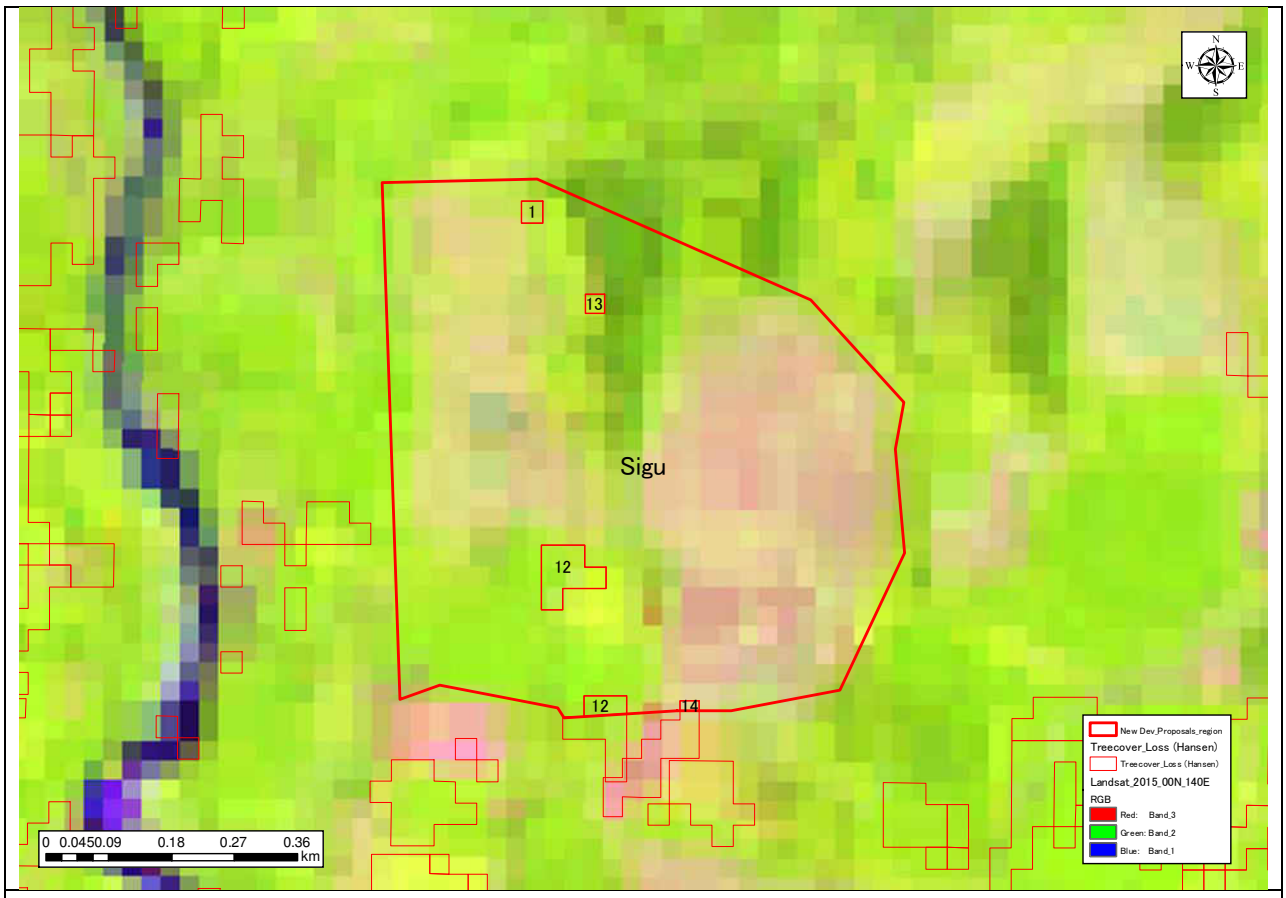
3.c Ufenapa: Vege Map with Treecover Loss



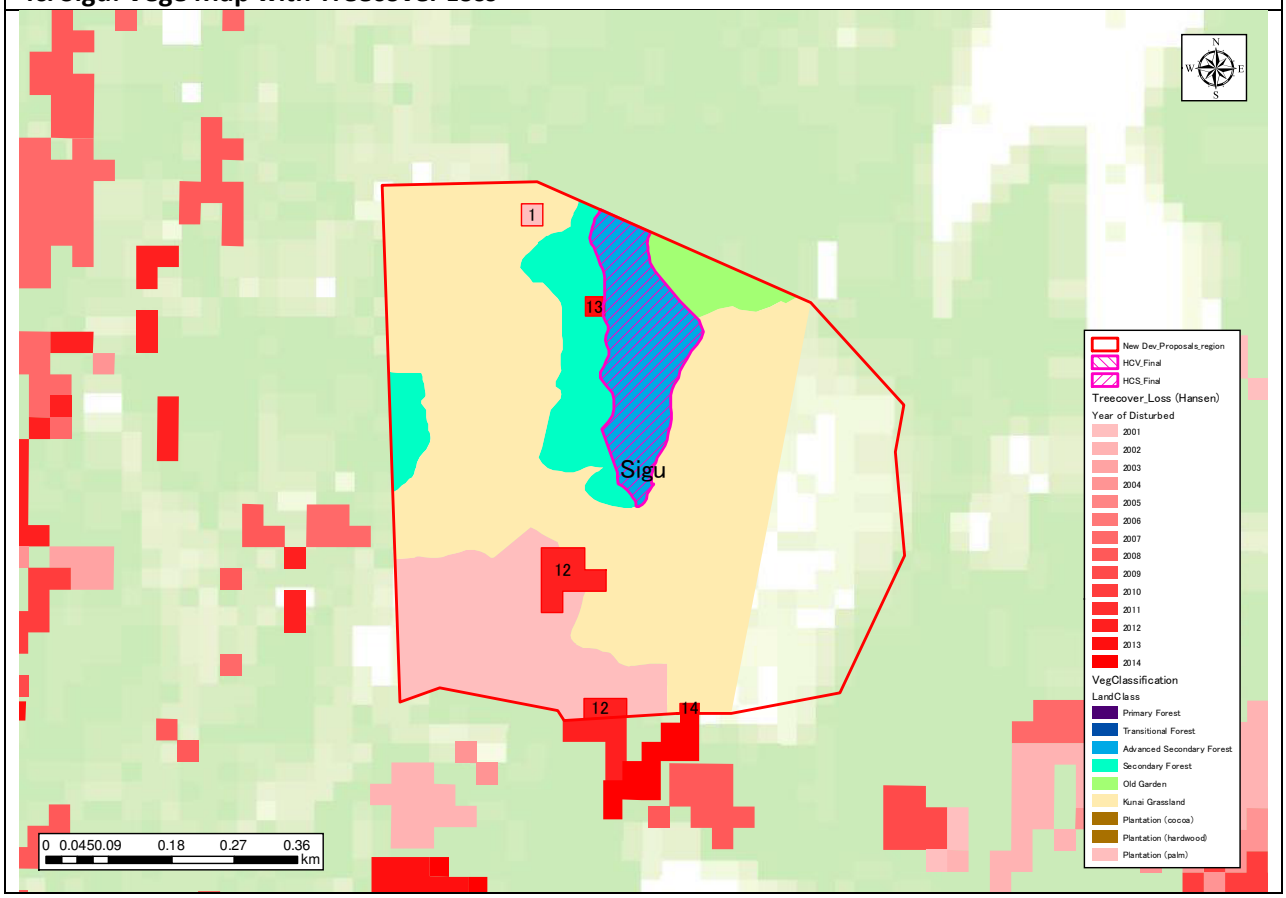
4a. Sigu: Landsat 2000 as Baseline Data



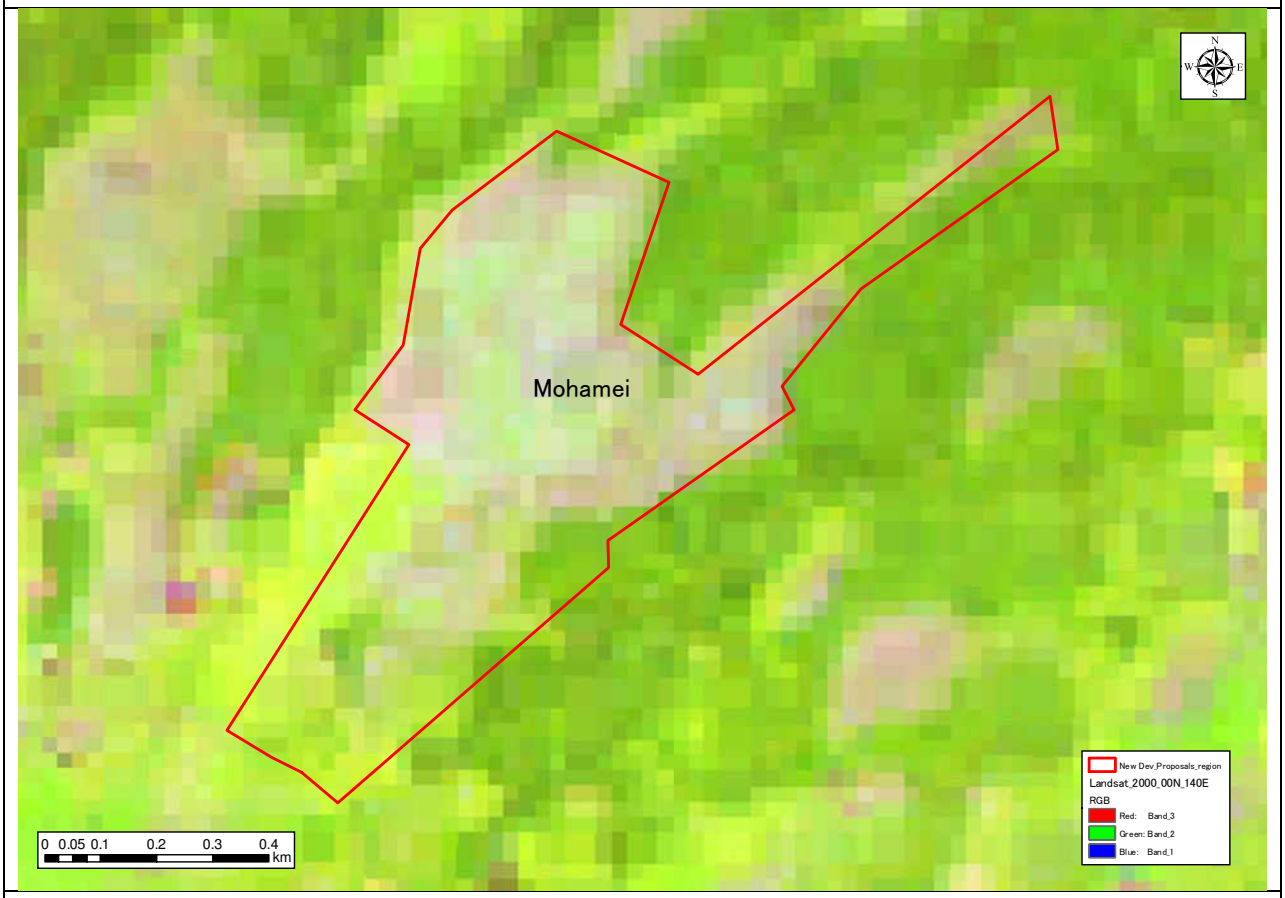
4b. Sigu: Landsat 2015 with Treecover Loss



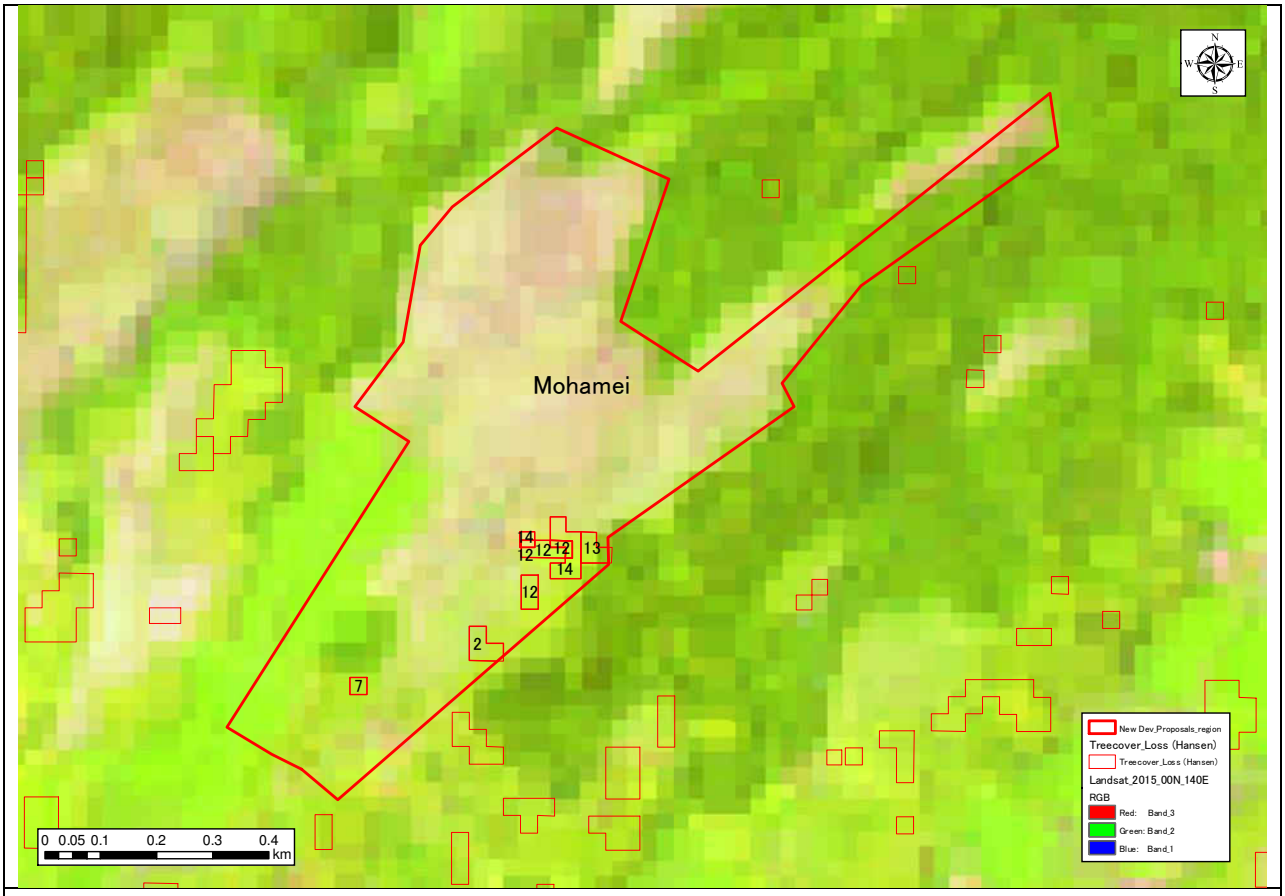
4c. Sigu: Vege Map with Treecover Loss



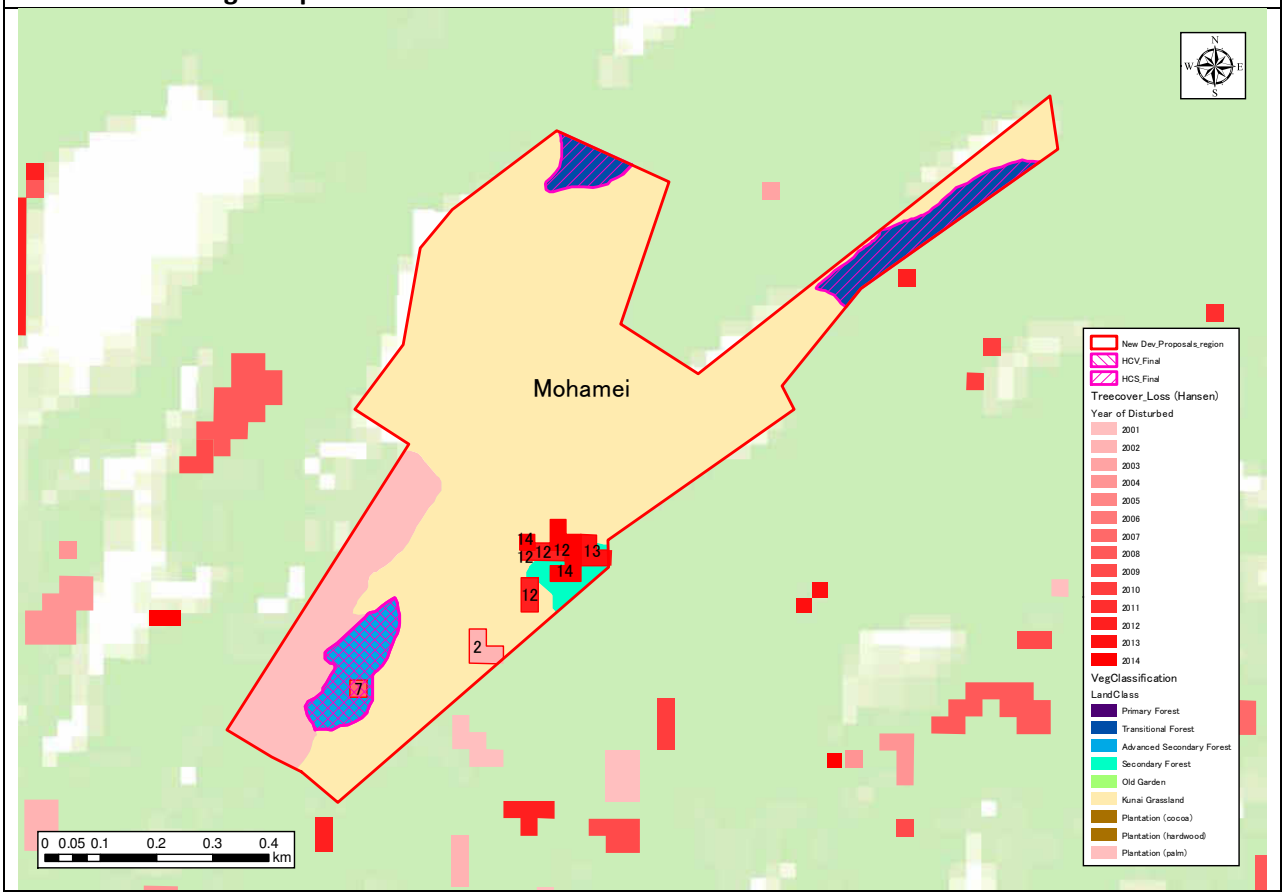
5a. Mohamei: Landsat 2000 as Baseline Data



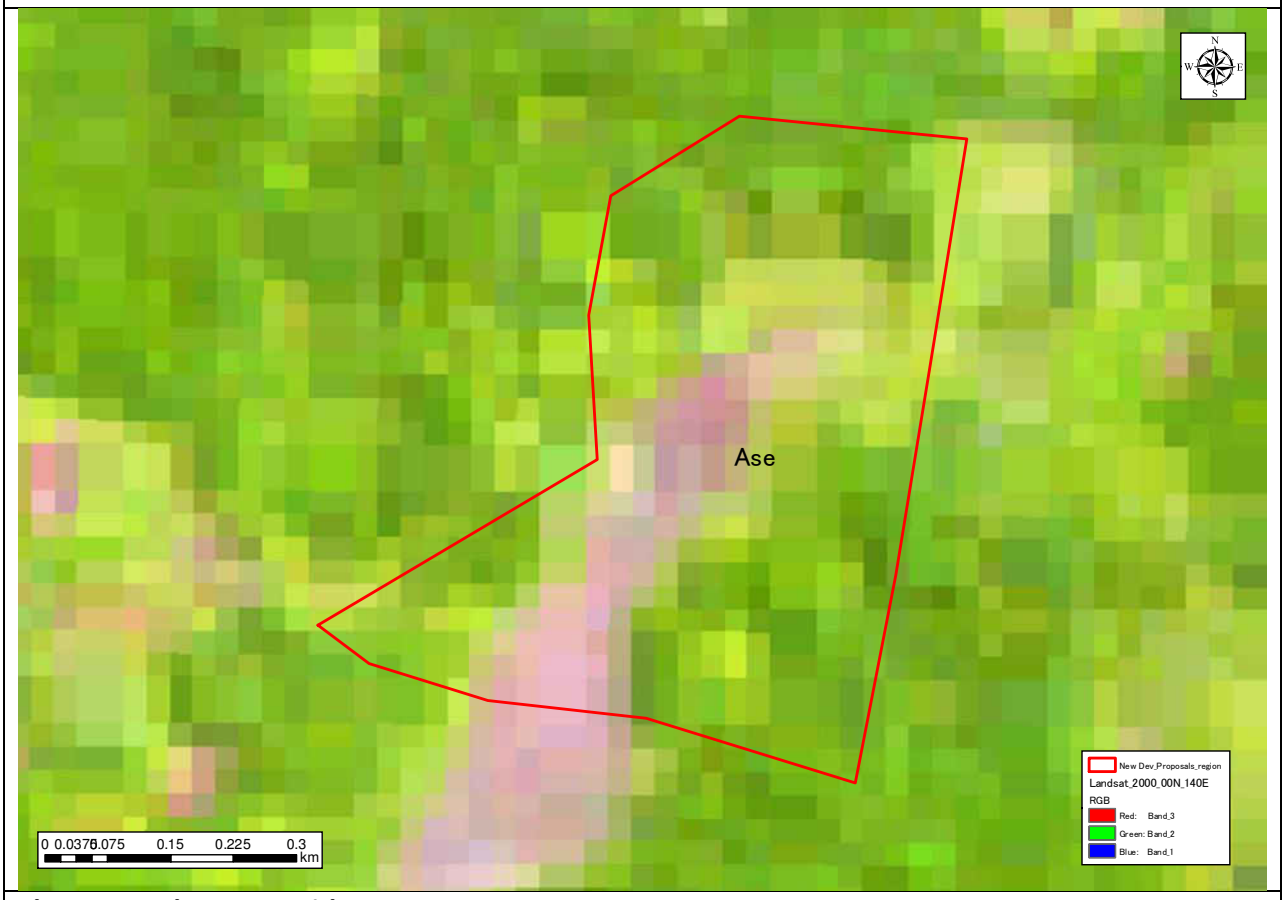
5b. Mohamei: Landsat 2014 with Treecover Loss



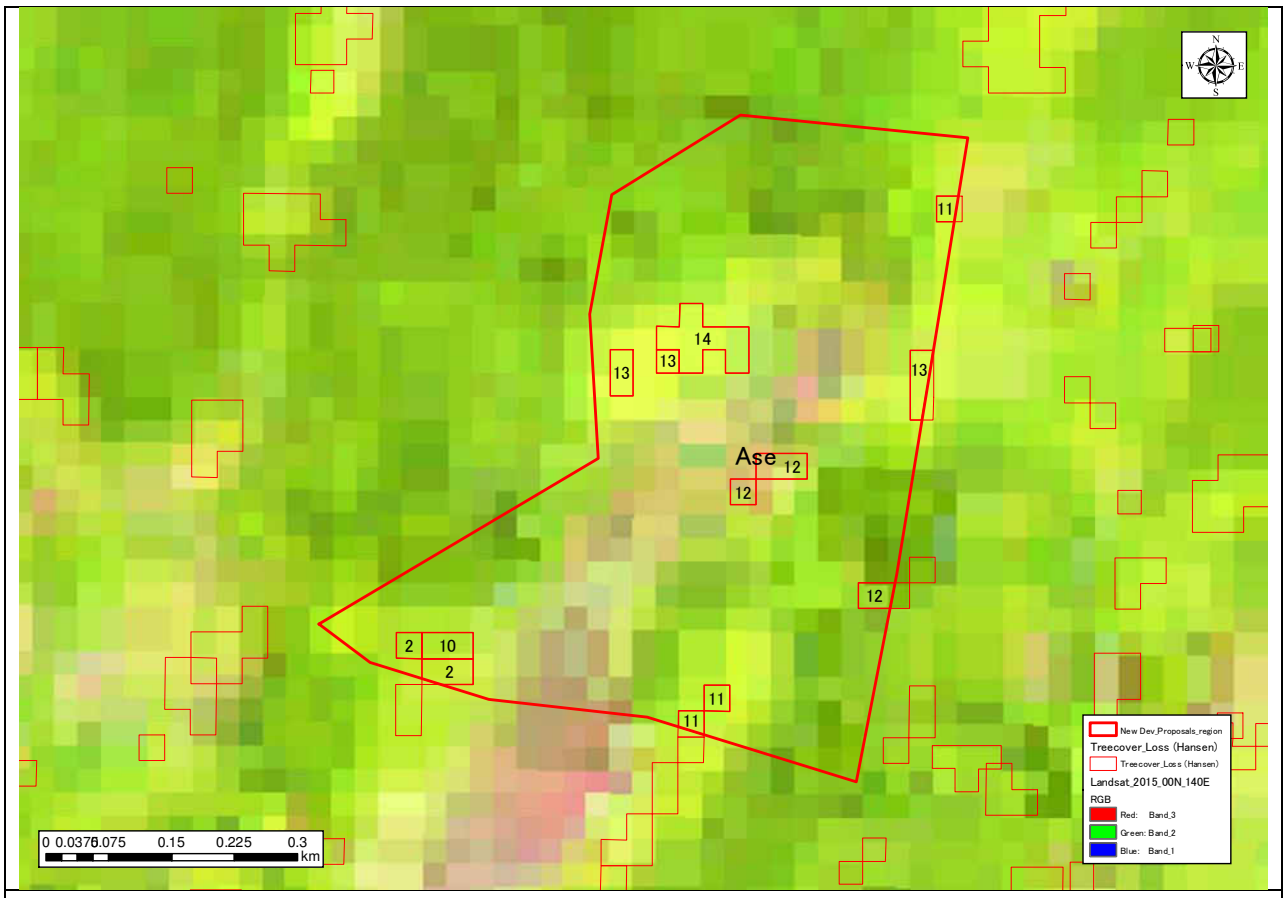
5c. Mohamei: Vege Map with Treecover Loss



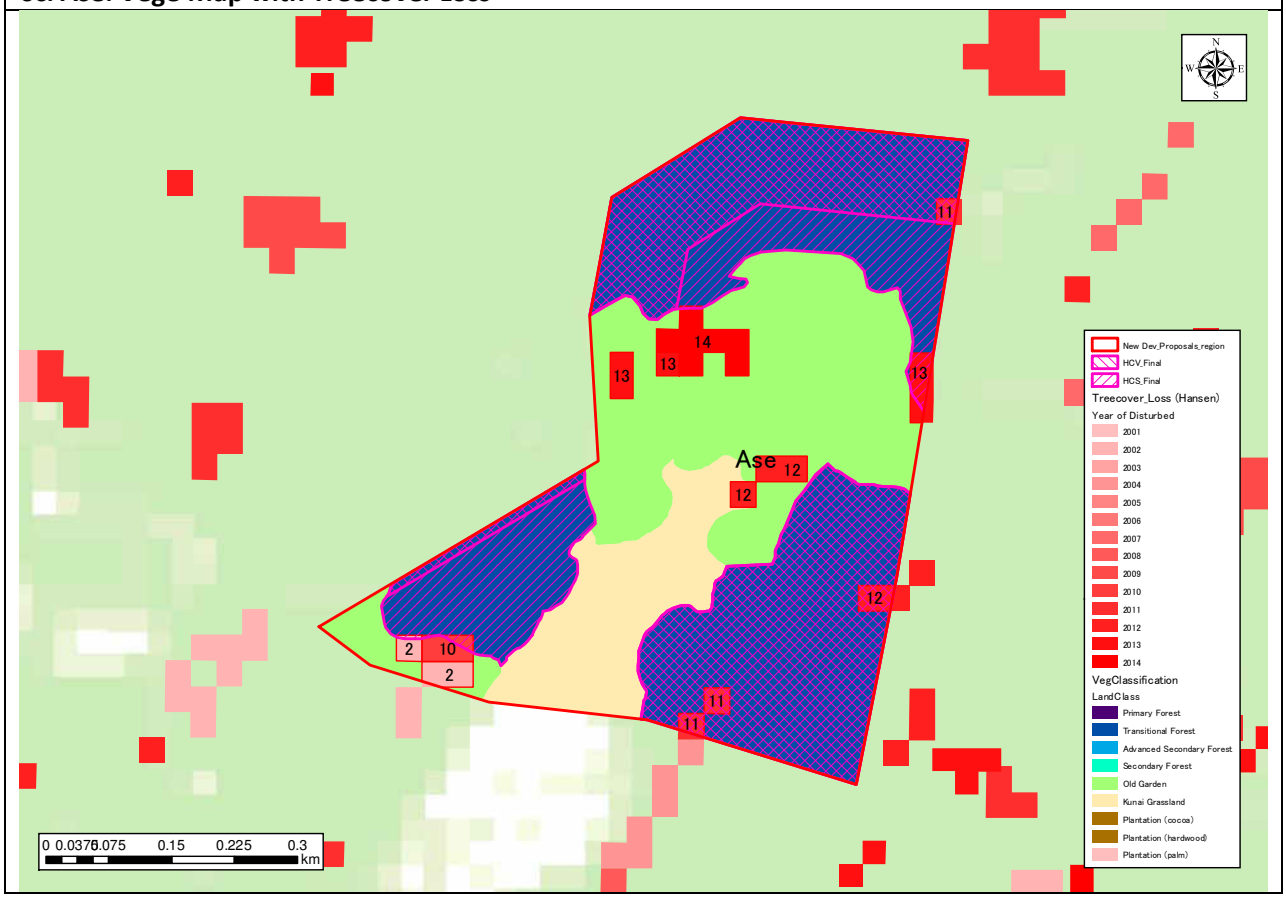
6a. Ase: Landsat 2000 as Baseline Data



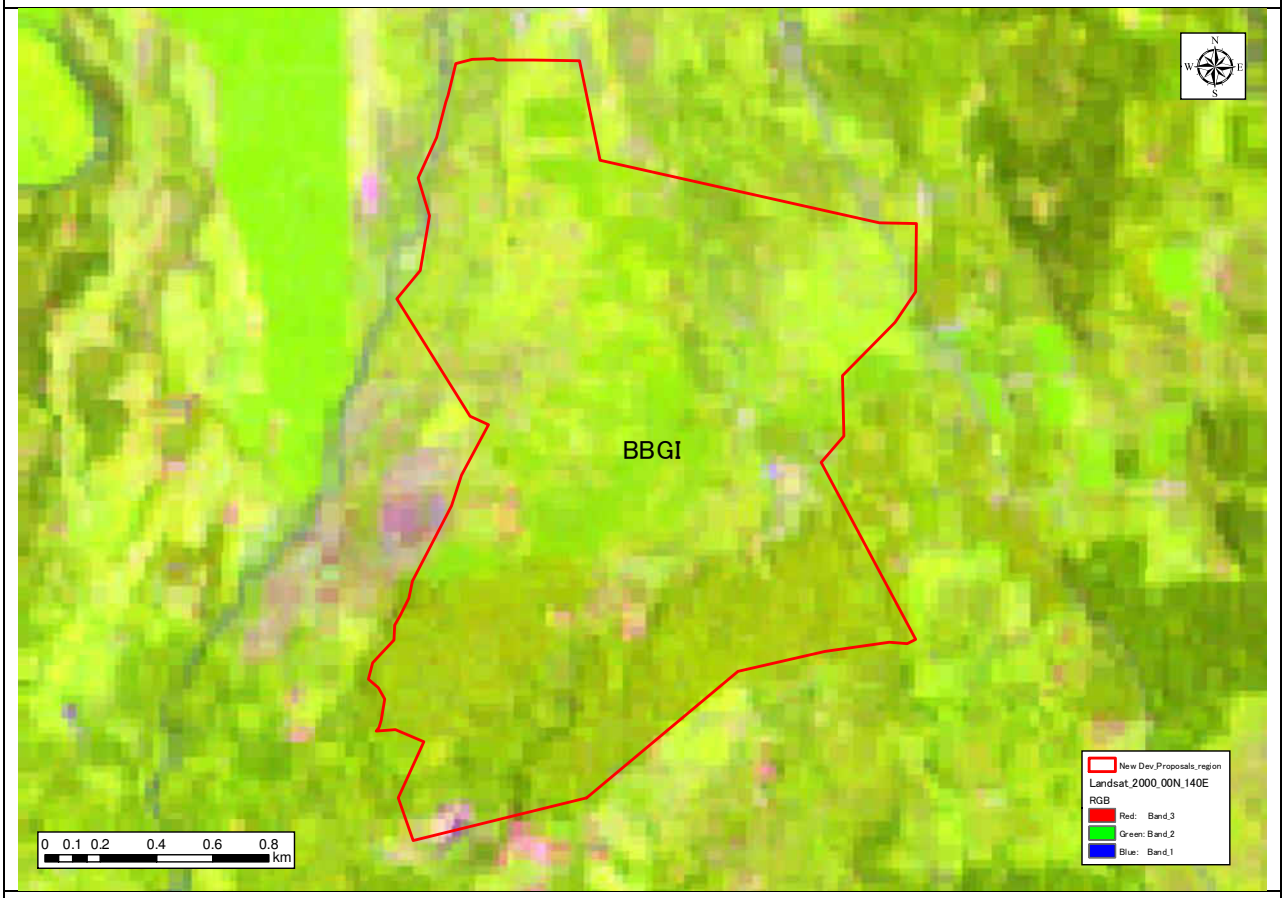
6b. Ase: Landsat 2105 with Treecover Loss



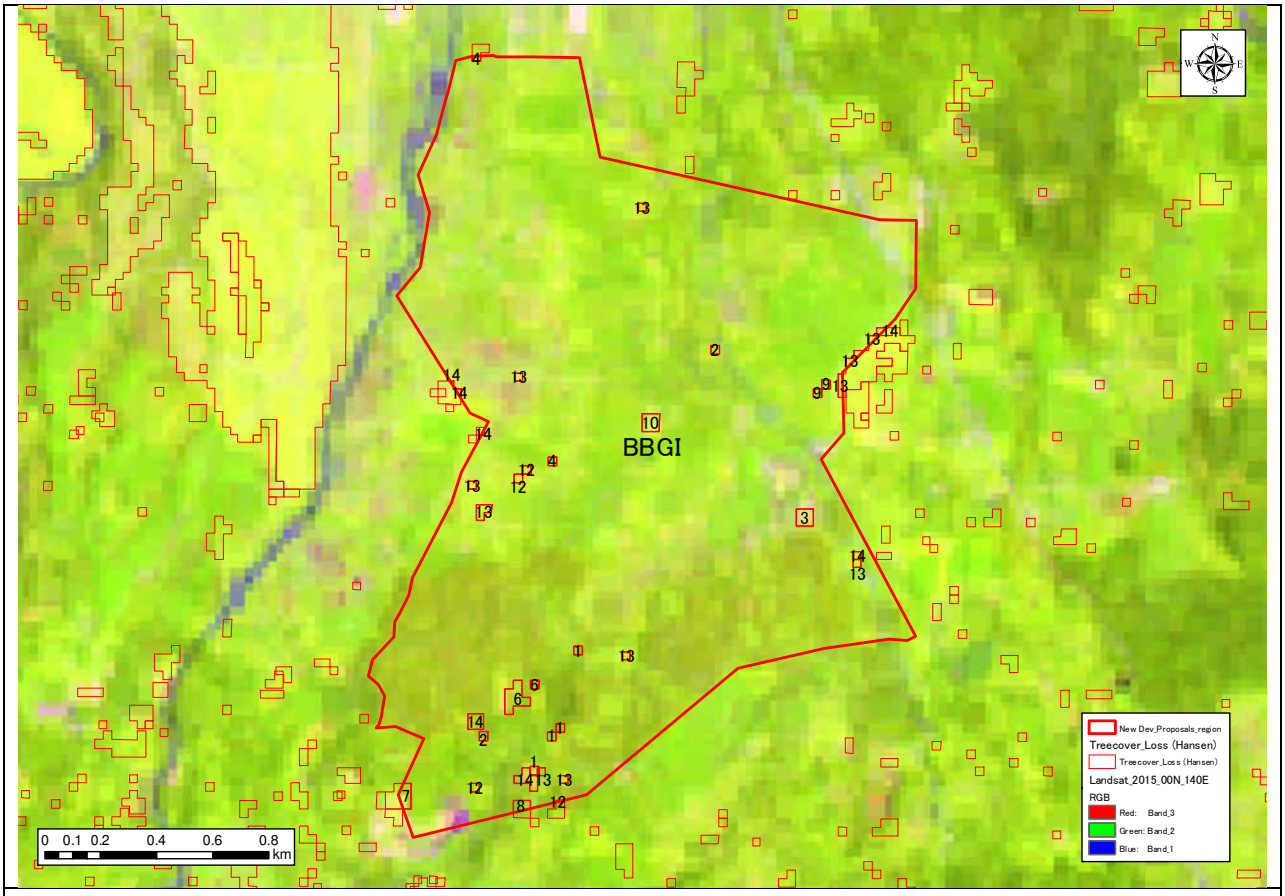
6c. Ase: Vege Map with Treecover Loss



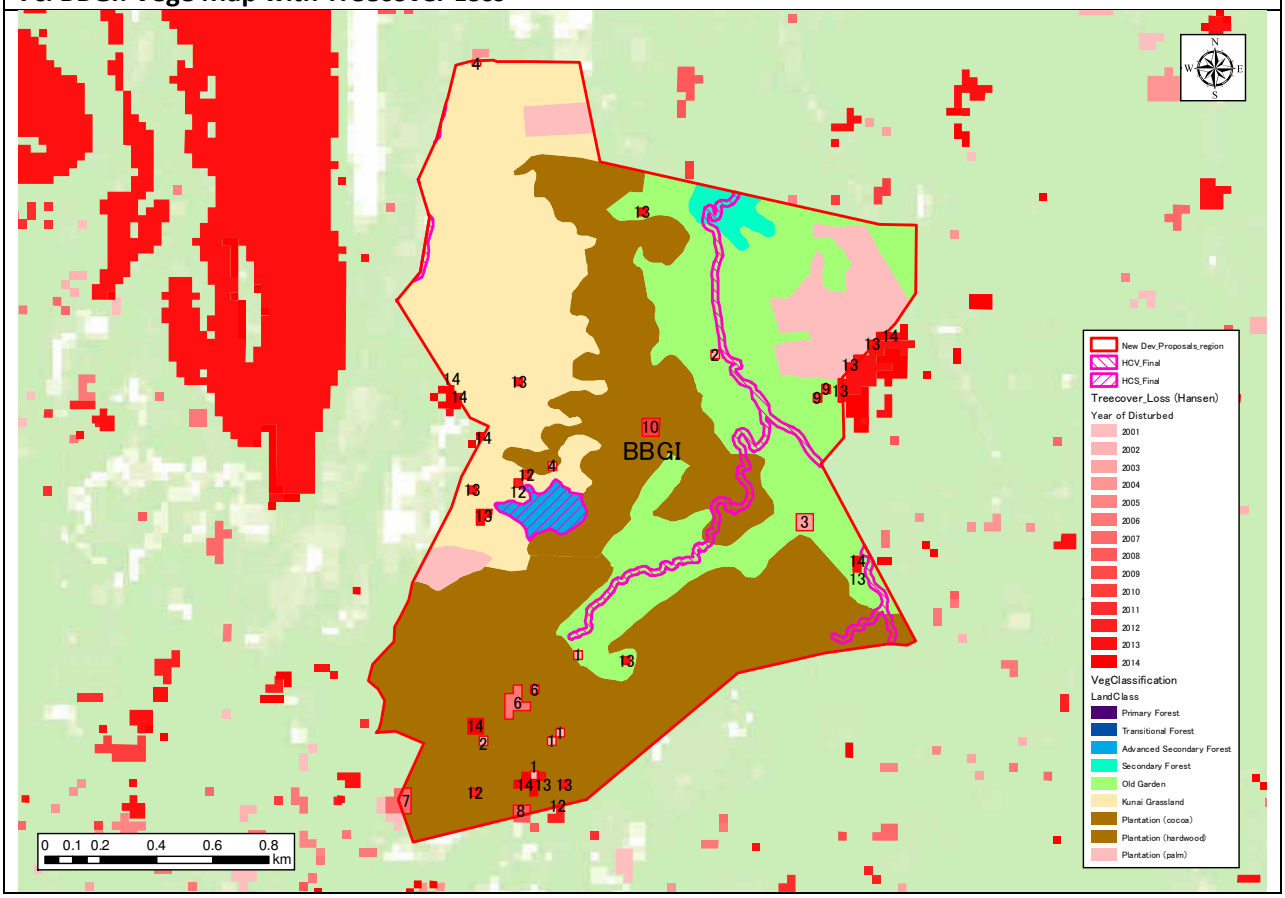
7a. BBGI: Landsat 2000 as Baseline Data



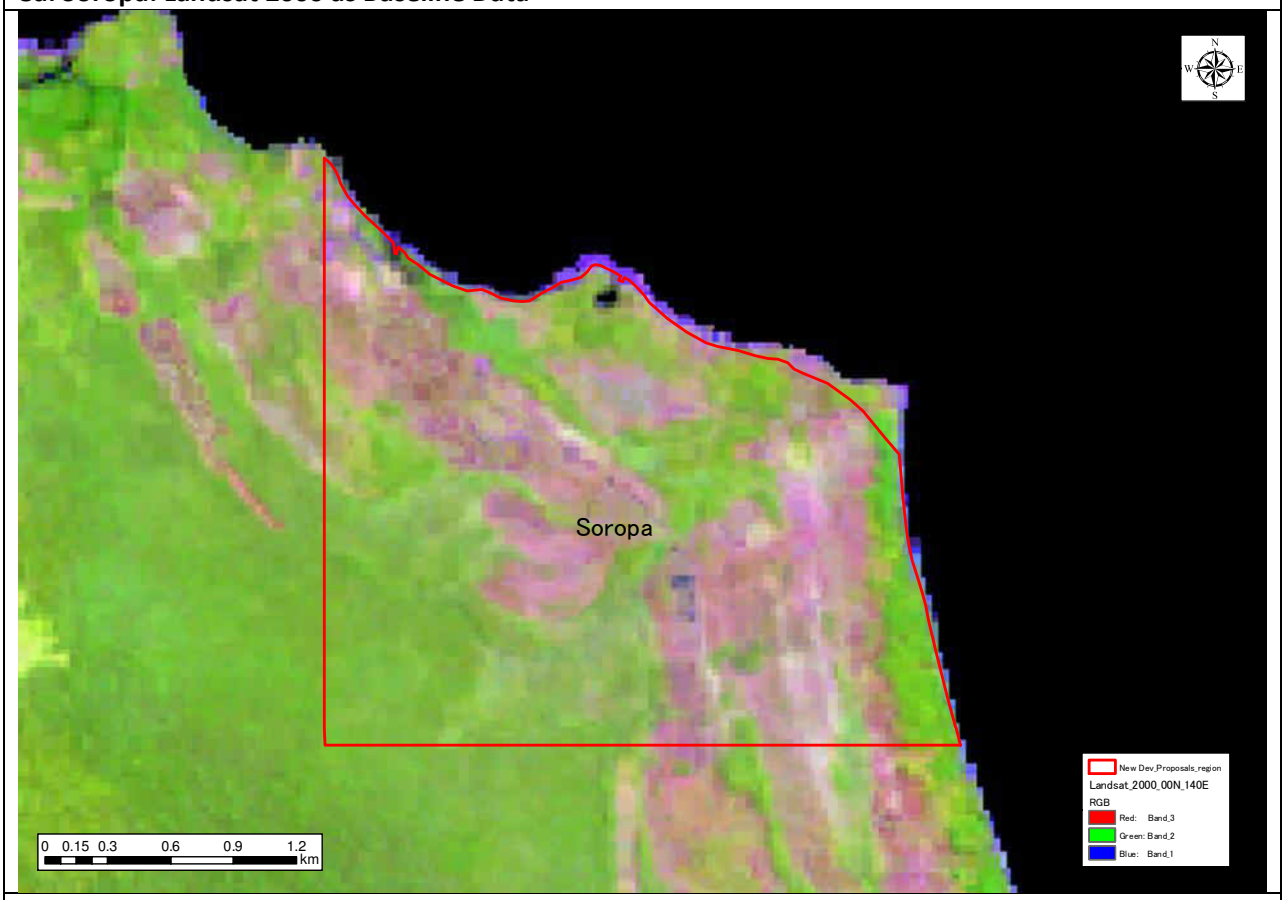
7b. BBGI: Landsat 2015 with Treecover Loss



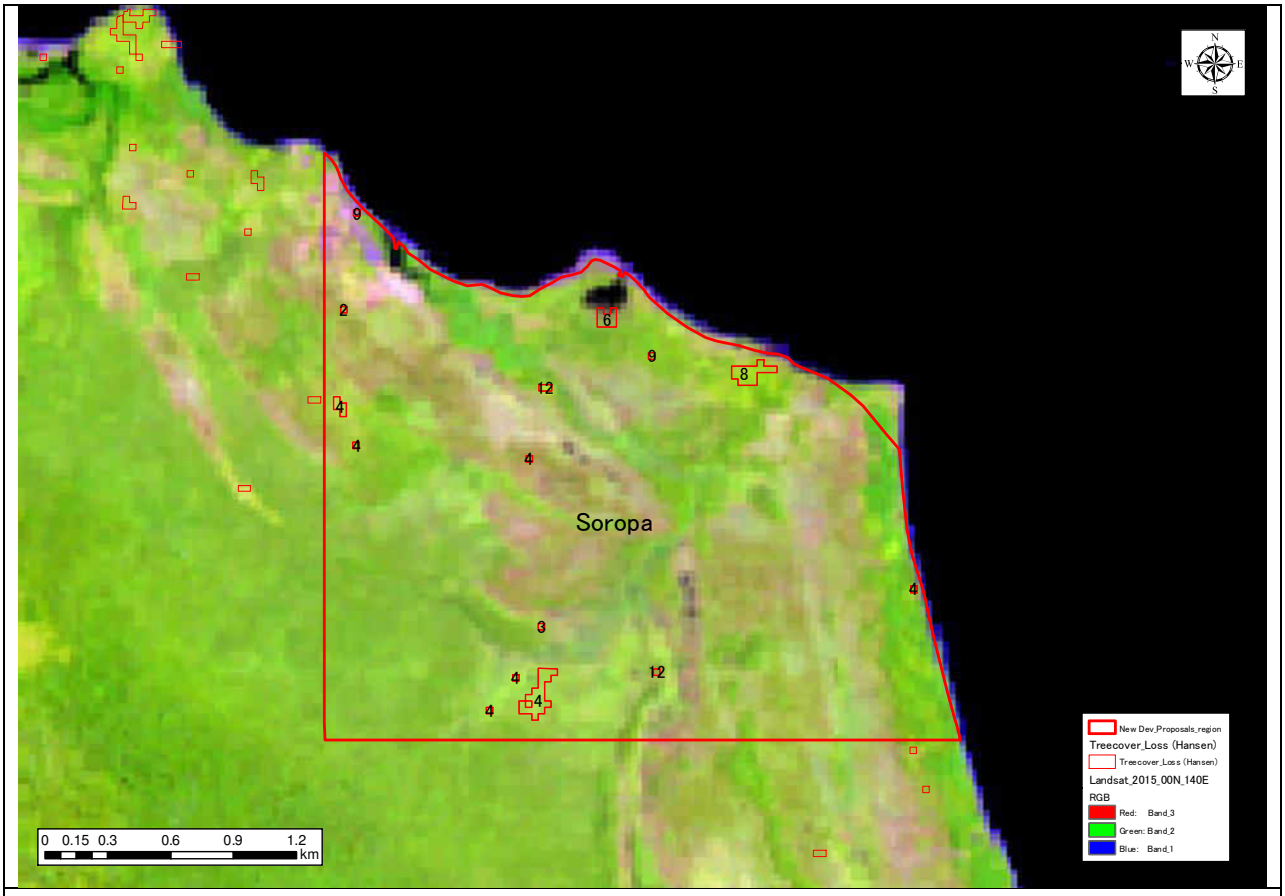
7c. BBGI: Vege Map with Treecover Loss



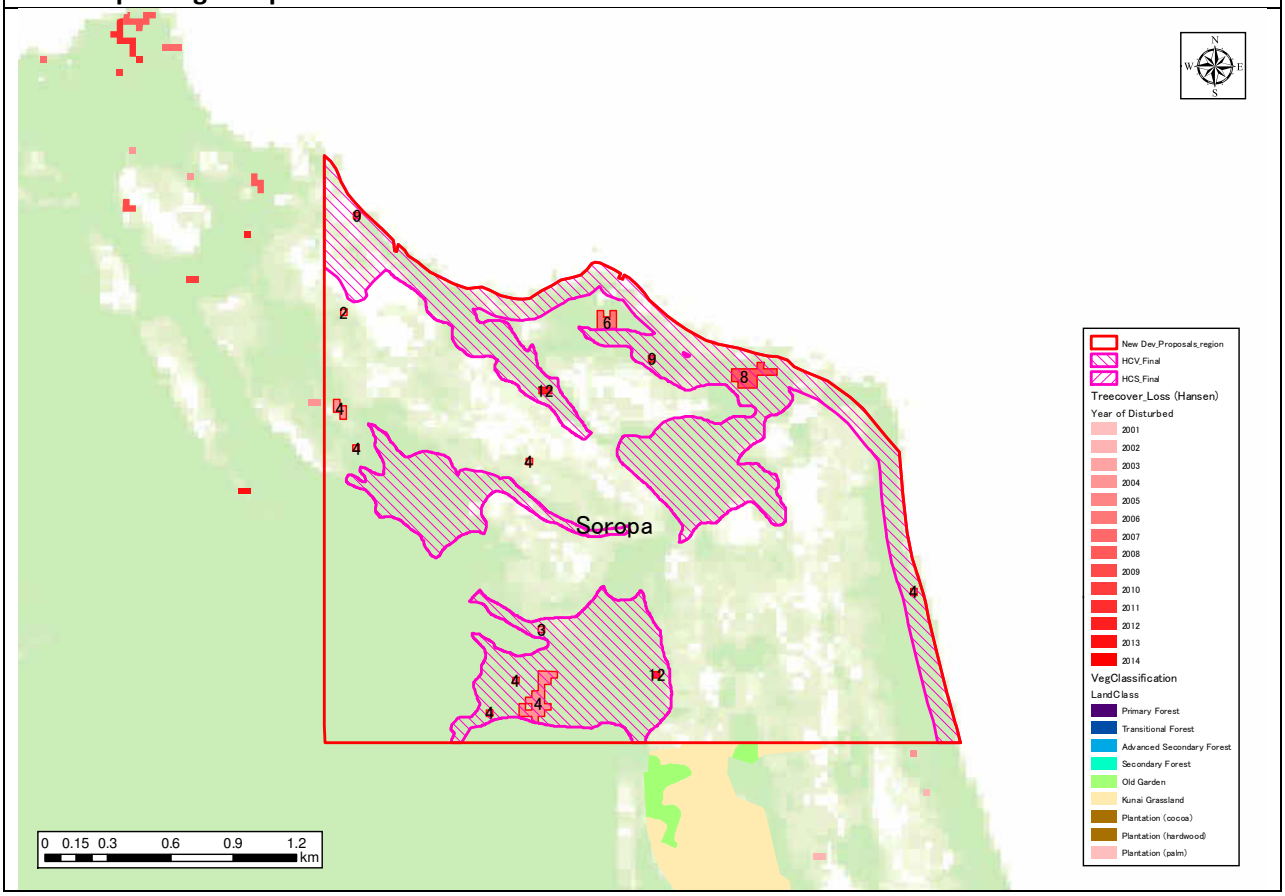
8a. Soropa: Landsat 2000 as Baseline Data



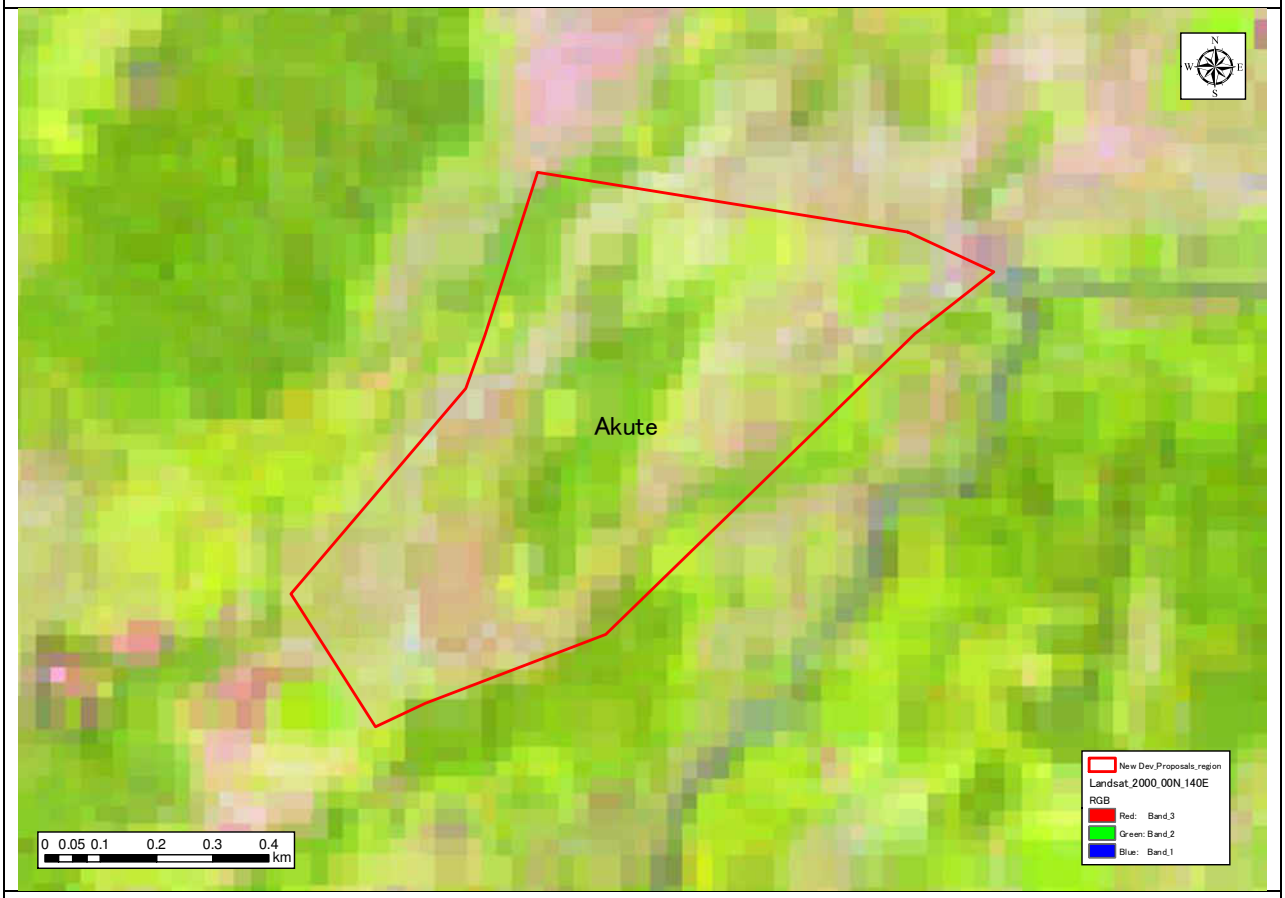
8b. Soropa: Landsat 2015 with Treecover Loss



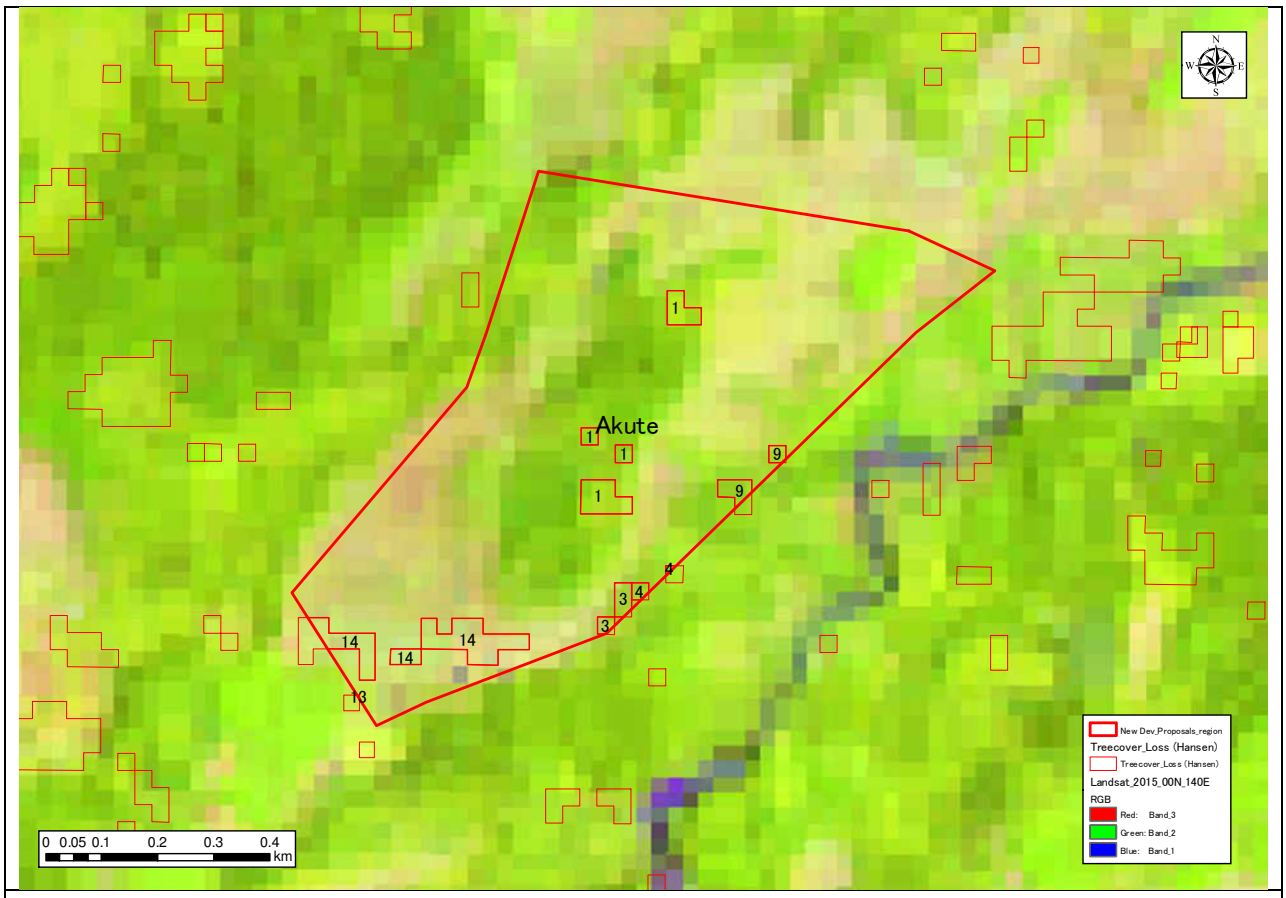
8c. Soropa: Vege Map with Treecover Loss



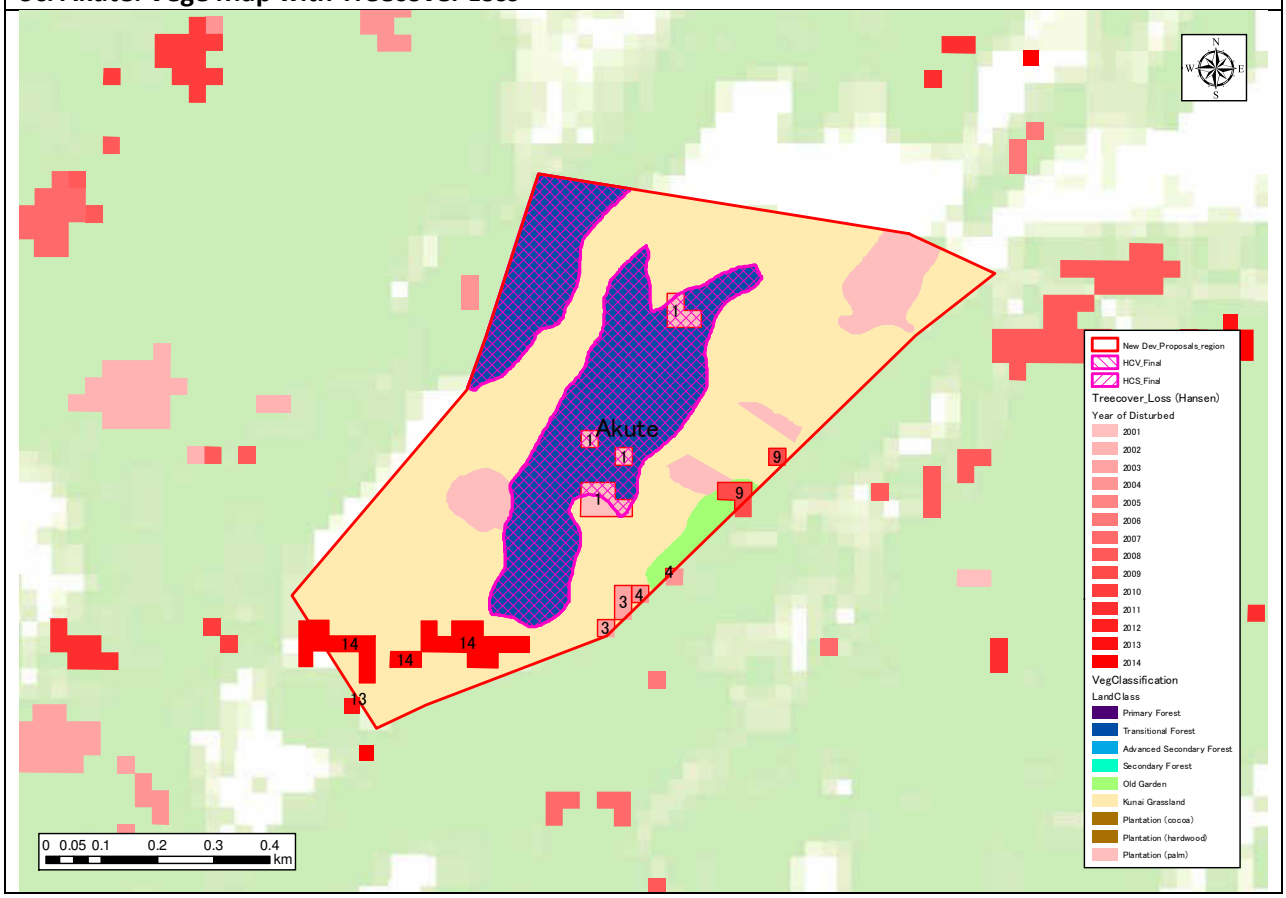
9a. Akute: Landsat 2000 as Baseline Data



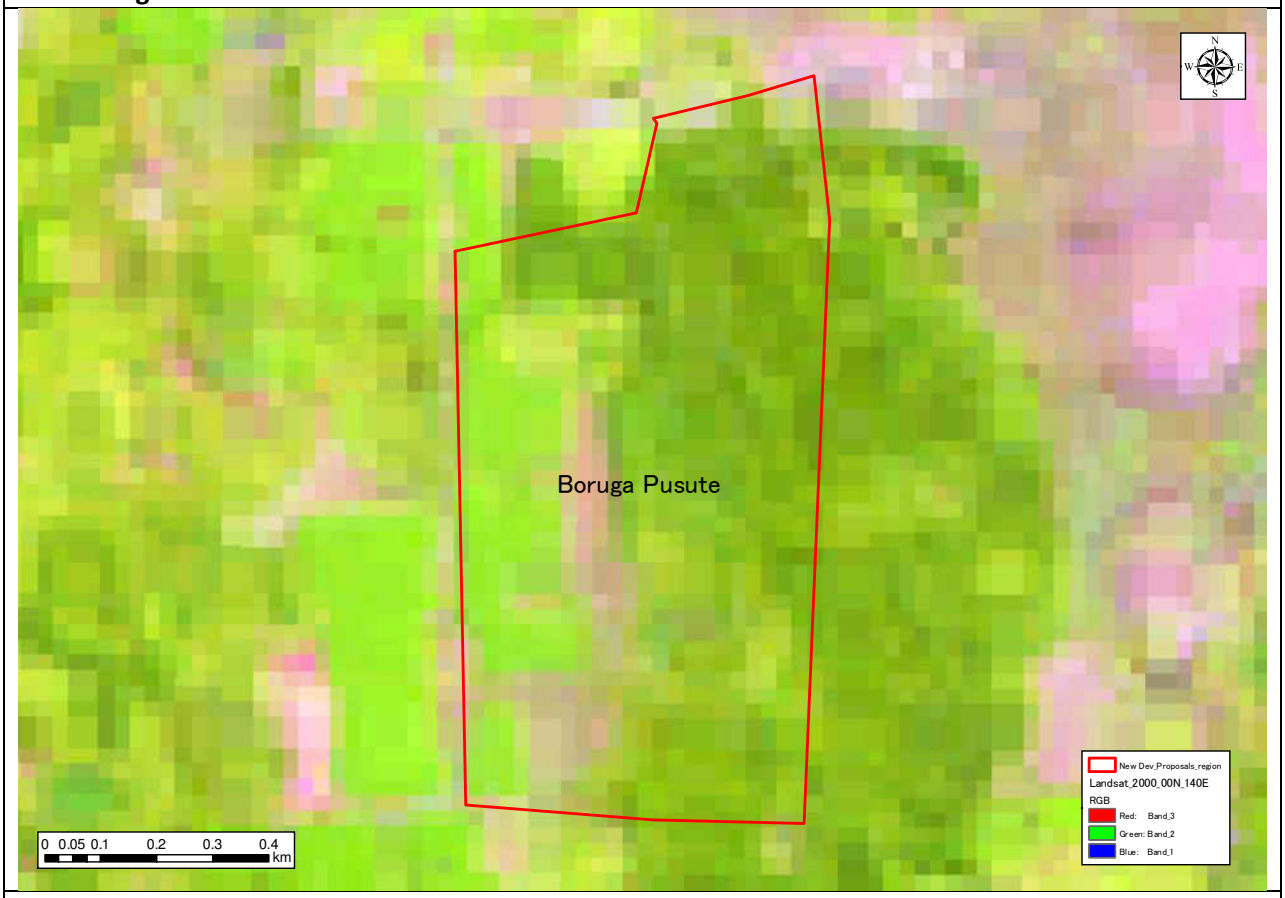
9b. Akute: Landsat 2015 with Treecover Loss



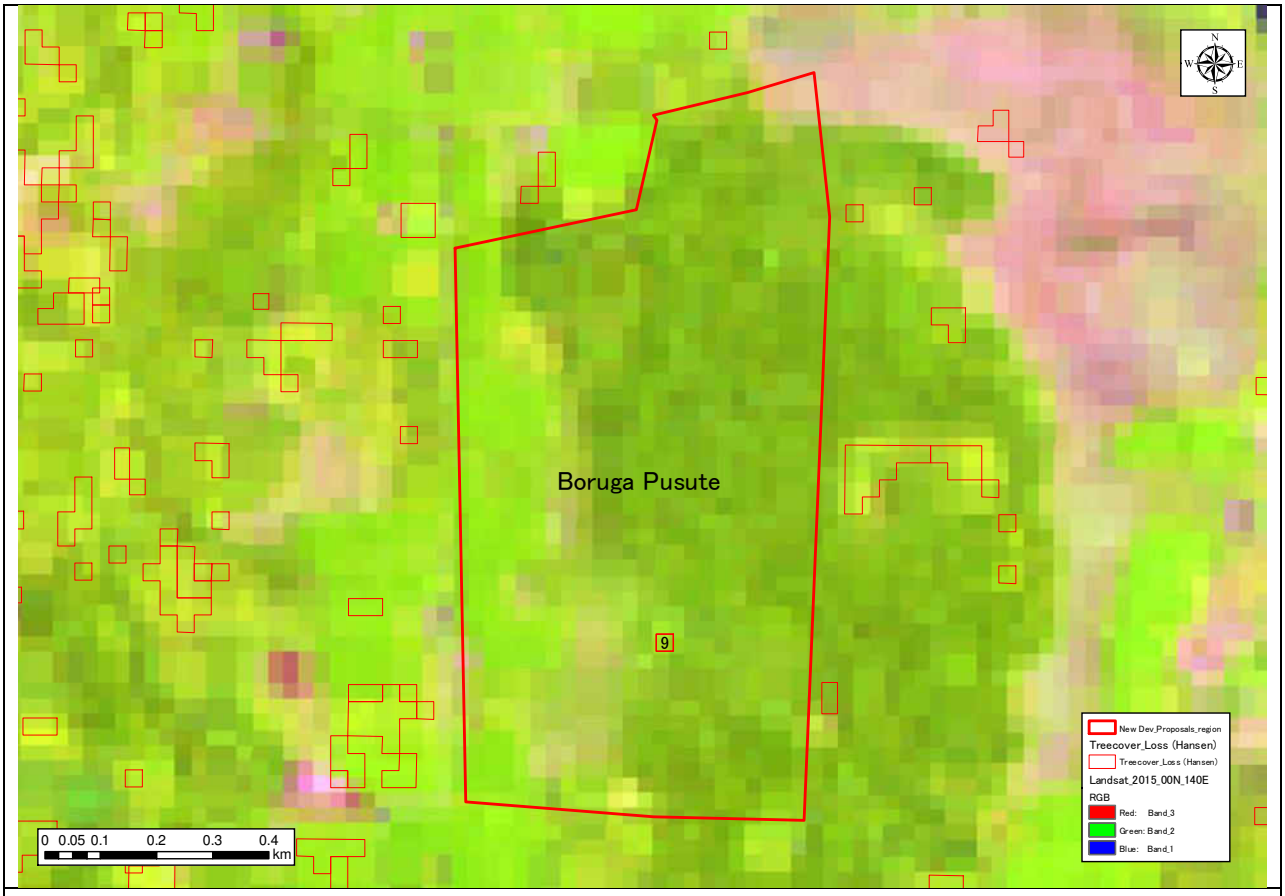
9c. Akute: Vege Map with Treecover Loss



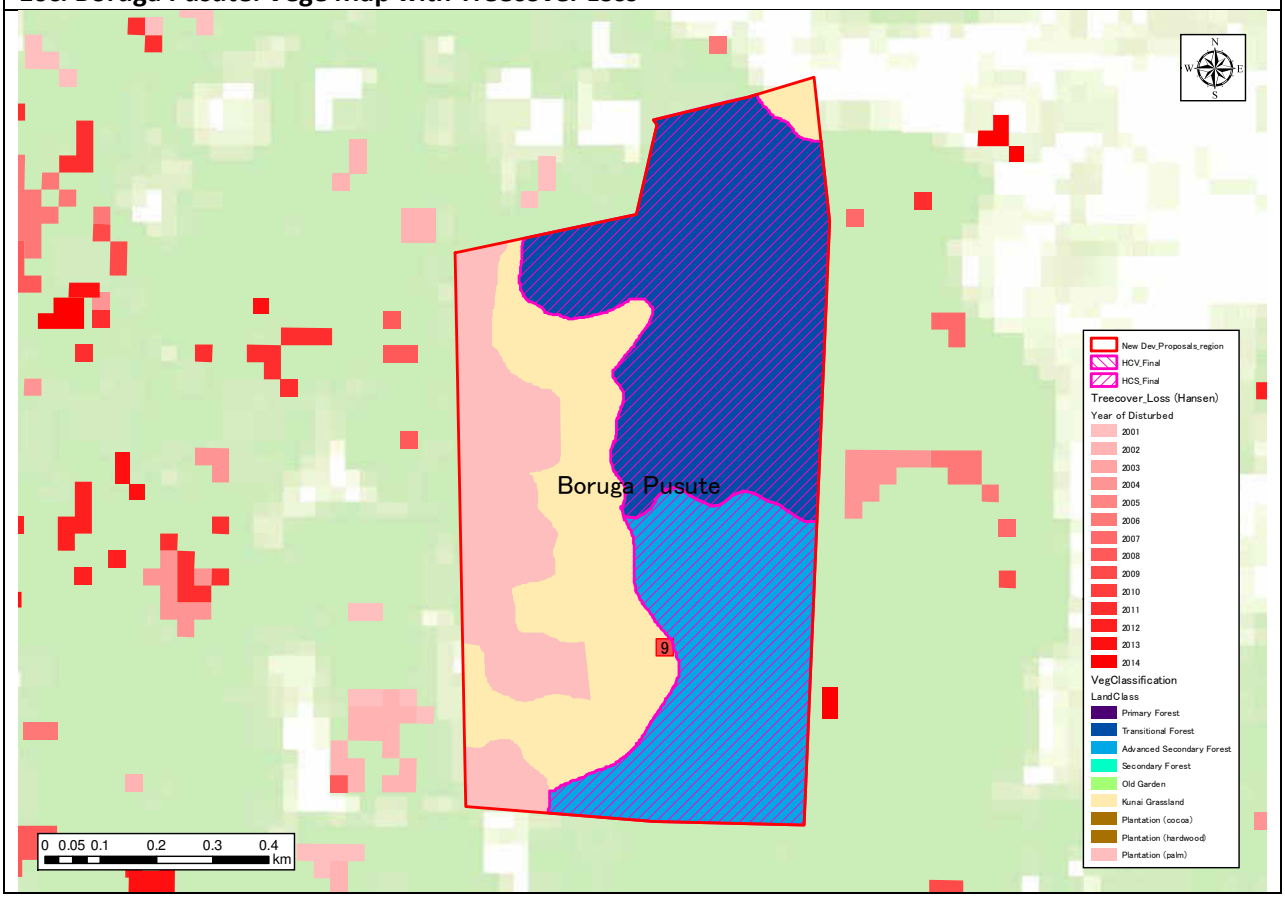
10a. Boruga Pusute: Landsat 2000 as Baseline Data



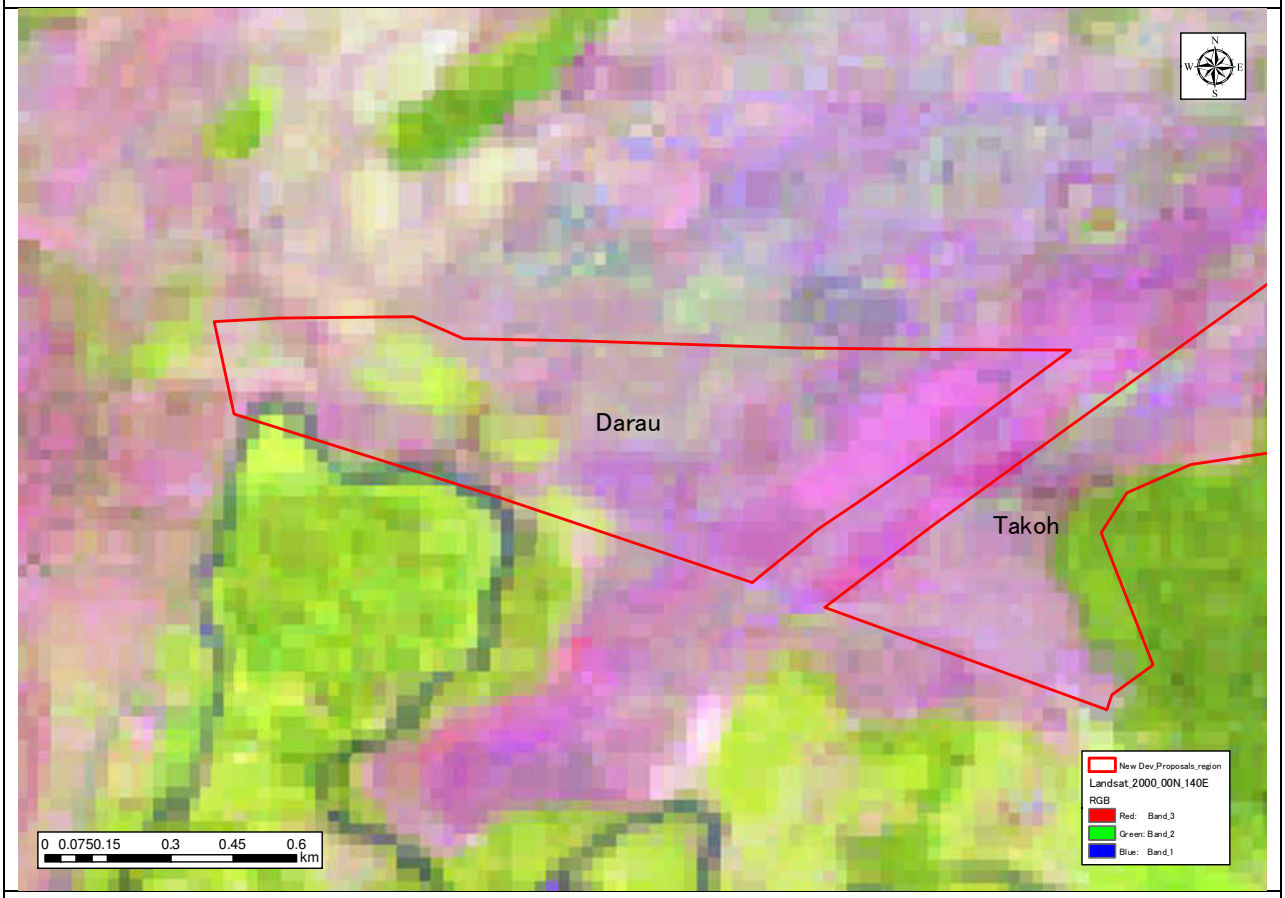
10b. Boruga Pusute: Landsat 2015 with Tree Cover Loss



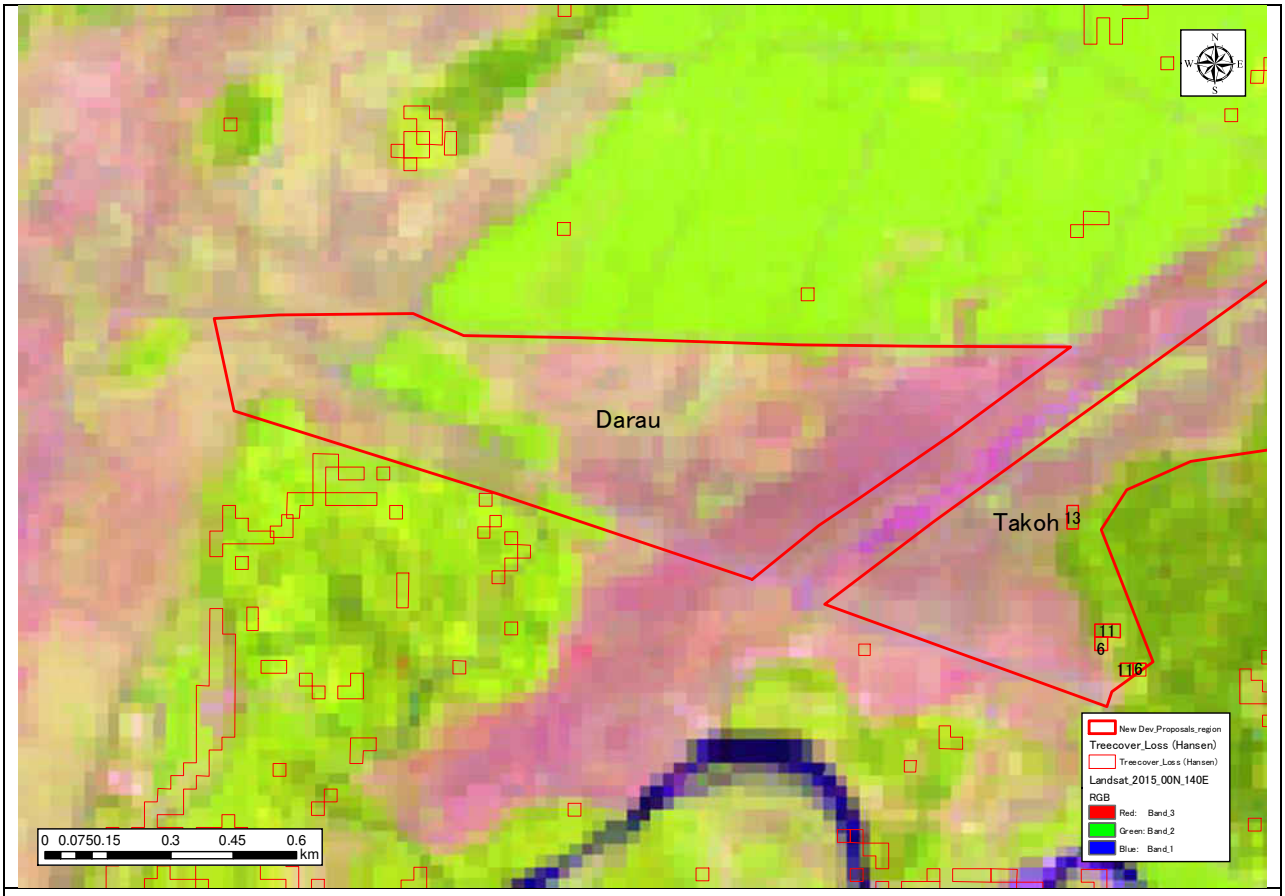
10c. Boruga Pusute: Vege Map with Treecover Loss



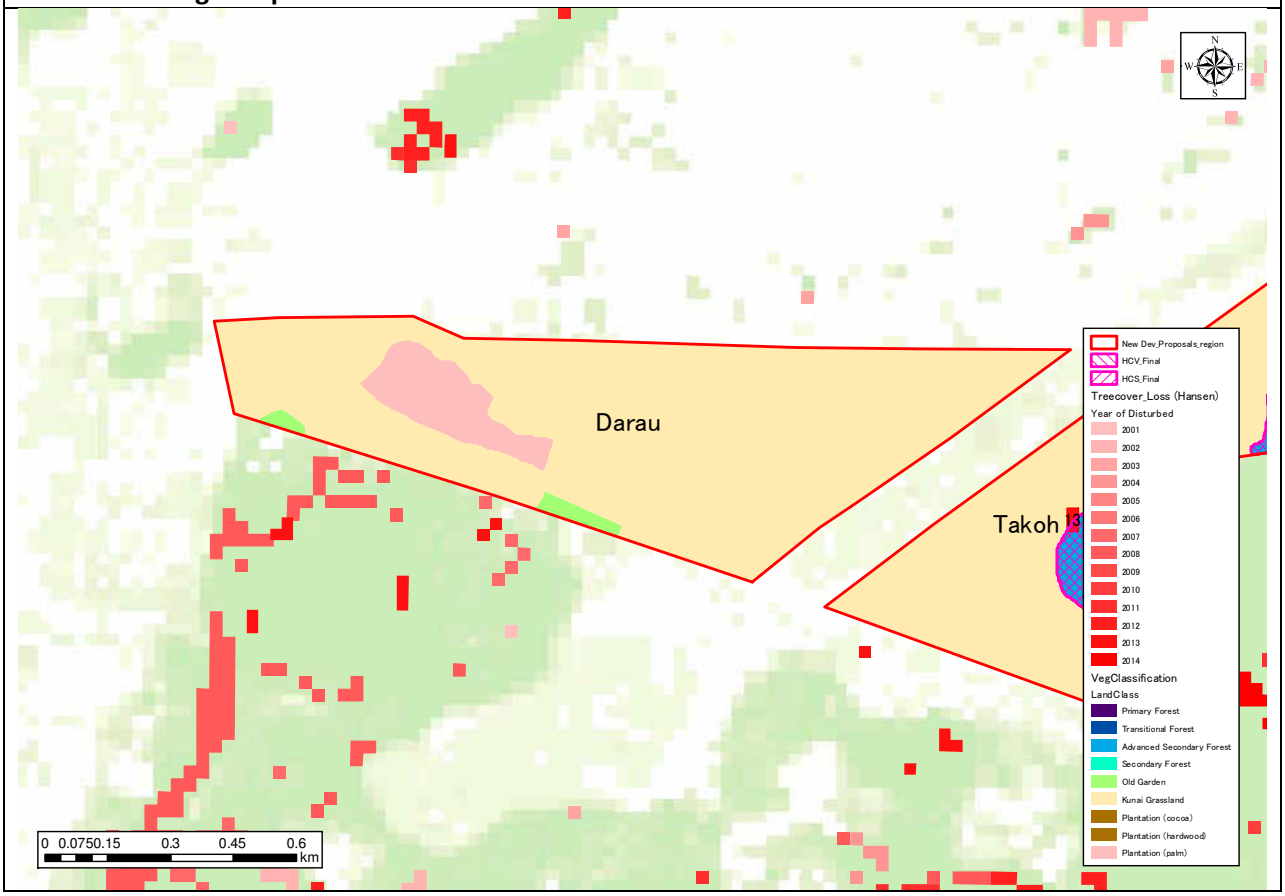
11a. Darau: Landsat 2000 as Baseline Data



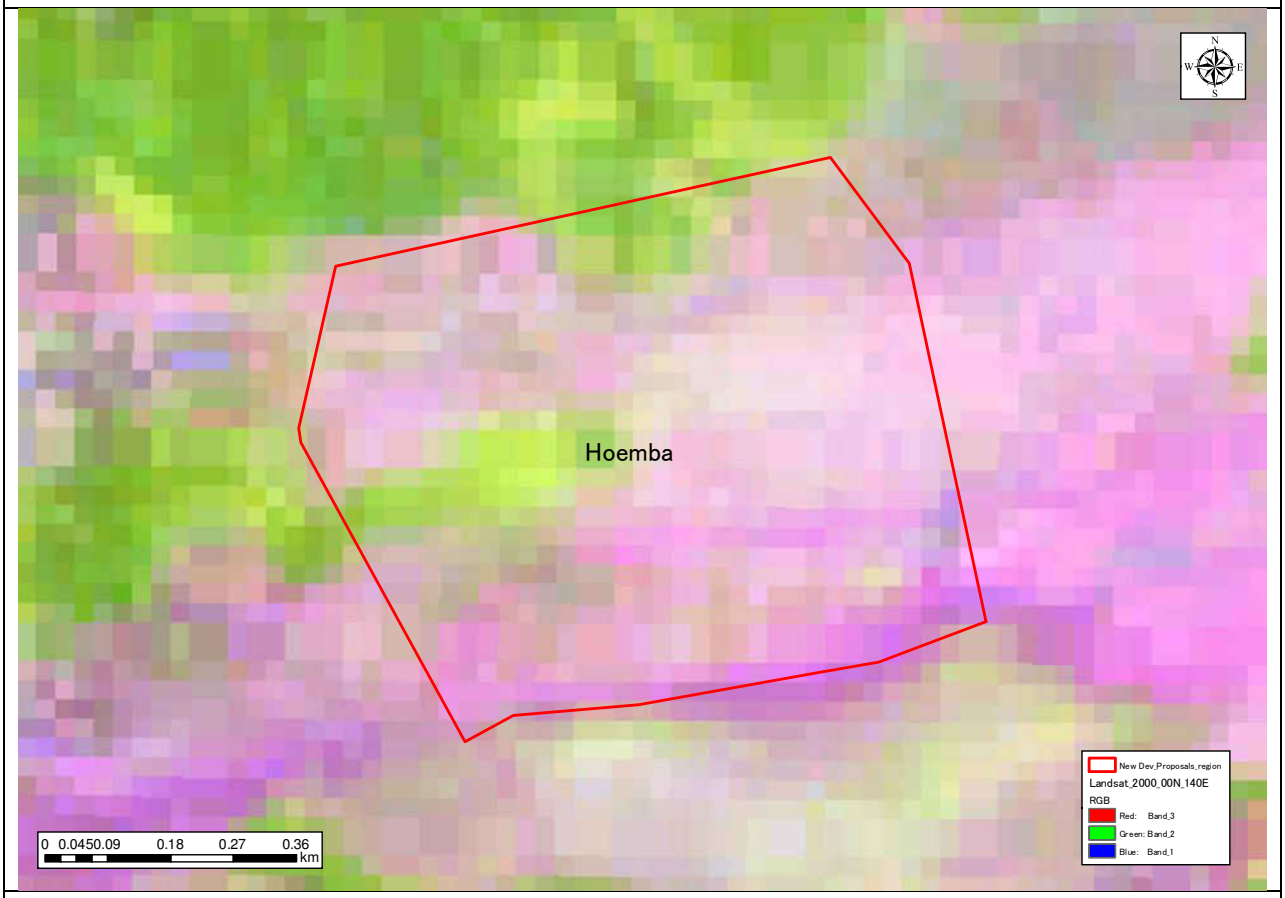
11b. Darau: Landsat 2015 with Treecover Loss



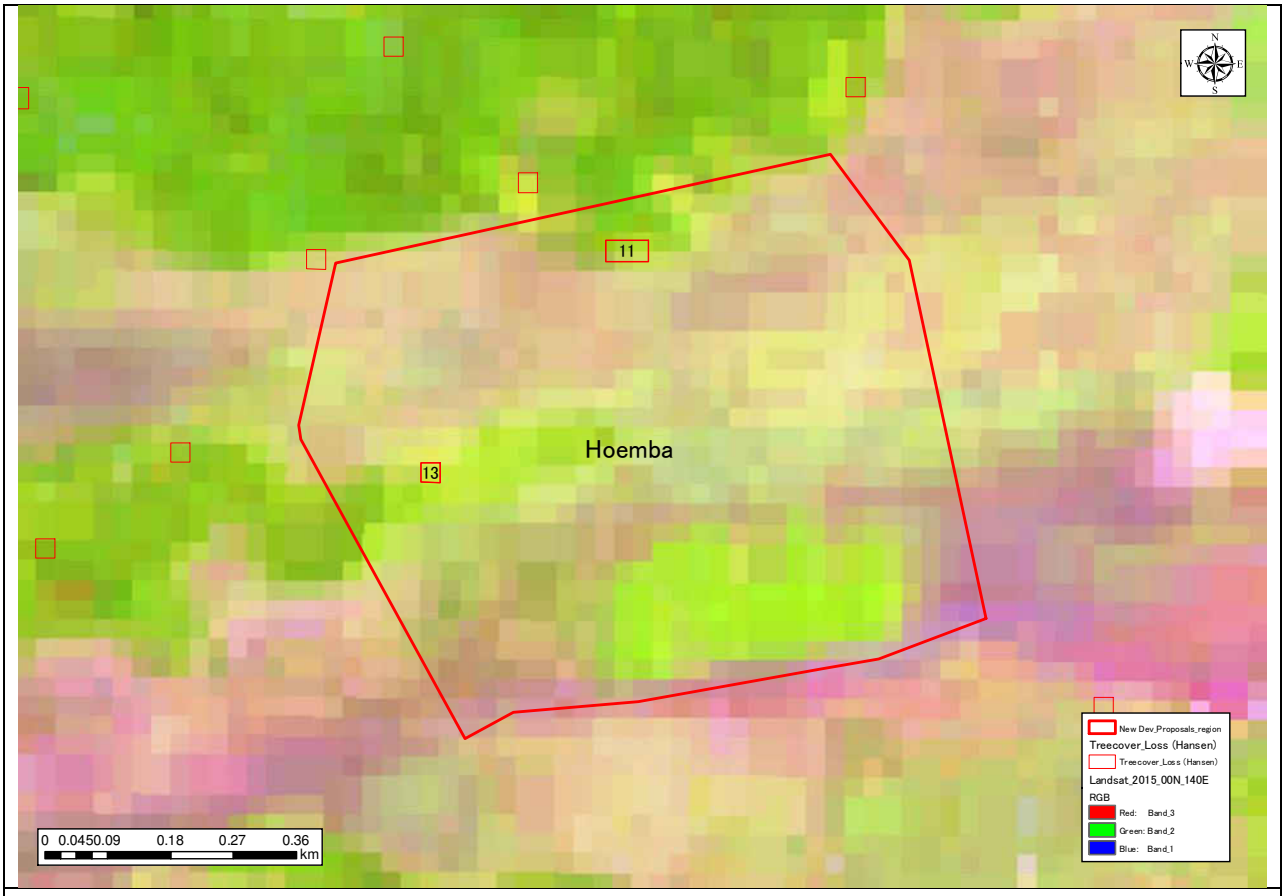
11c. Darau: Vege Map with Treecover Loss



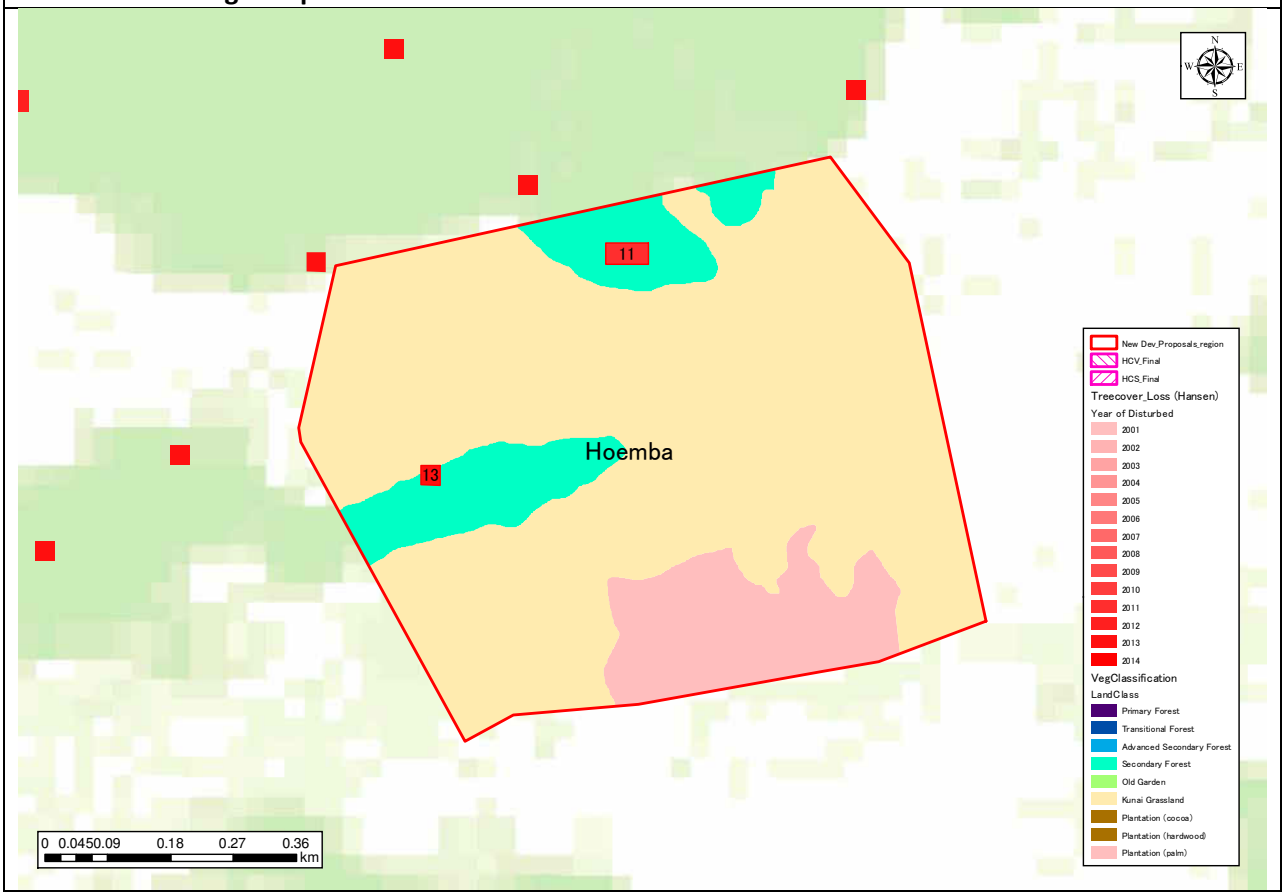
12a. Hoemba: Landsat 2000 as Baseline Data



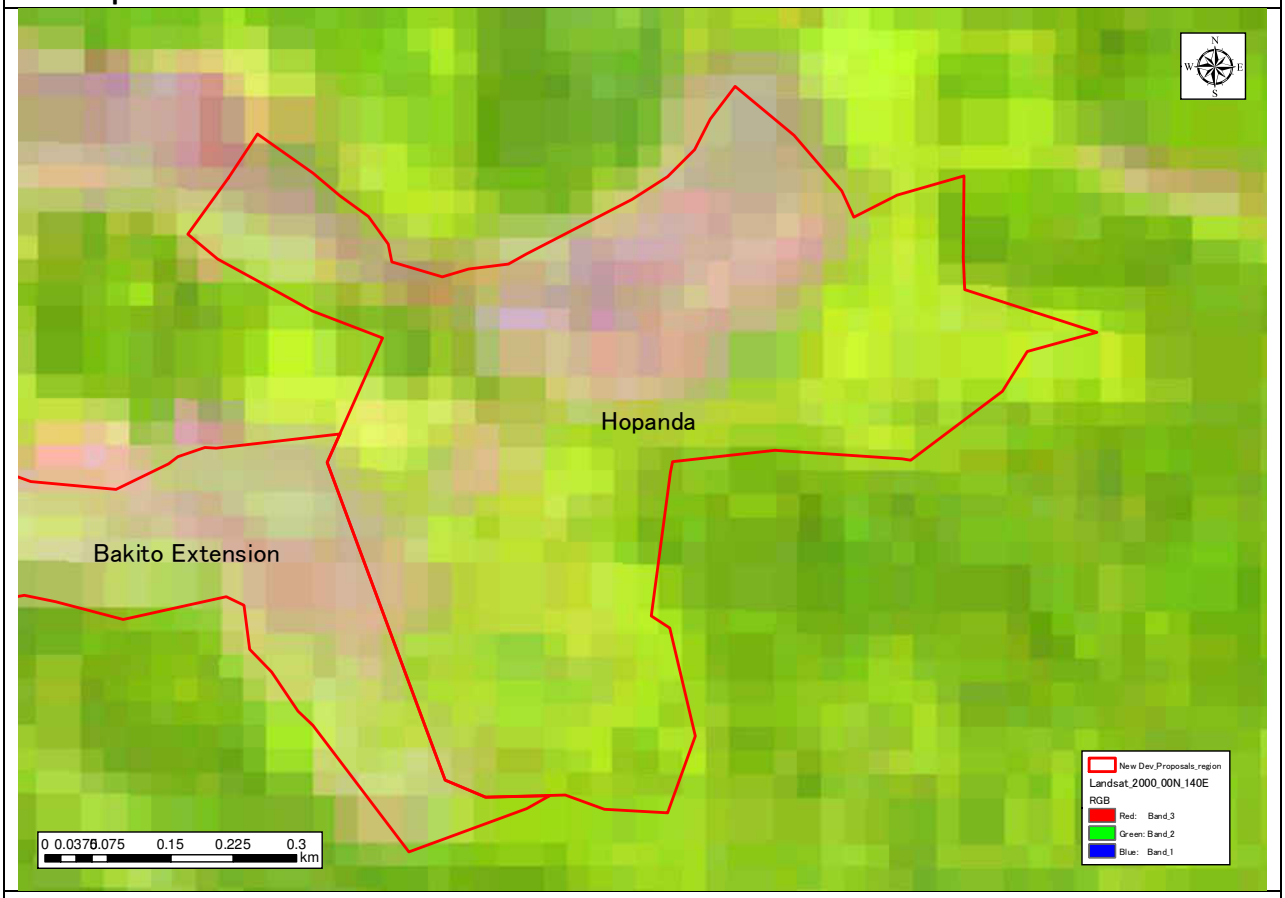
12b. Hoemba: Landsat 2015 with Treecover Loss



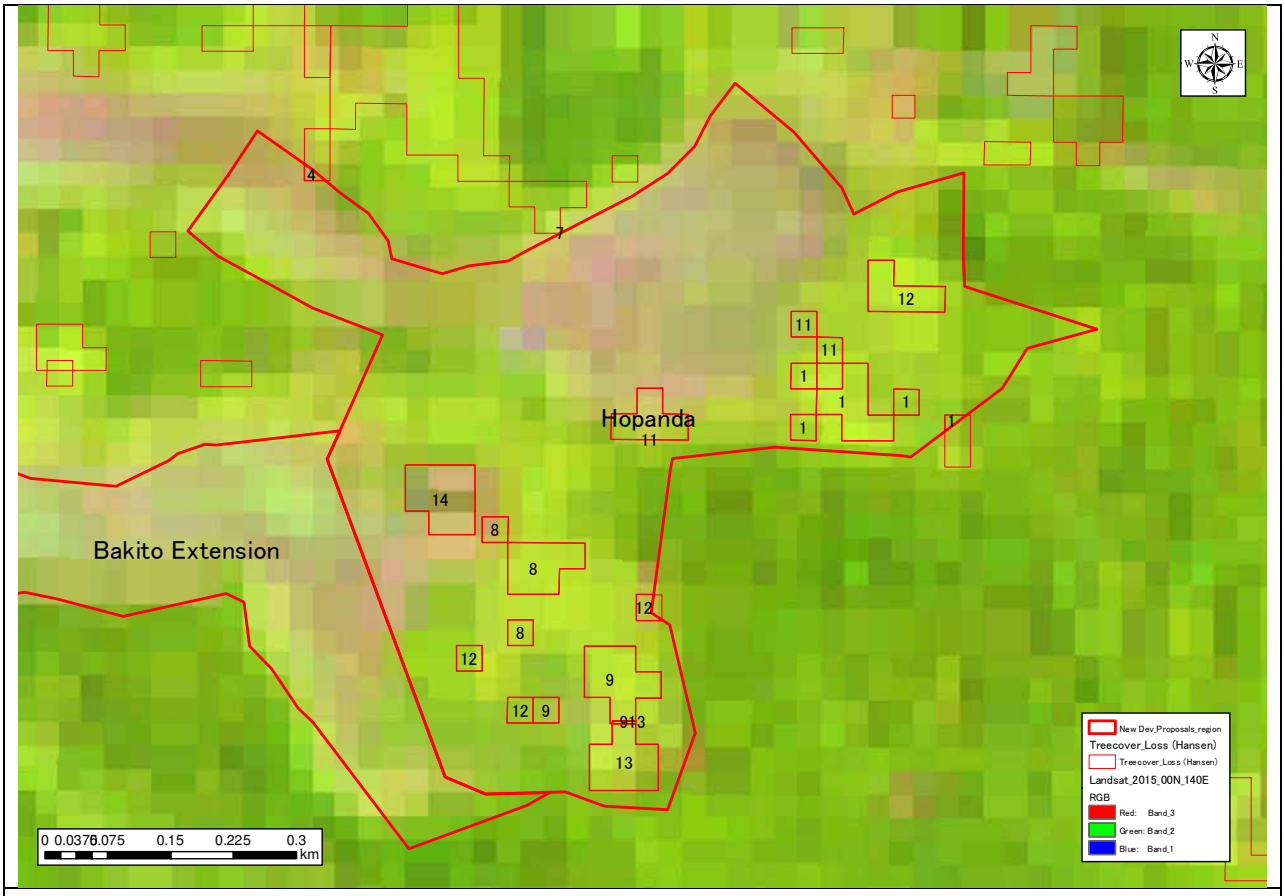
12c. Hoemba: Vege Map with Treecover Loss



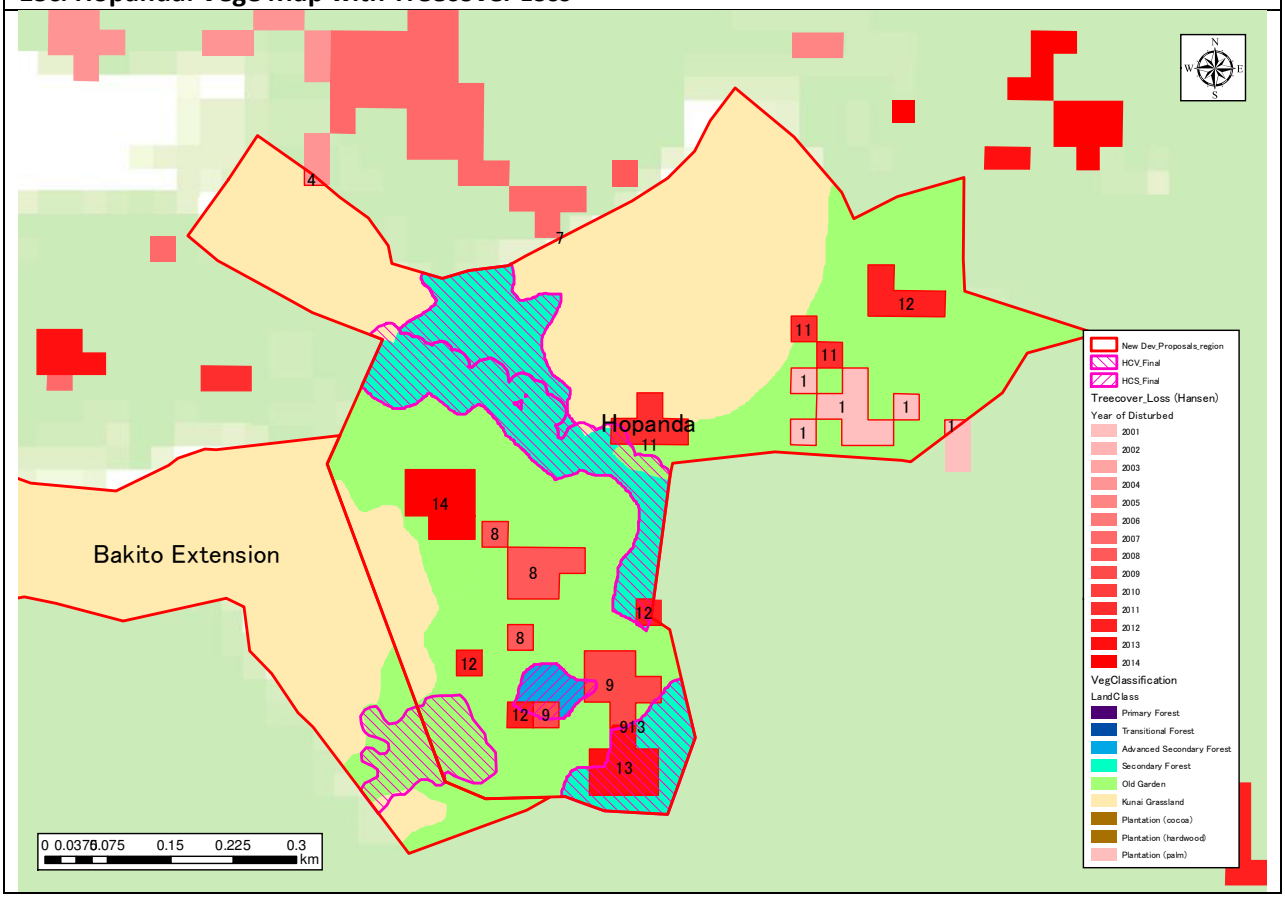
13a. Hopanda: Landsat 2000 as Baseline Data



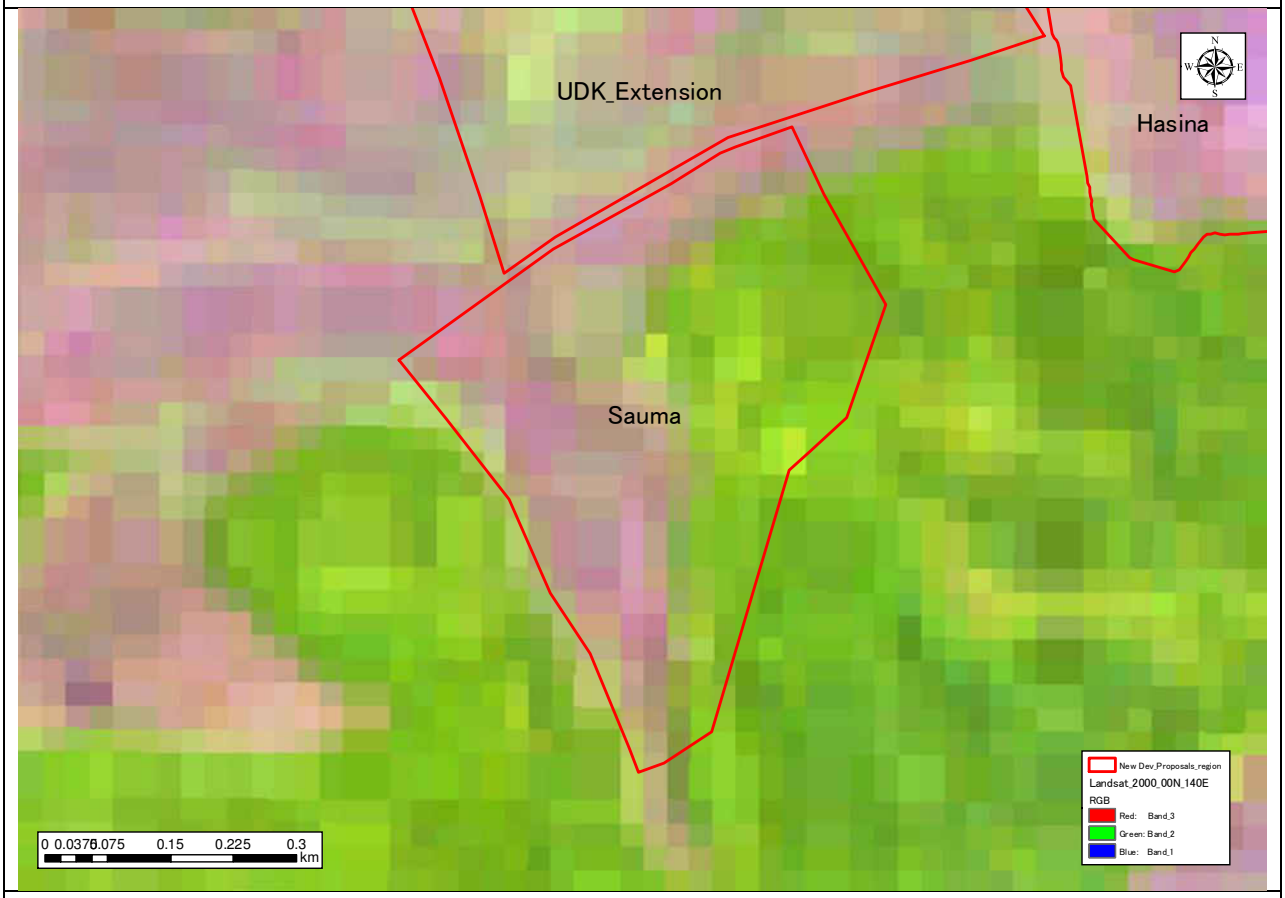
13b. Hopanda: Landsat 2000 with Treecover Loss



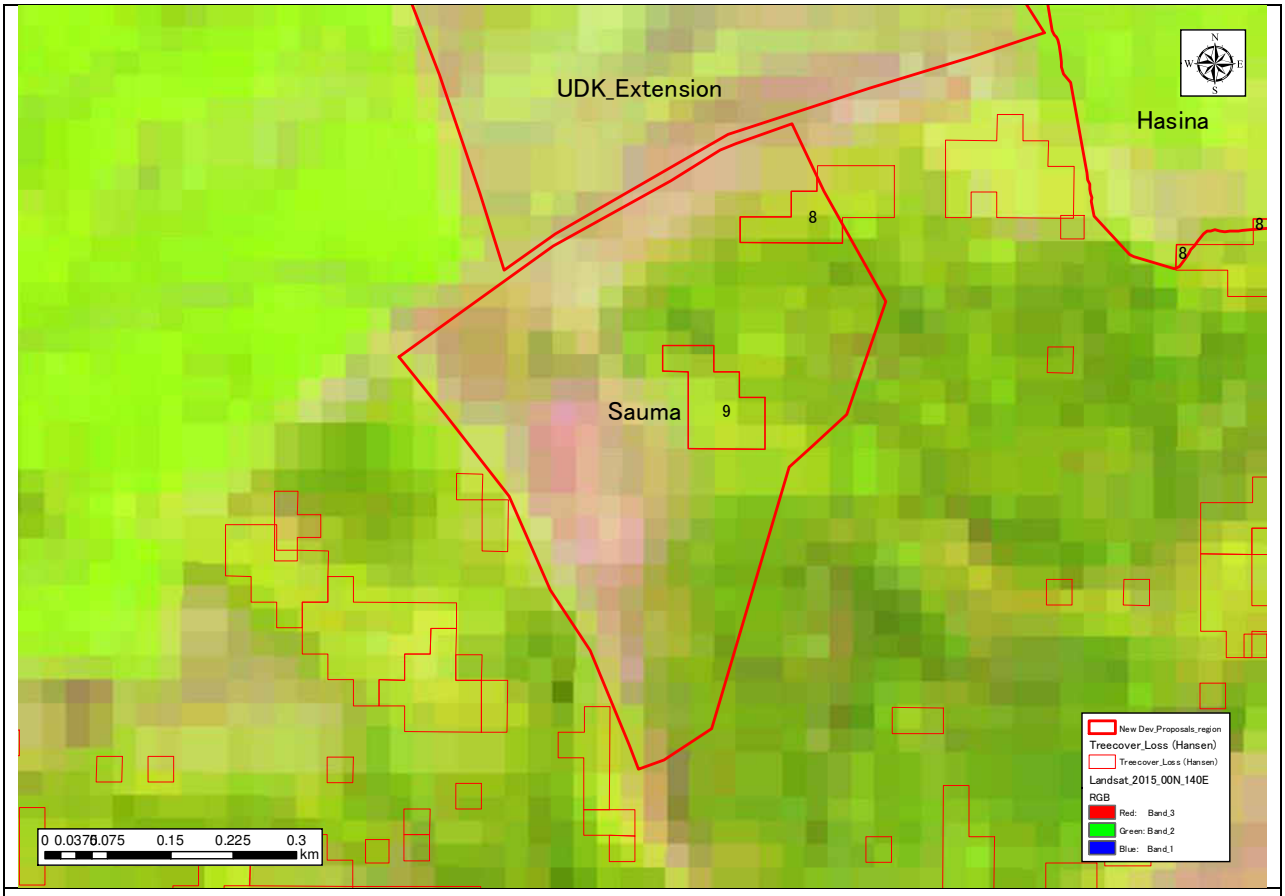
13c. Hopanda: Vege Map with Treecover Loss



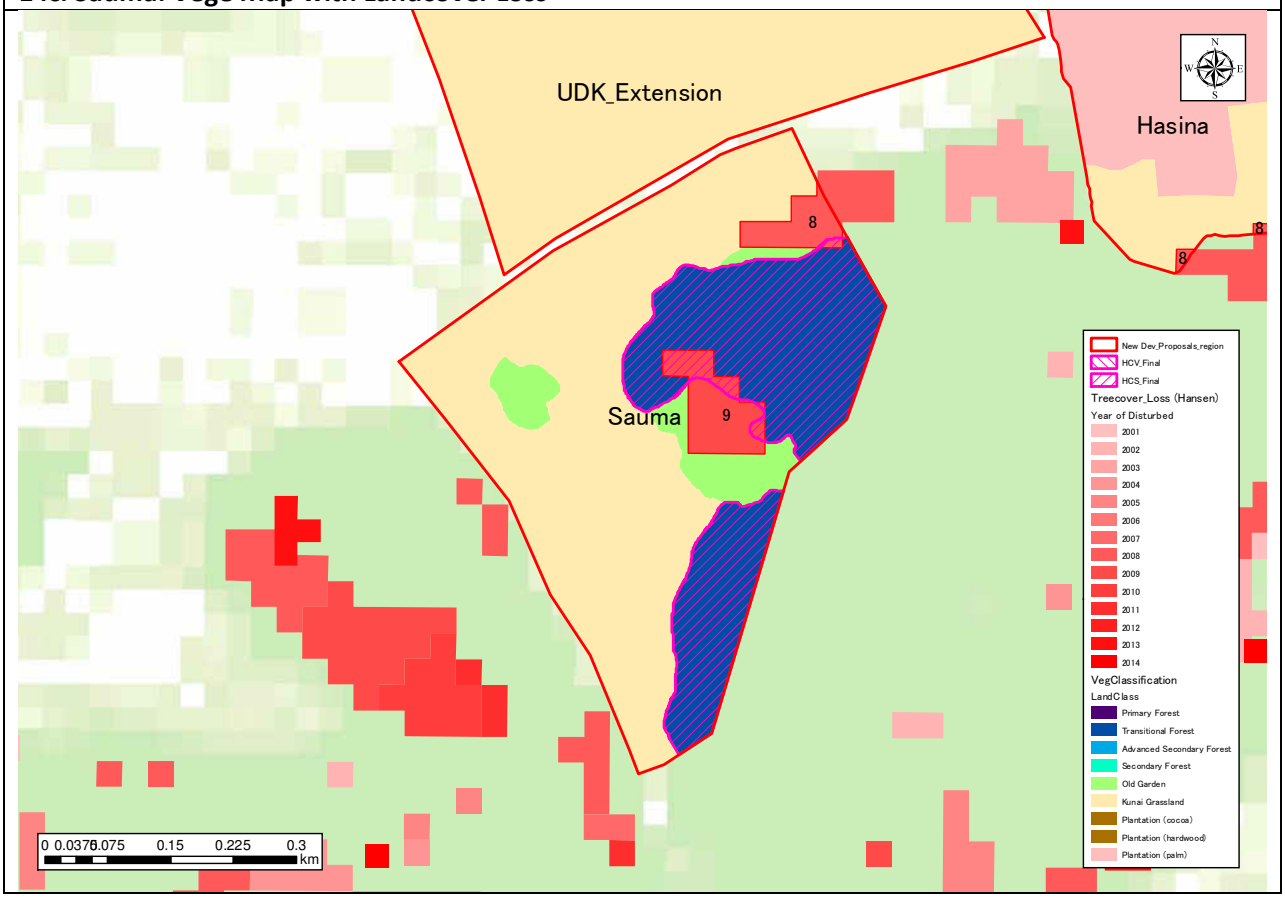
14a. Sauma: Landsat 2000 as Baseline Data



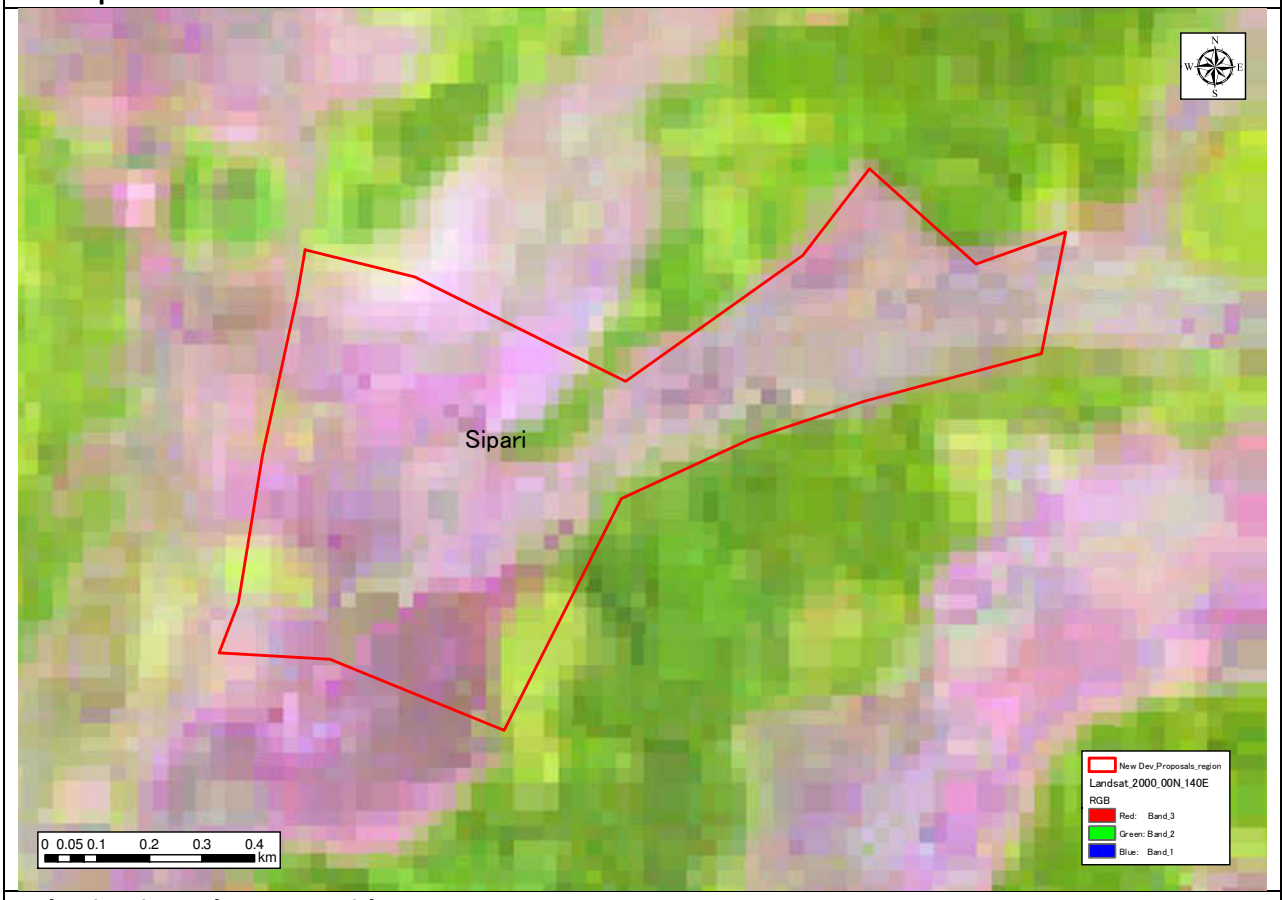
14b. Sauma: Landsat 2015 with Treecover Loss



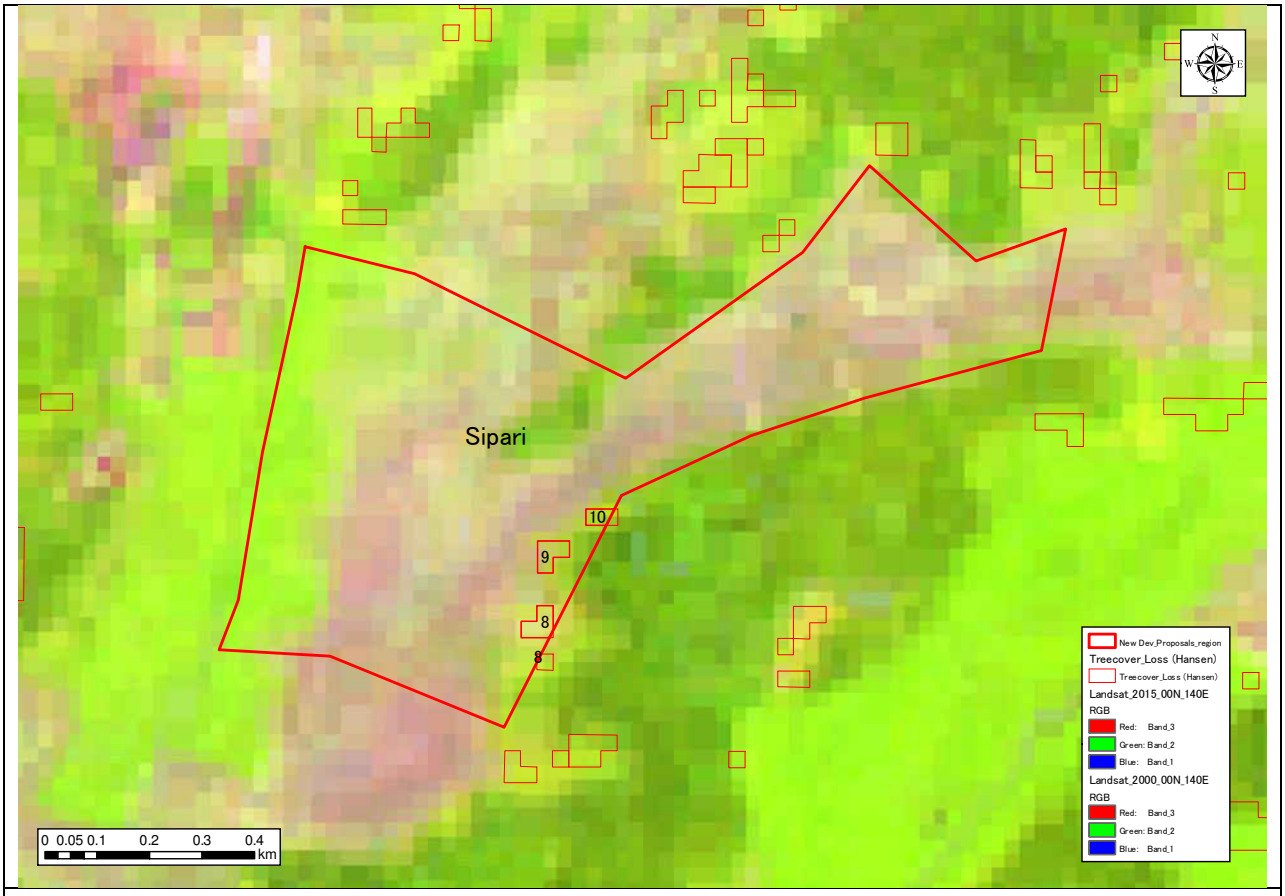
14c. Sauma: Vege Map with Landcover Loss



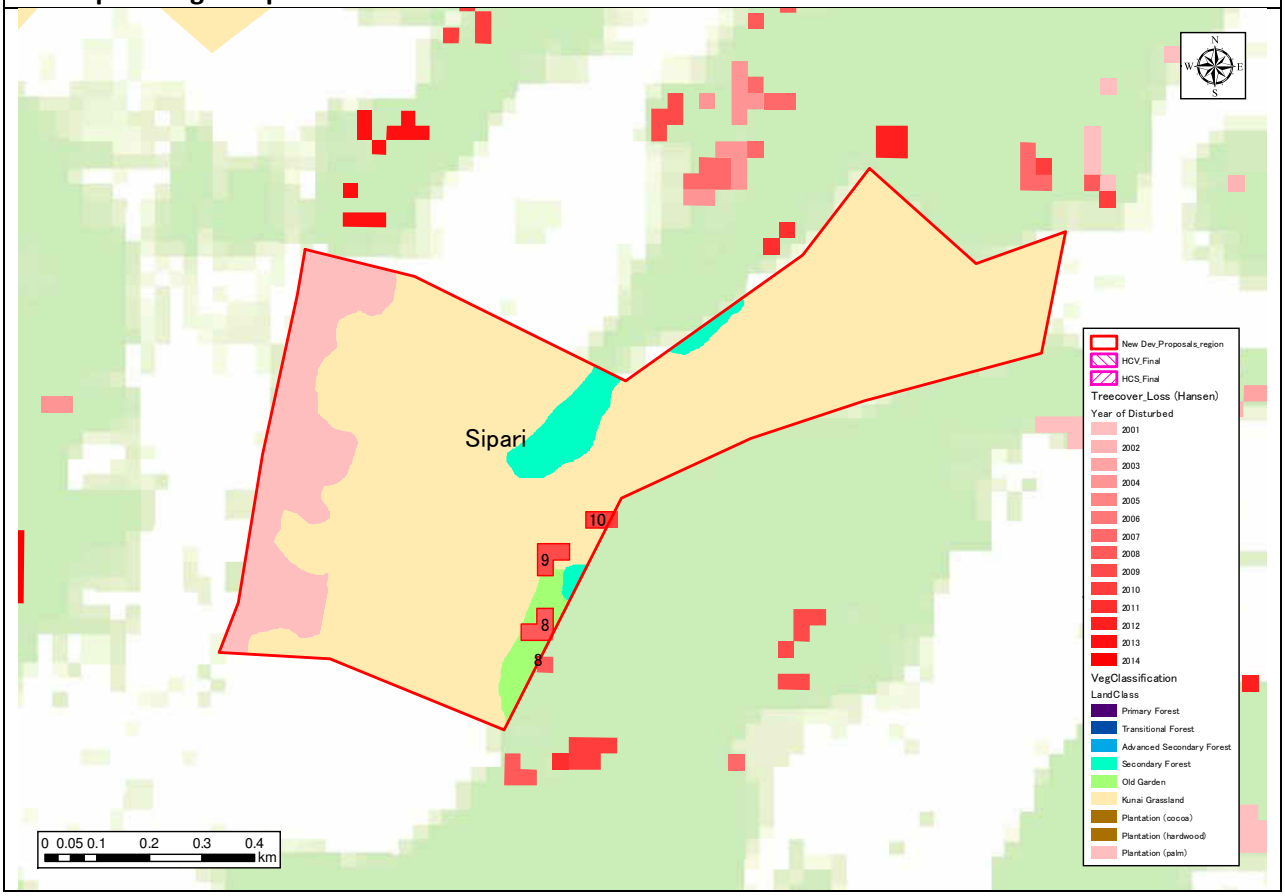
15a. Sipari: Landsat 2000 as Baseline Data



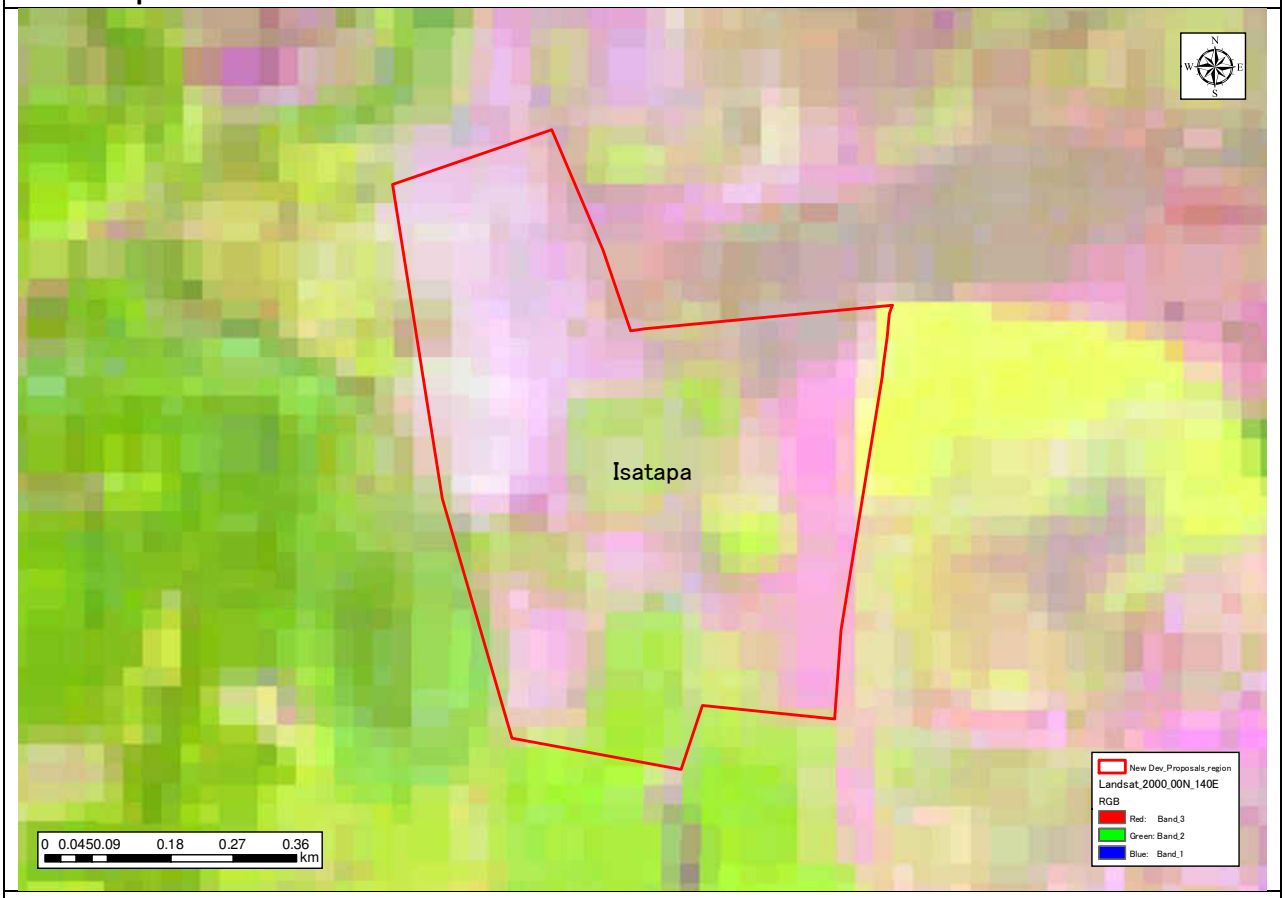
15b. Sipari: Landsat 2000 with Treecover Loss



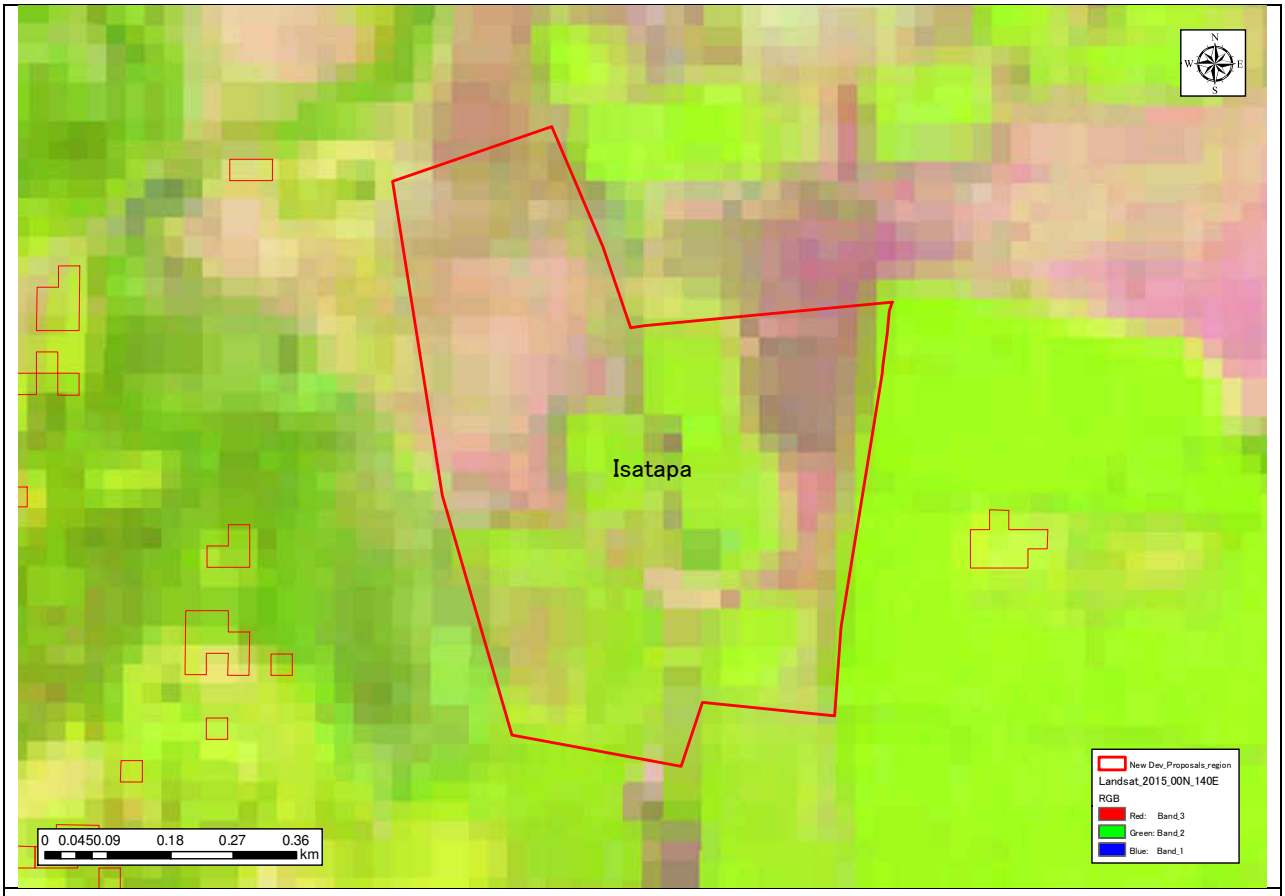
15c. Sipari: Vege Map with Treecover Loss



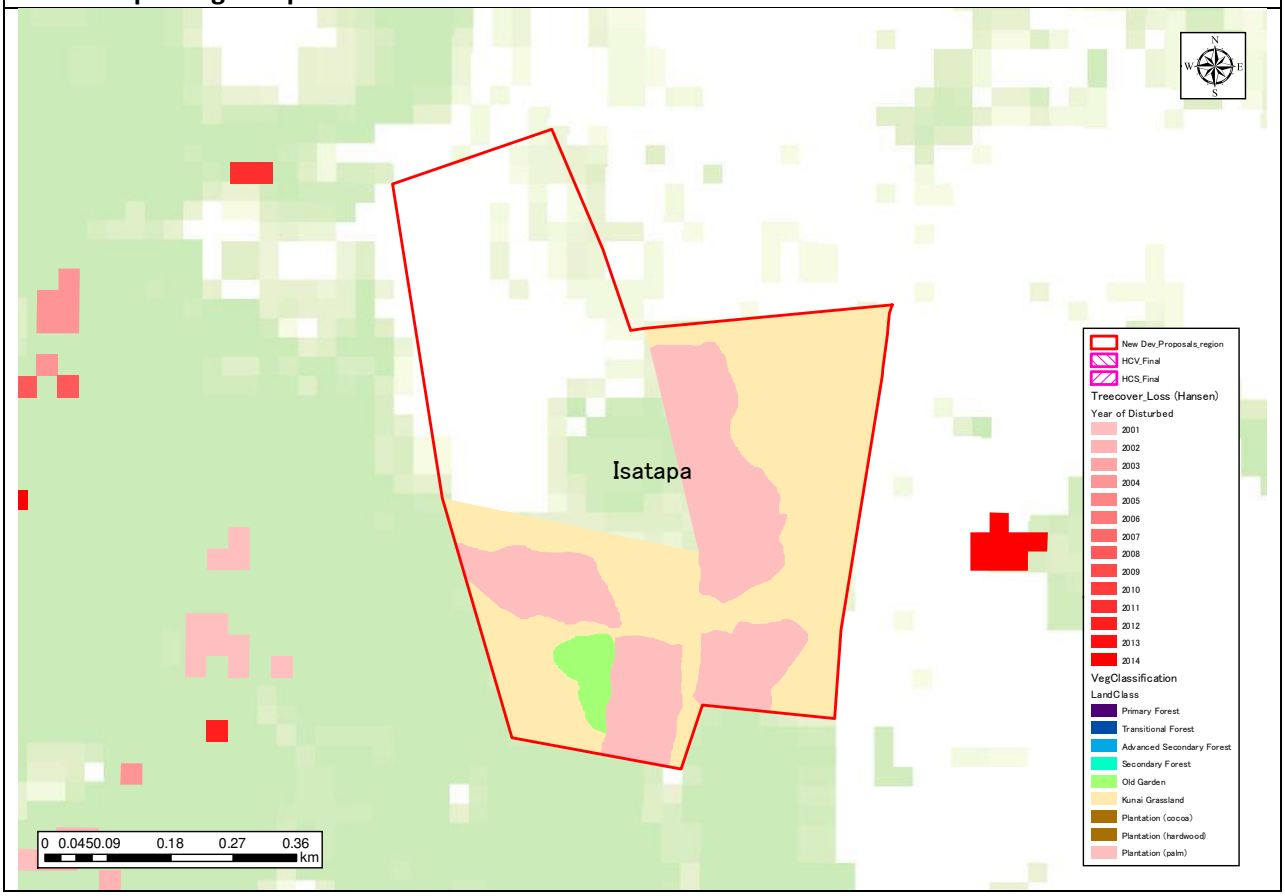
16a. Isatapa: Landsat2000 as Baseline Data



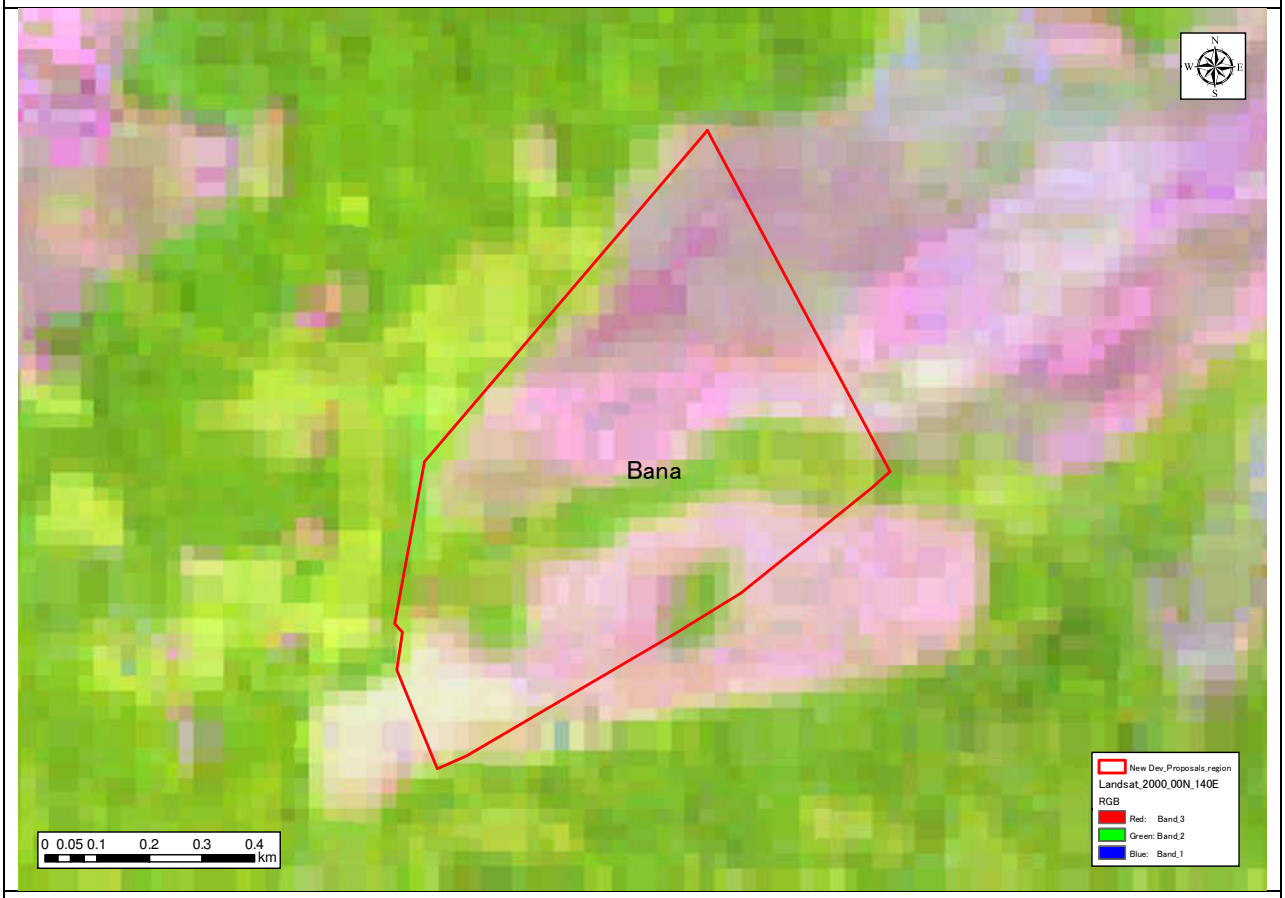
16b. Isatapa: Landsat 2015 with Treecover Loss



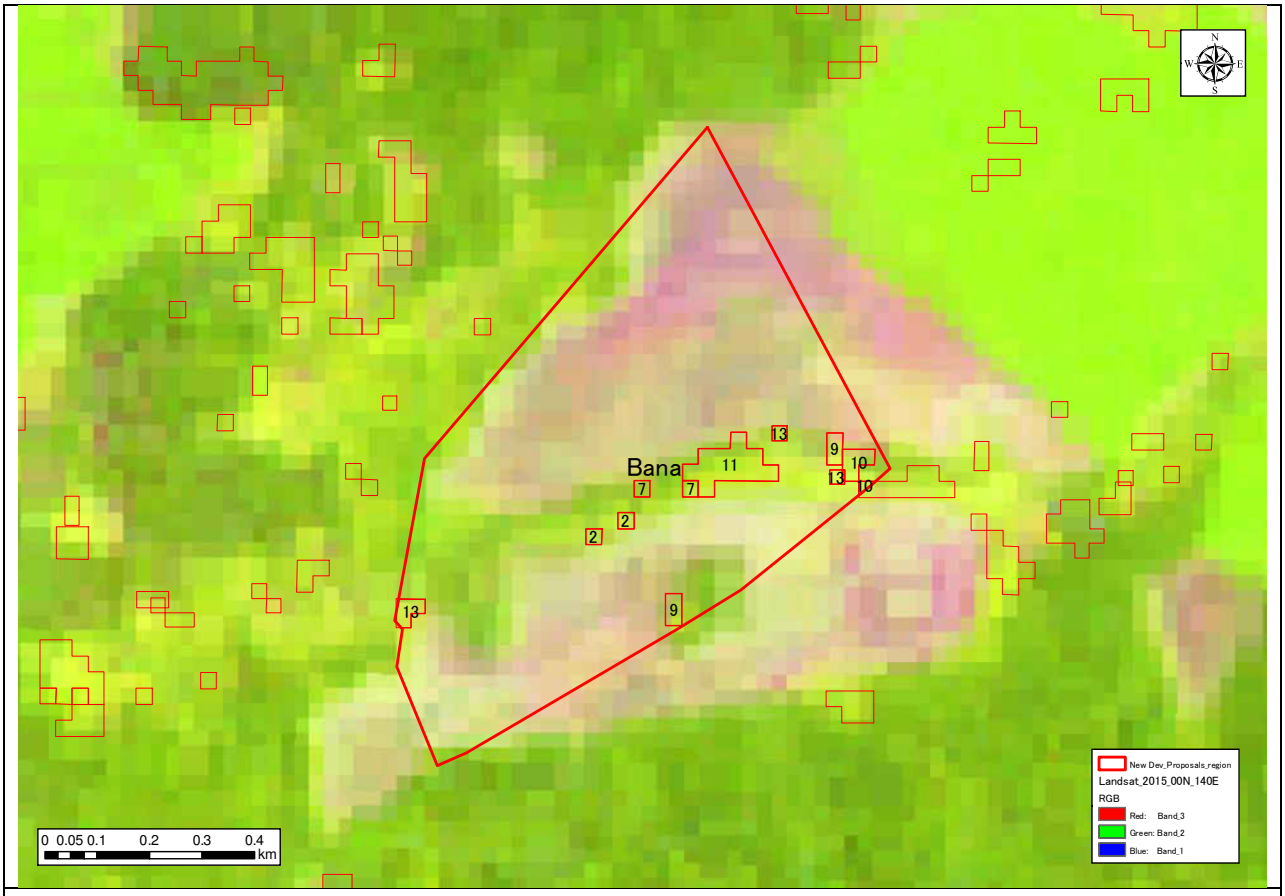
16c. Isatapa: Vege Map with Treecover Loss



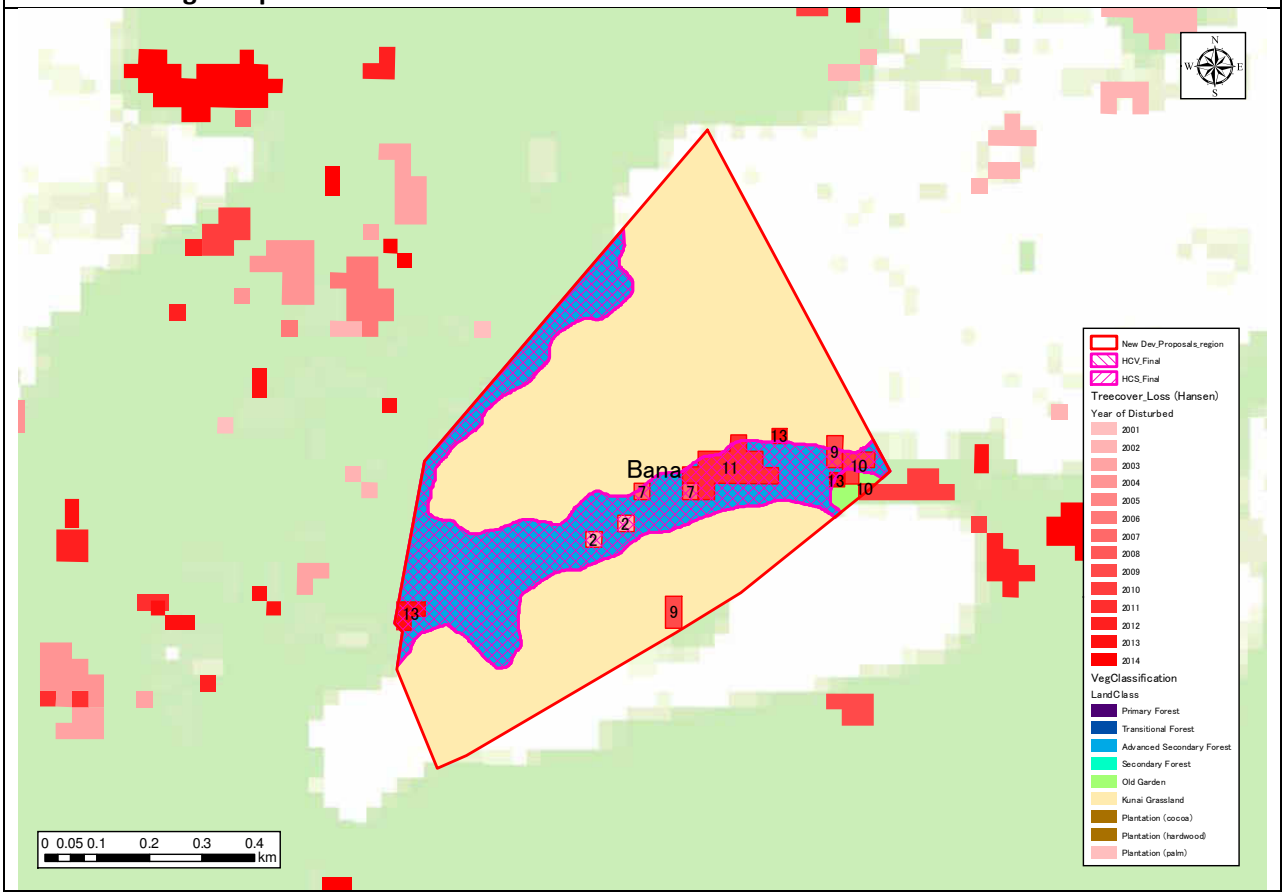
17a. Bana: Landsat 2000 as Baseline Data



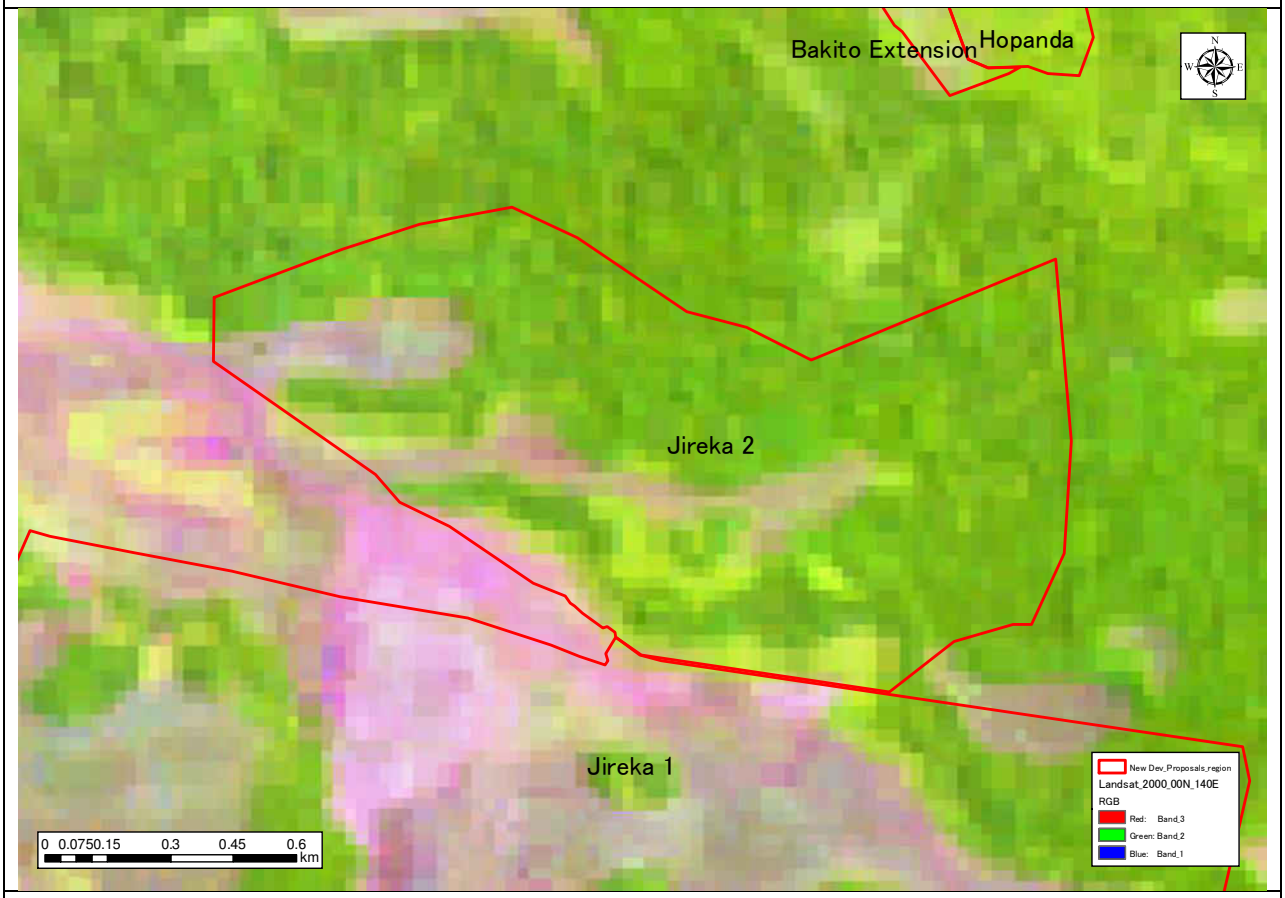
17b. Bana: Landsat 2015 with Treecover Loss



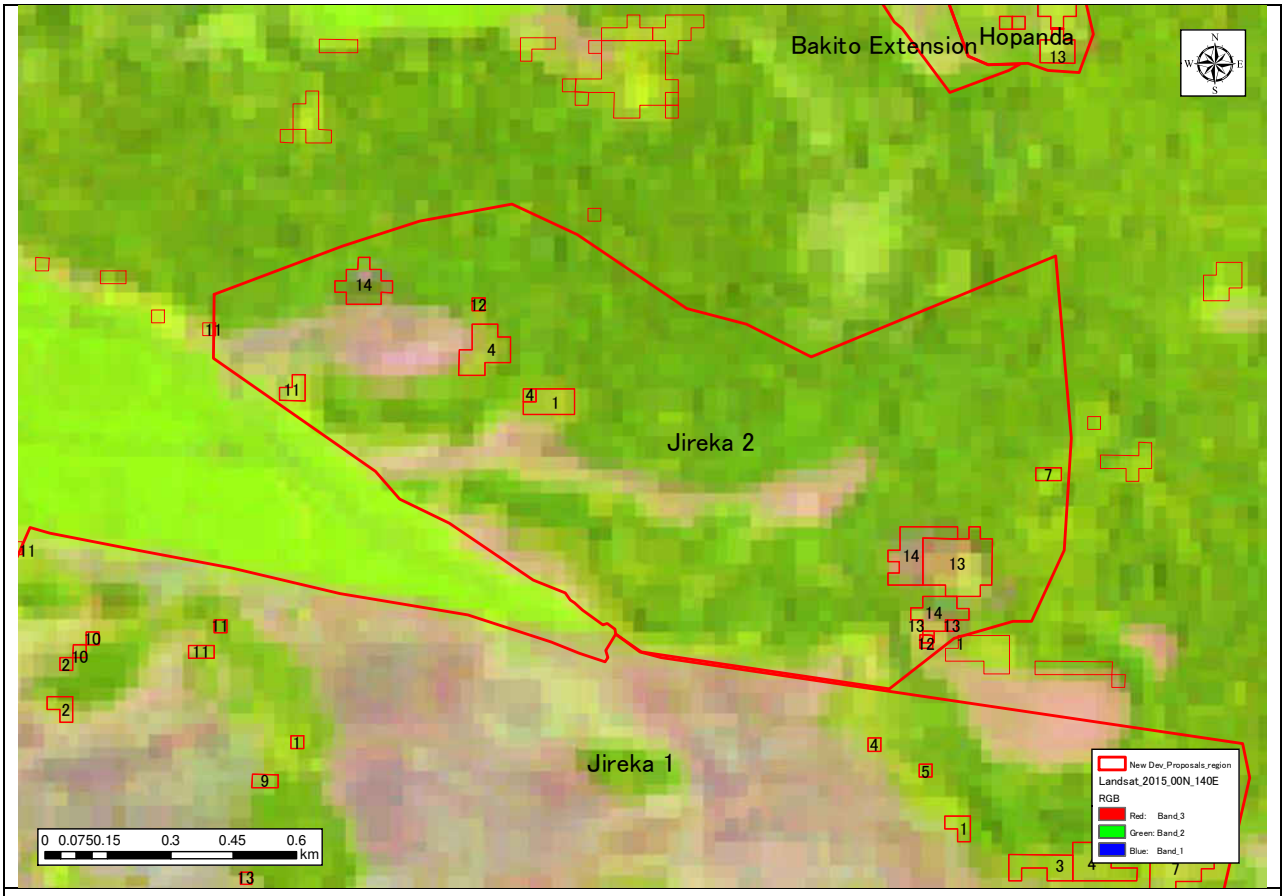
17c. Bana: Vege Map with Treecover Loss



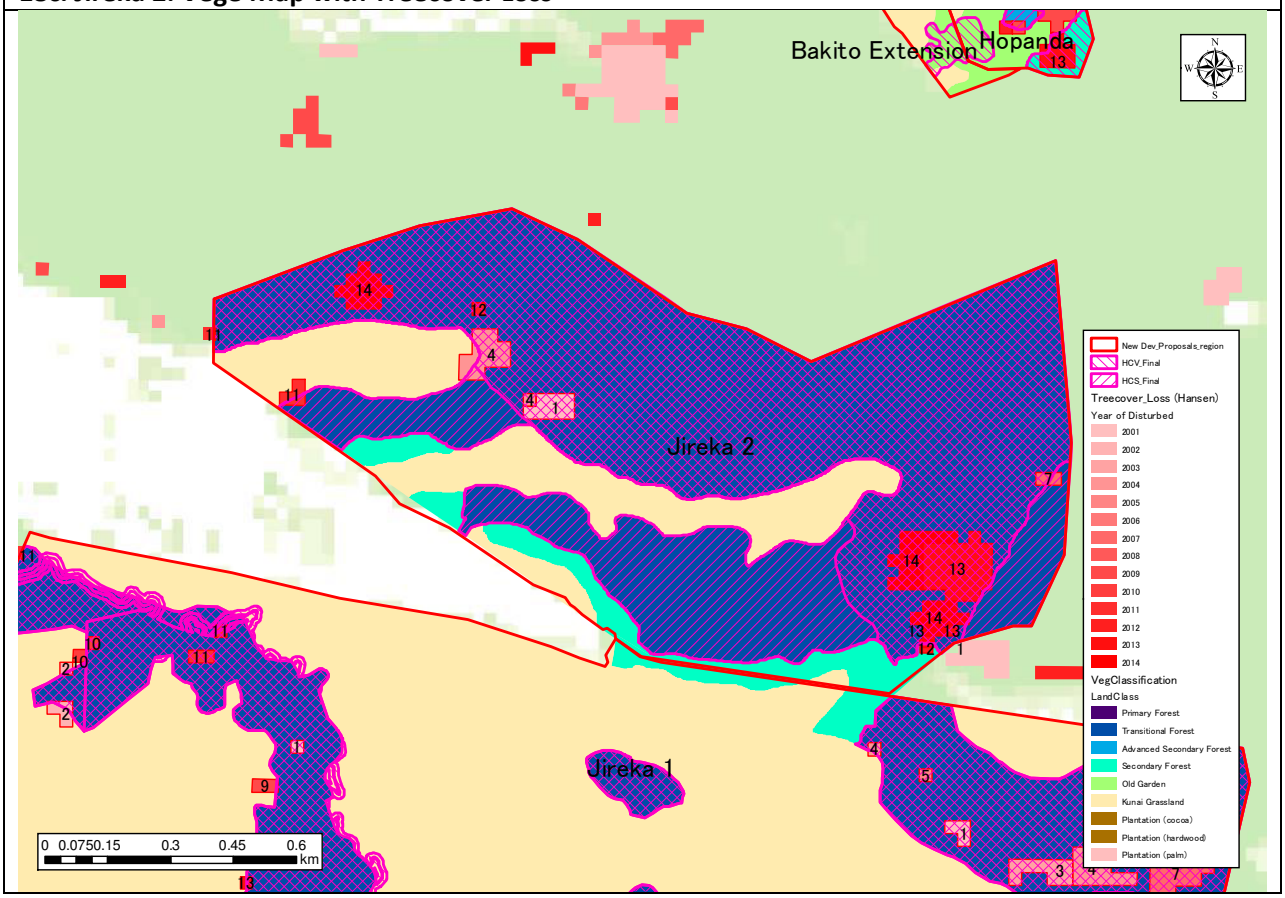
18a. Jireka 2: Landsat 2000 as Baseline Data



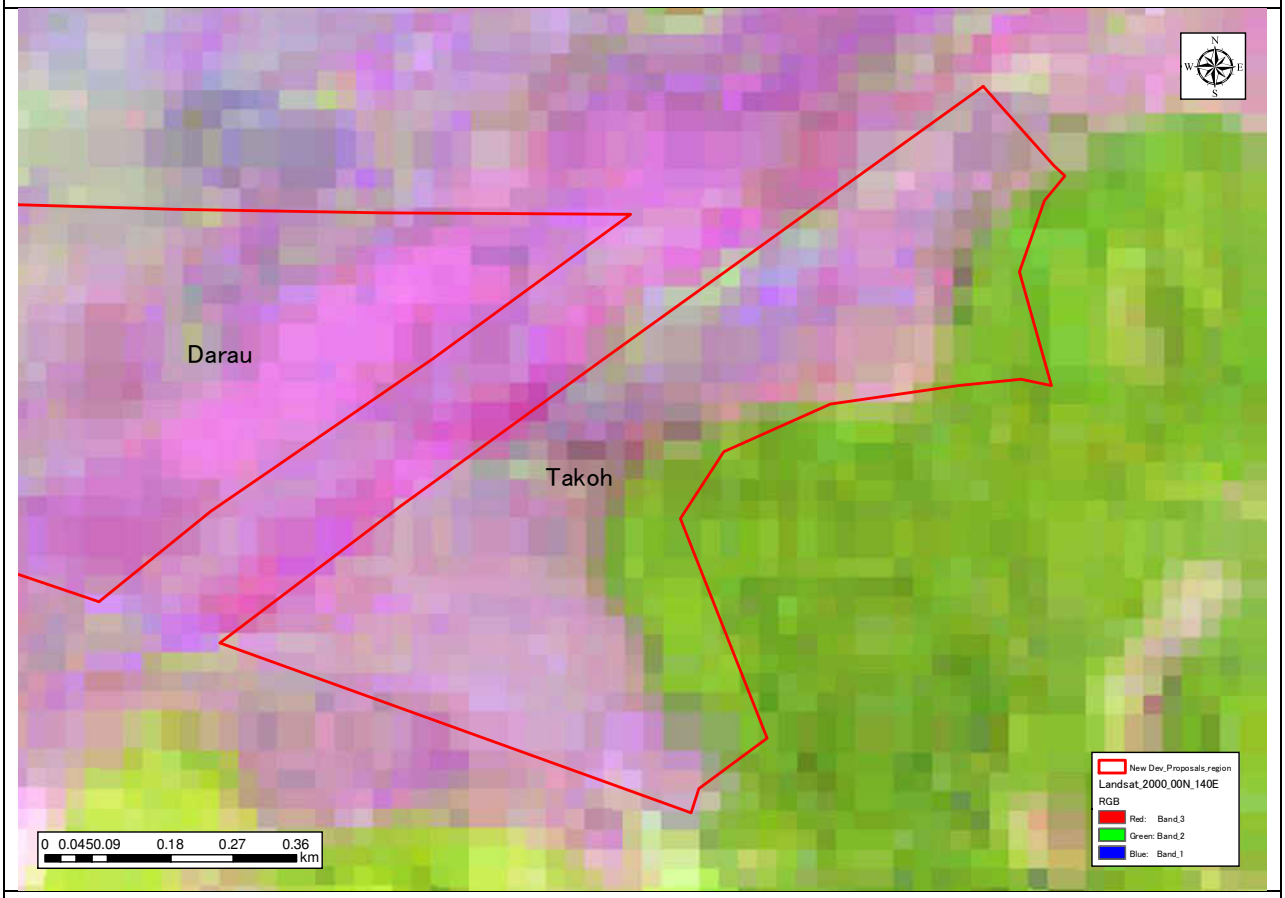
18b. Jireka 2: Landsat 2015 with Treecover Loss



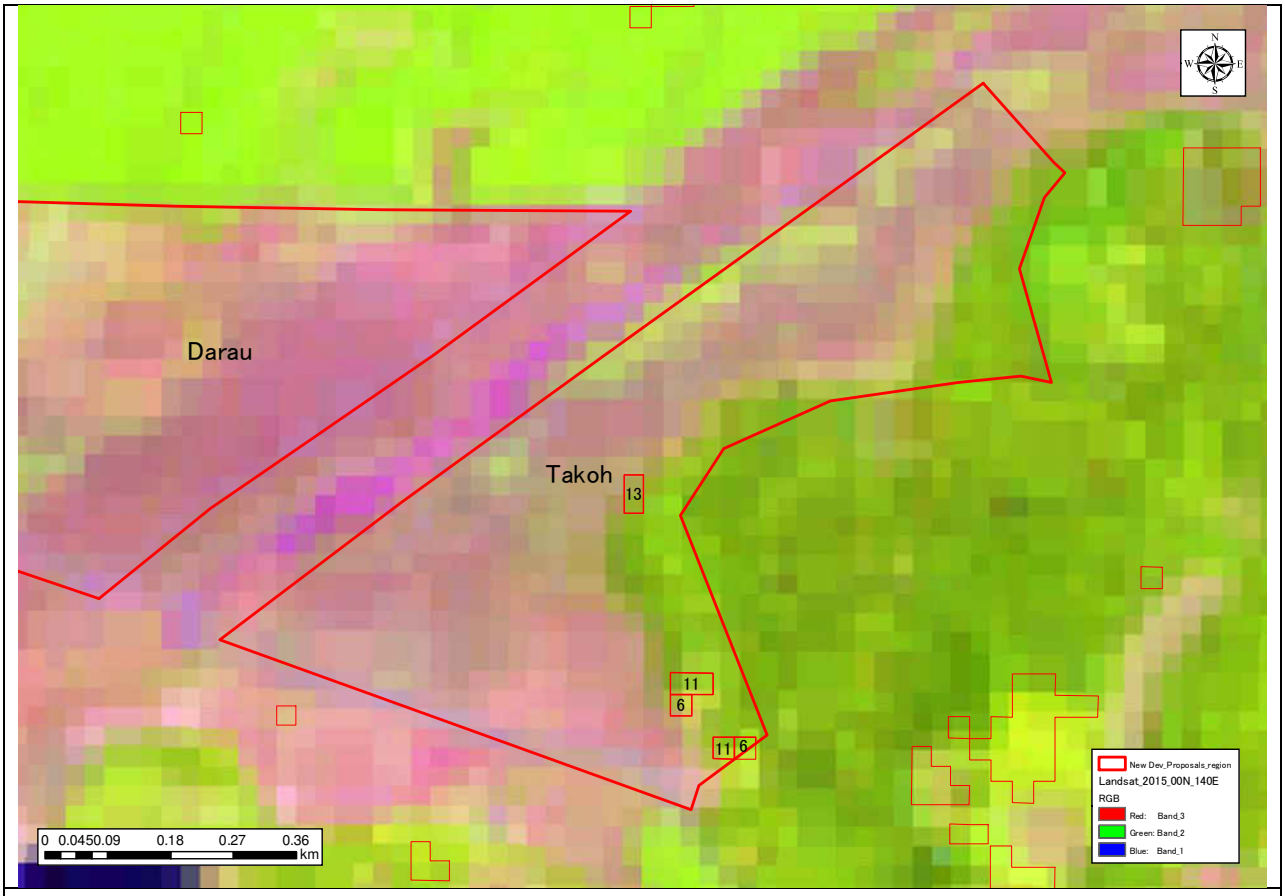
18c. Jireka 2: Vege Map with Treecover Loss



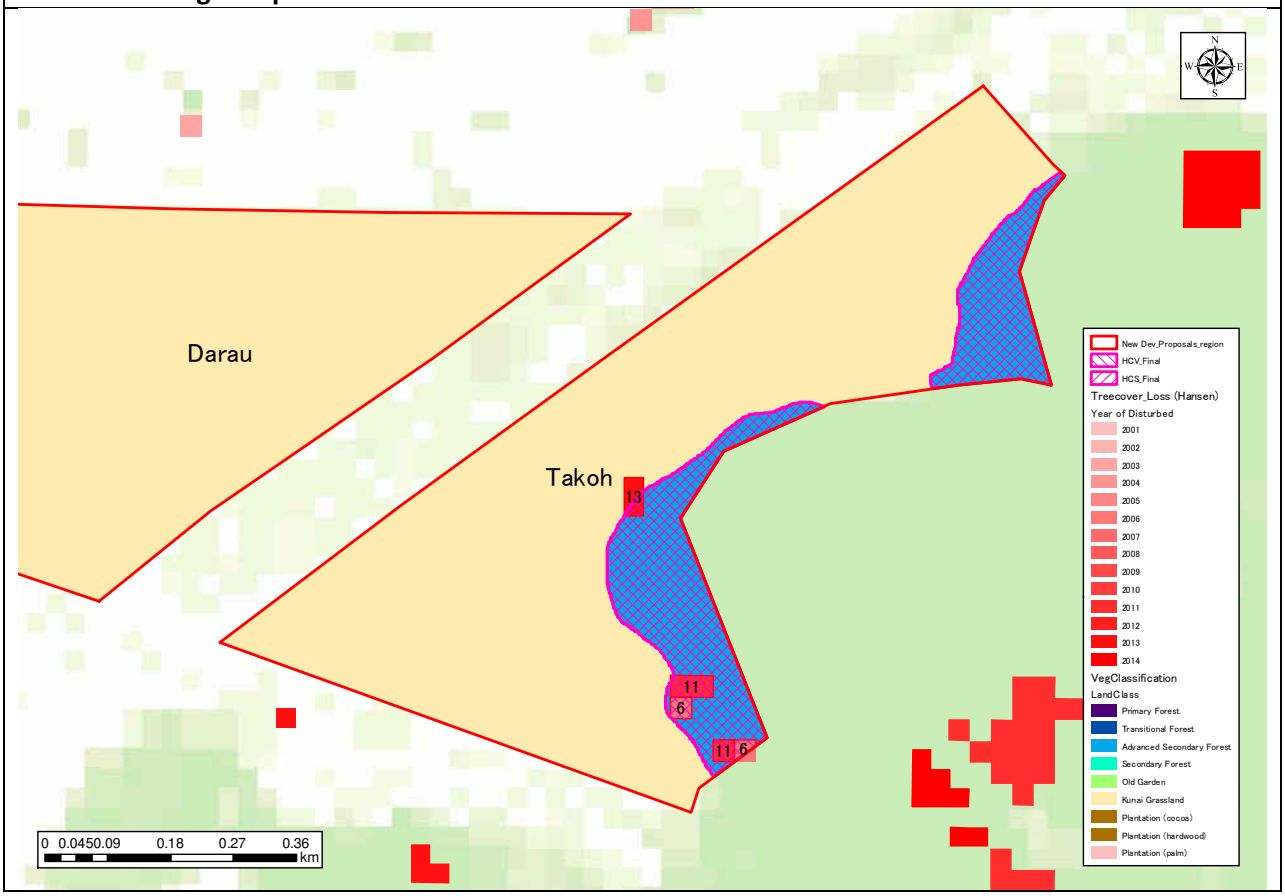
19a. Takoh: Landsat 2000 as Baseline Data



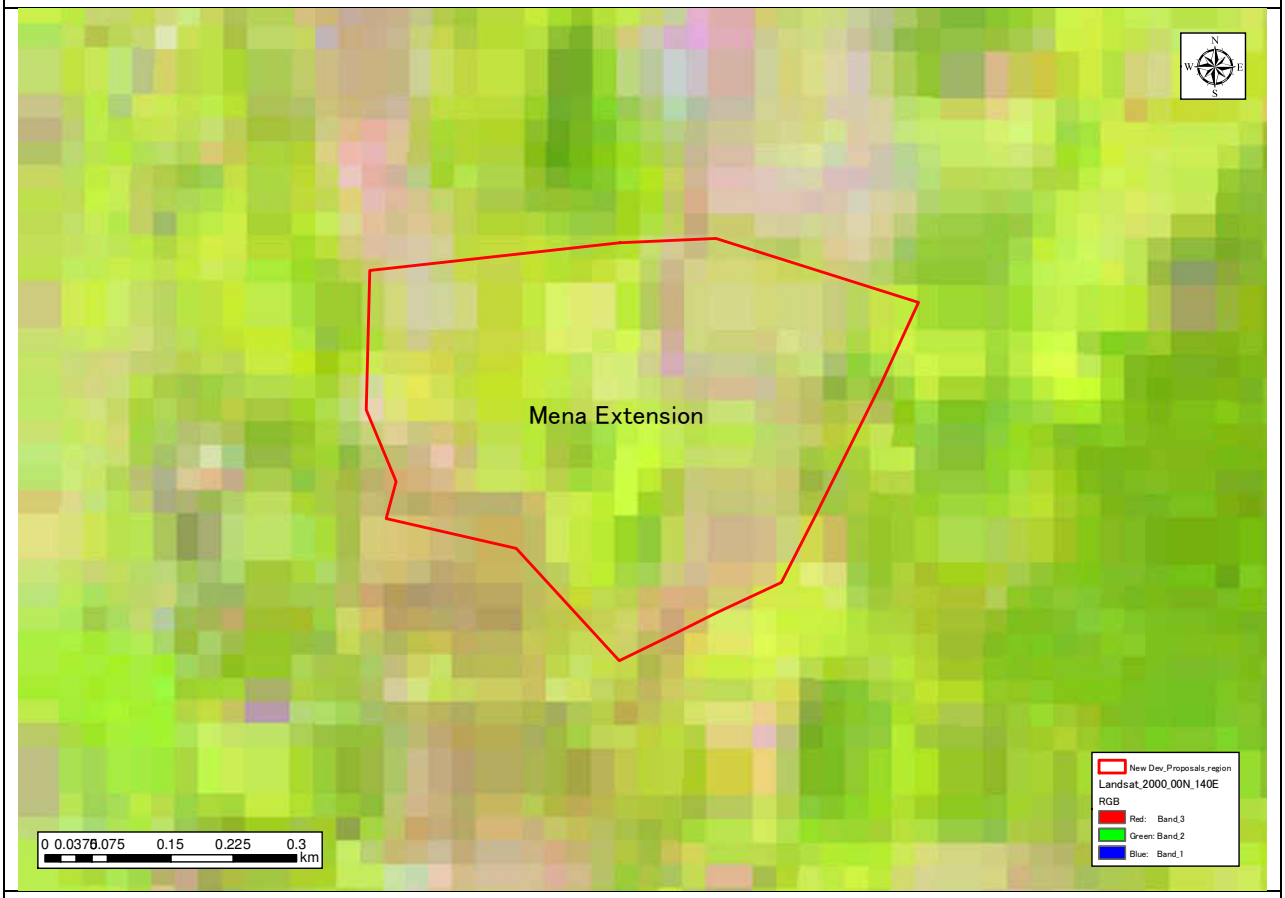
19b. Takoh: Landsat 2015 with Treecover Loss



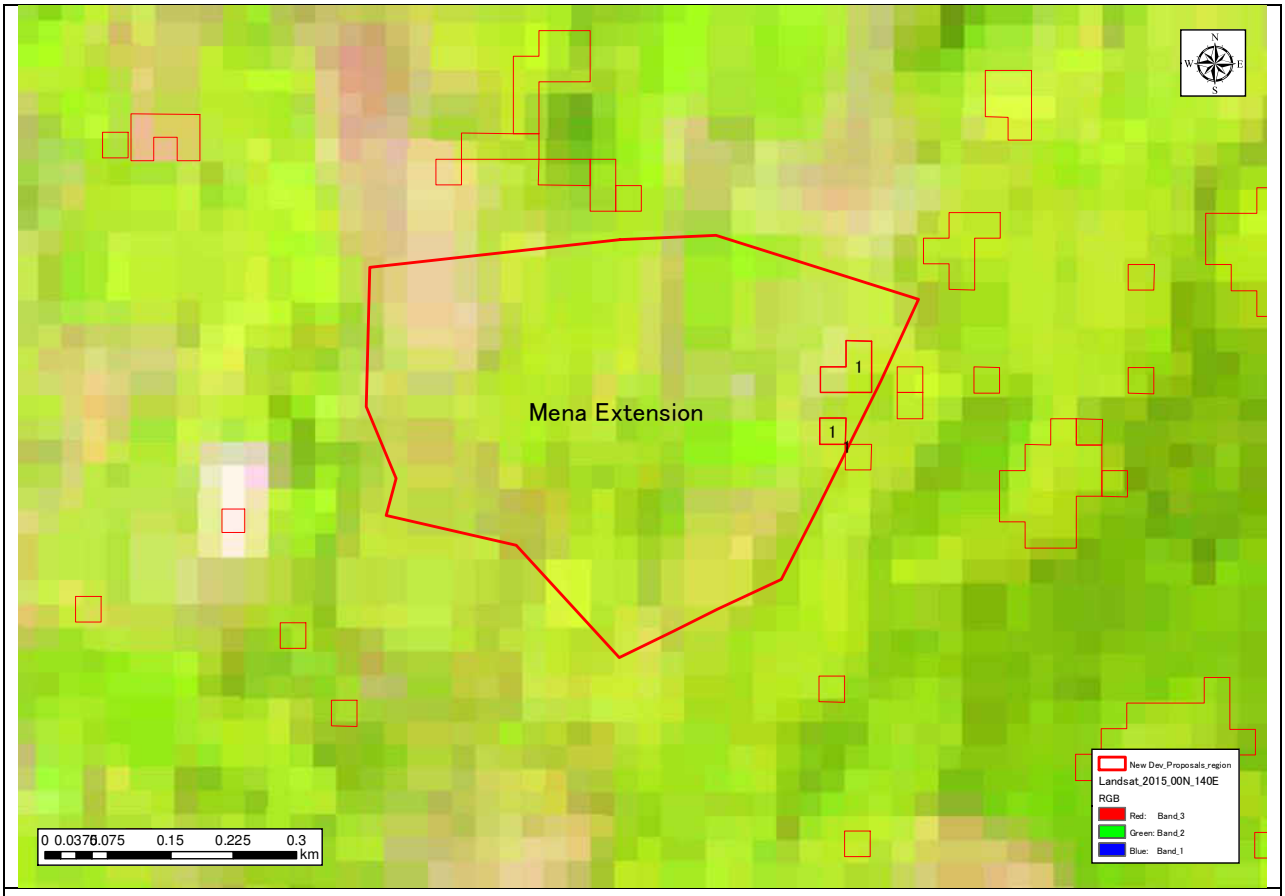
19c. Takoh: Vege Map with Treecover Loss



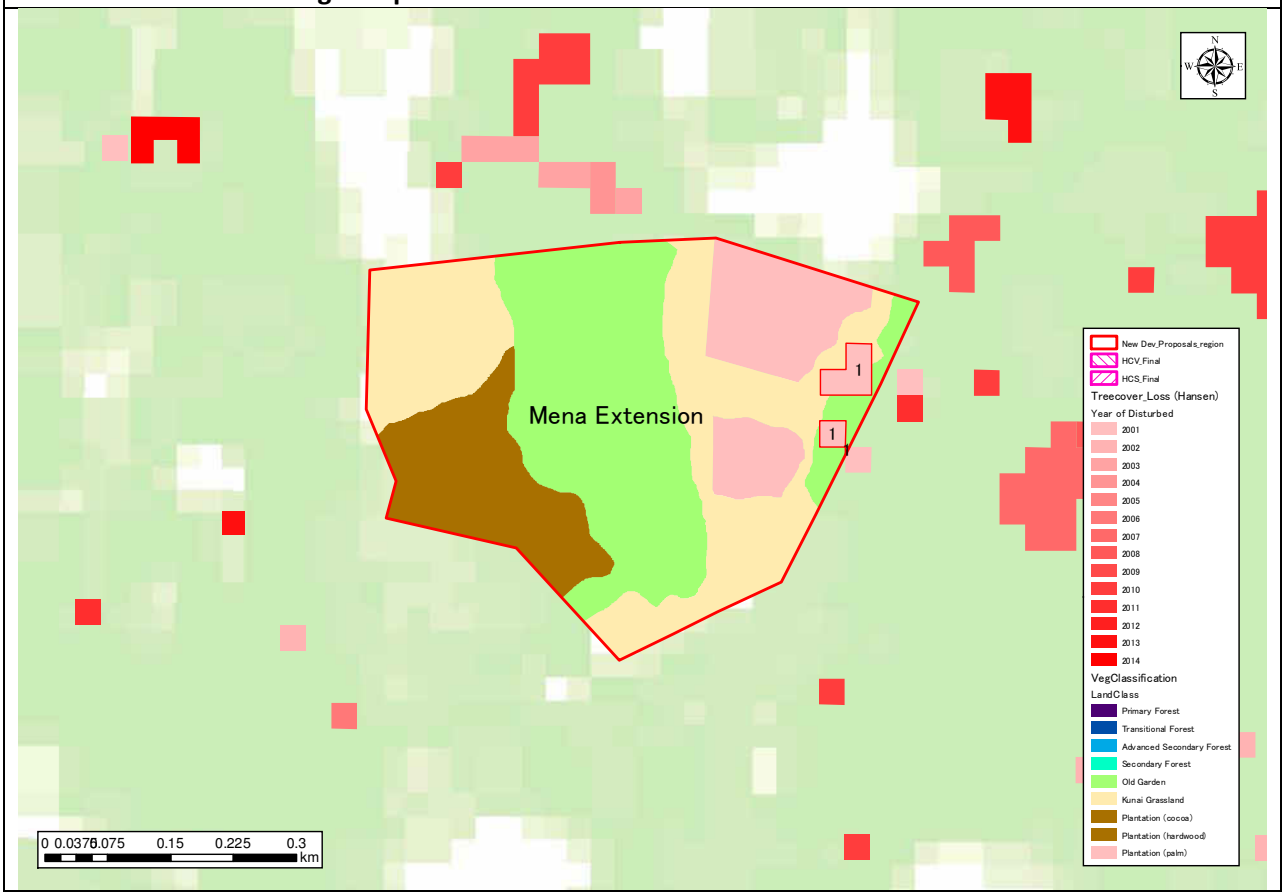
20a. Mena Extension: Landsat 2000 as Baseline Data



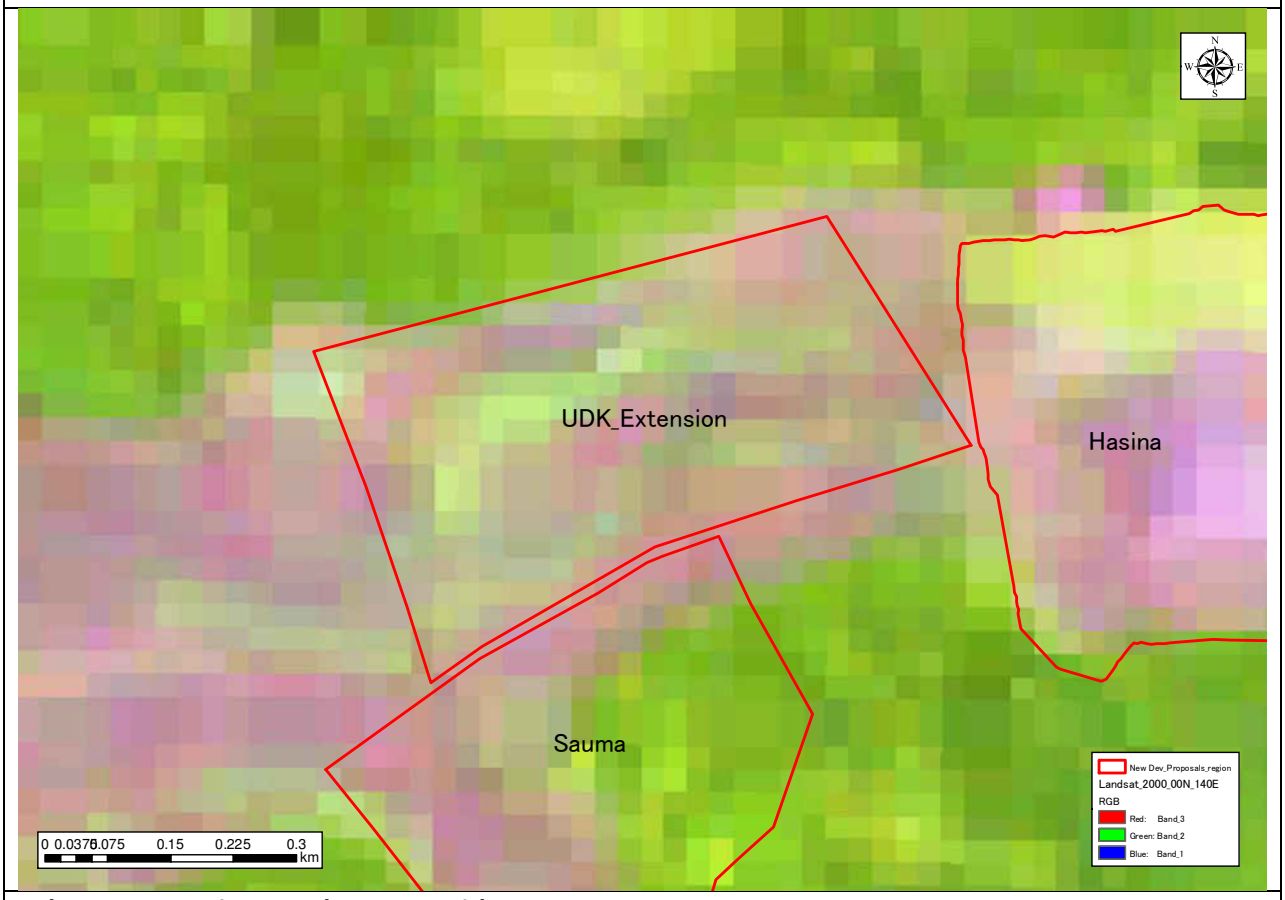
20b. Mena Extension: Landsat 2015 with Treecover Loss



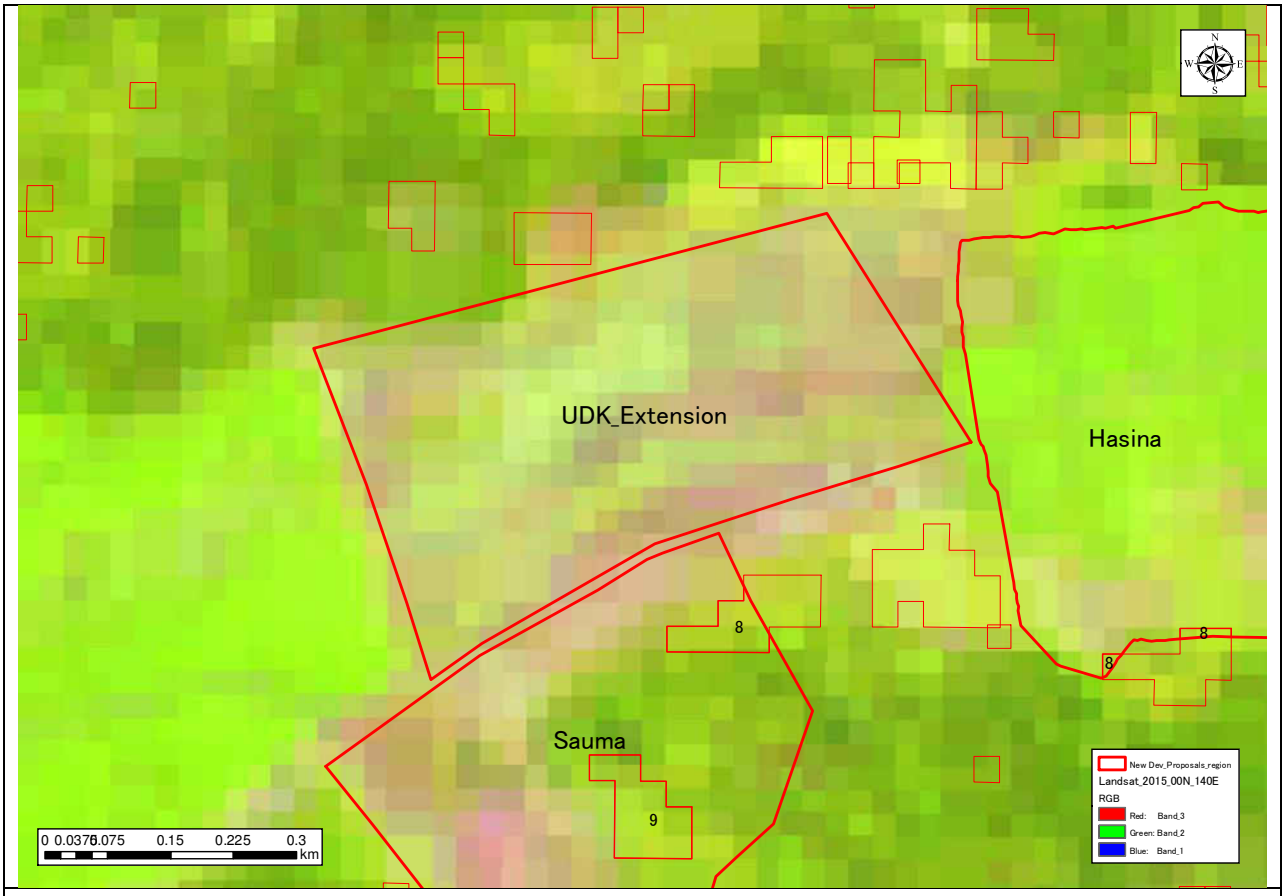
20c. Mena Extension: Vege Map with Treecover Loss



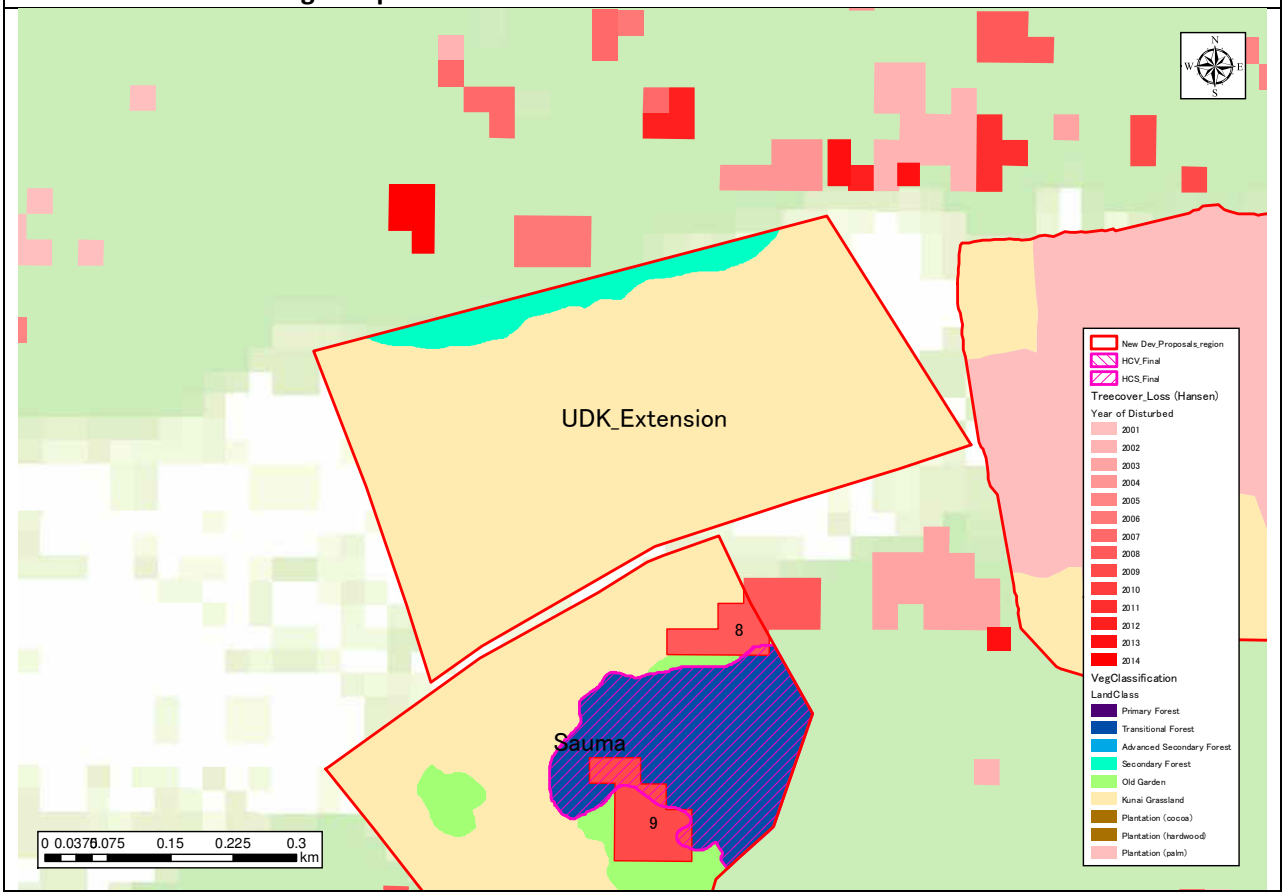
21a. UDK Extension: Landsat 2000 as Baseline Data



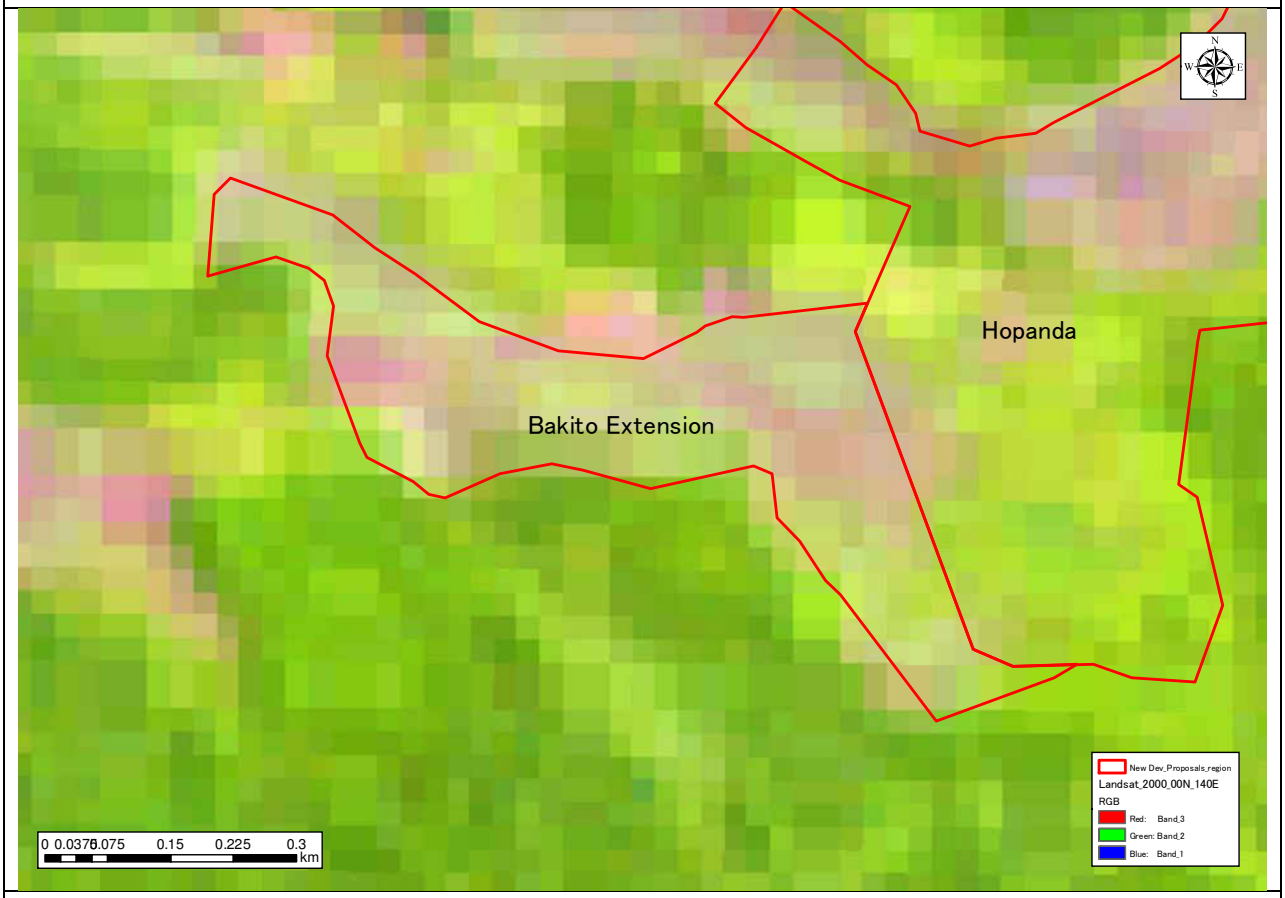
21b. UDK Extension: Landsat 2015 with Treecover Loss



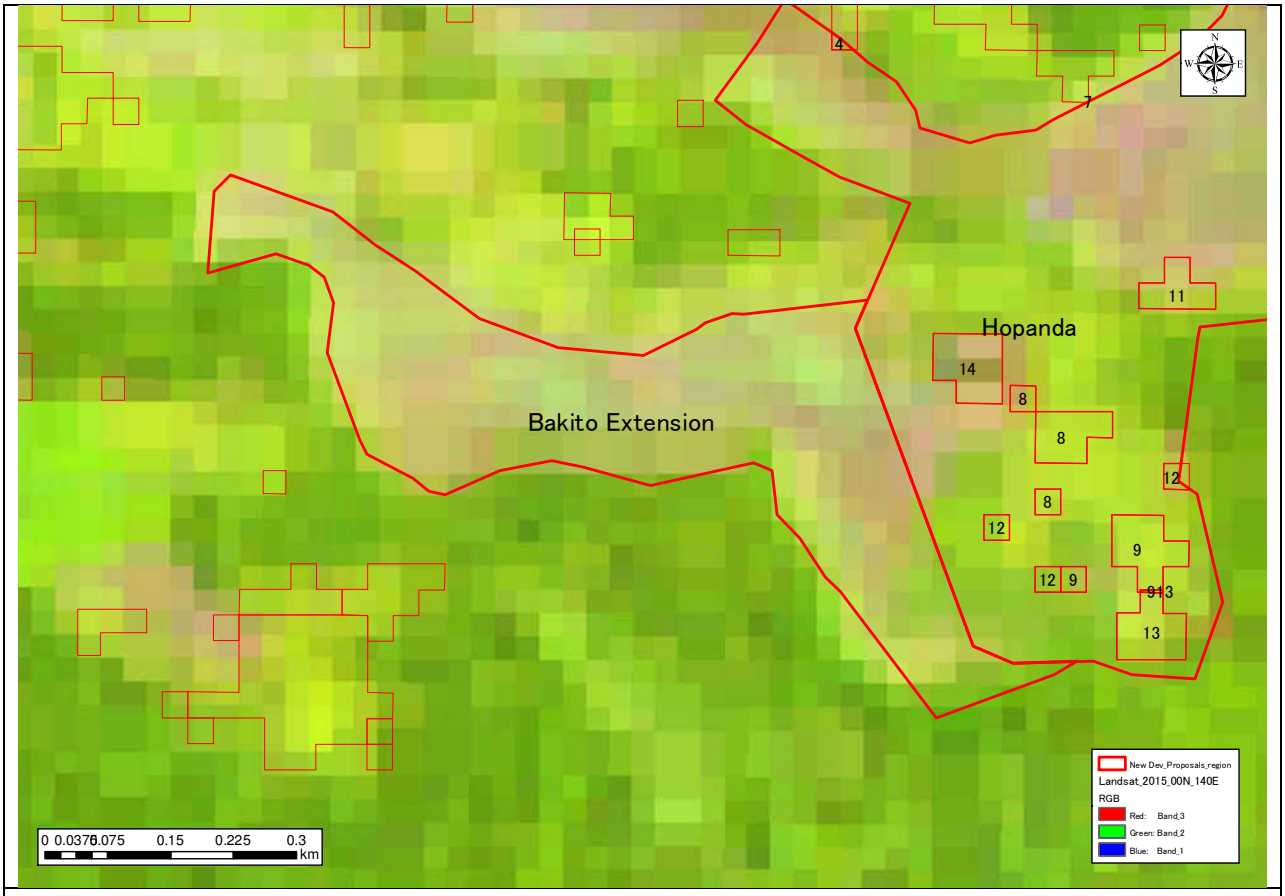
21c. UDK Extension: Vege Map with Treecover Loss



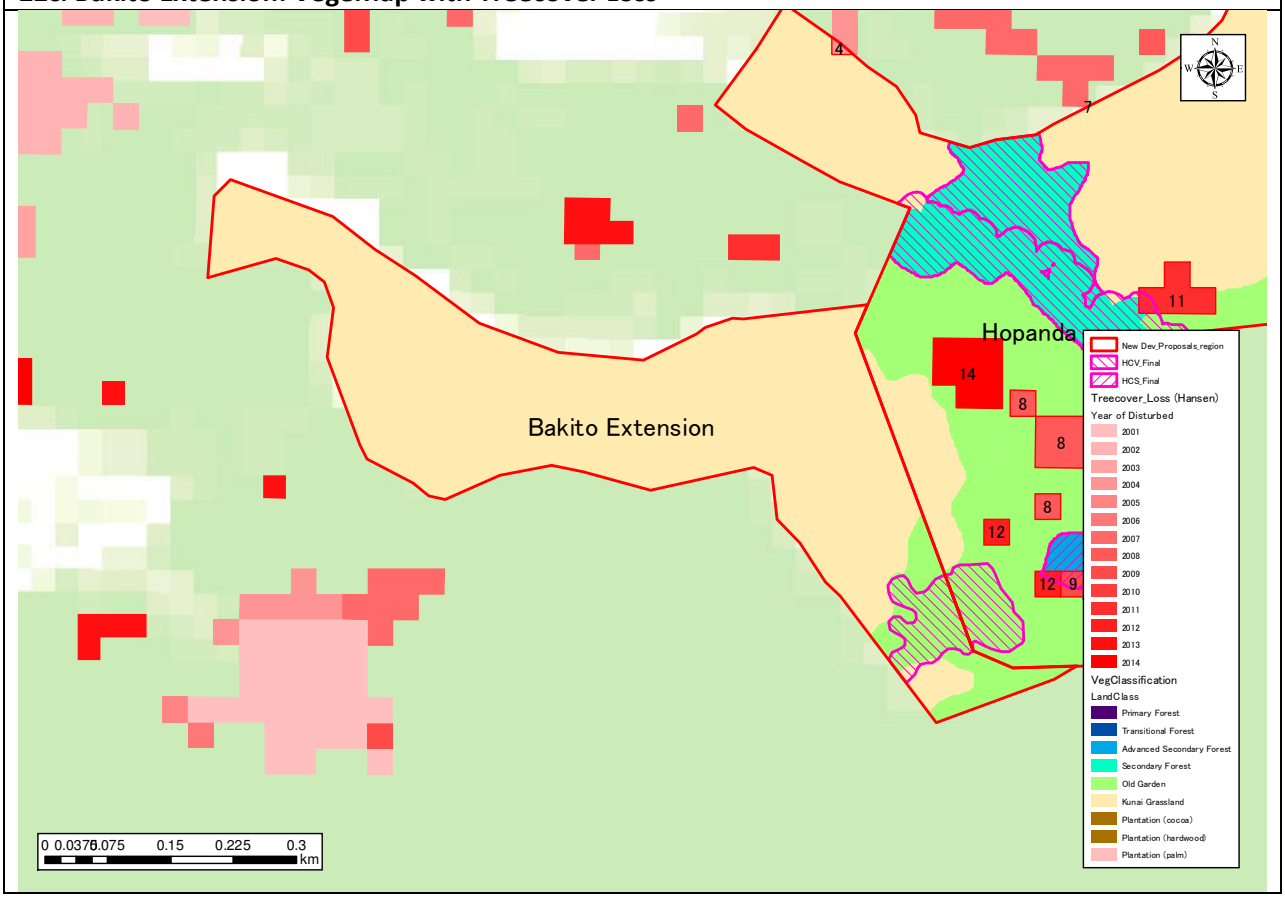
22a. Bakito Extension: Landsat 2000 as Baseline Data



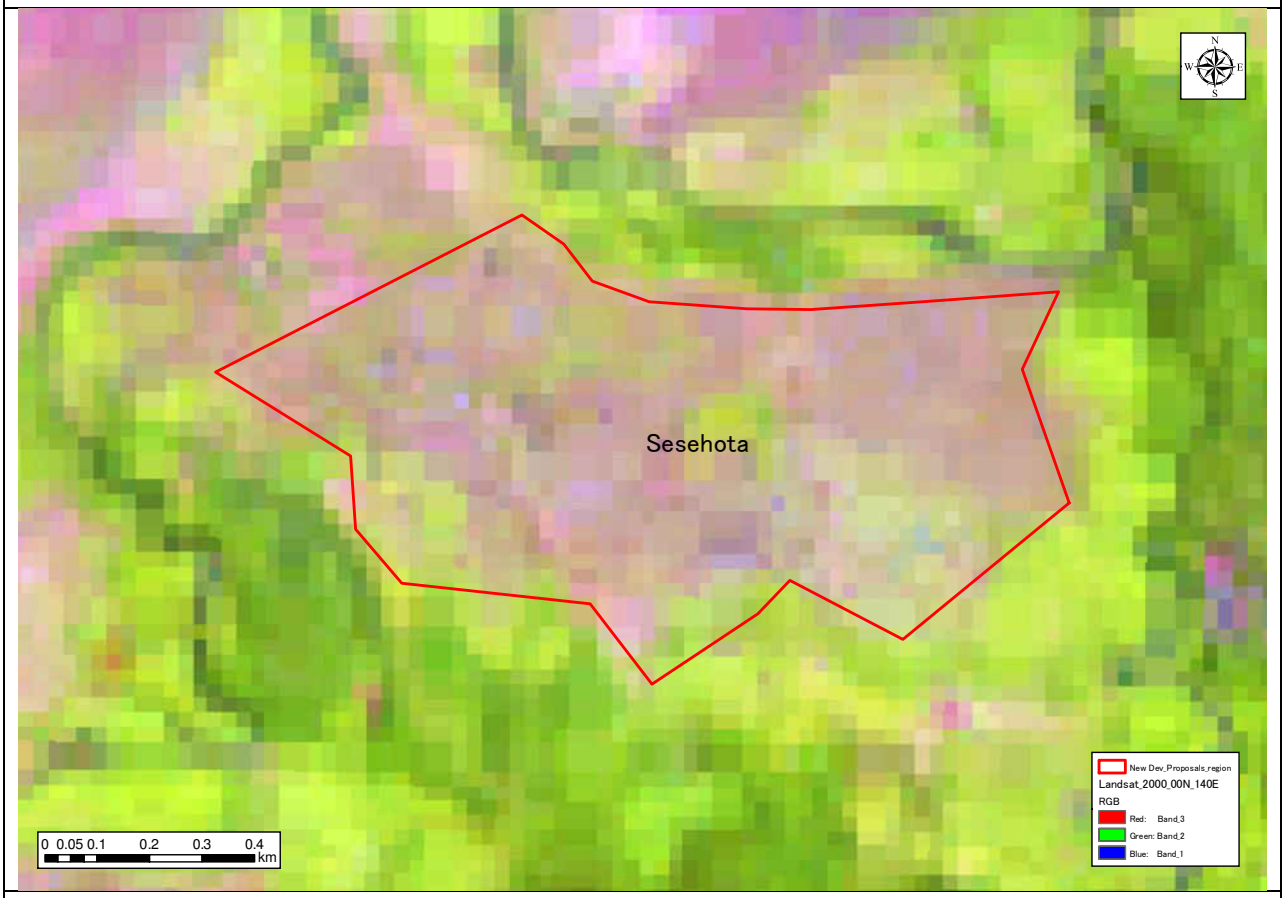
22b. Bakito Extension: Landsat 2015 with Treecover Loss



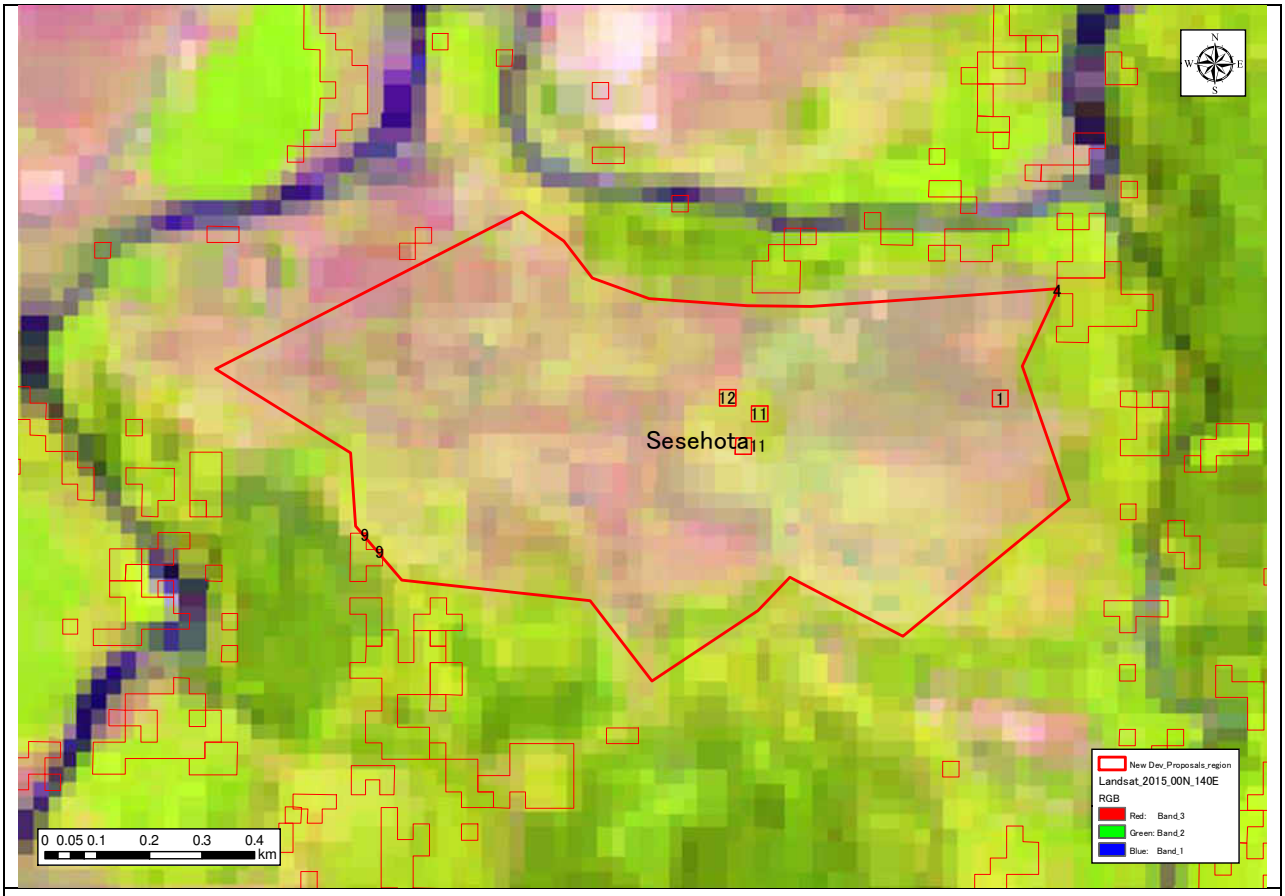
22c. Bakito Extension: VegeMap with Treecover Loss



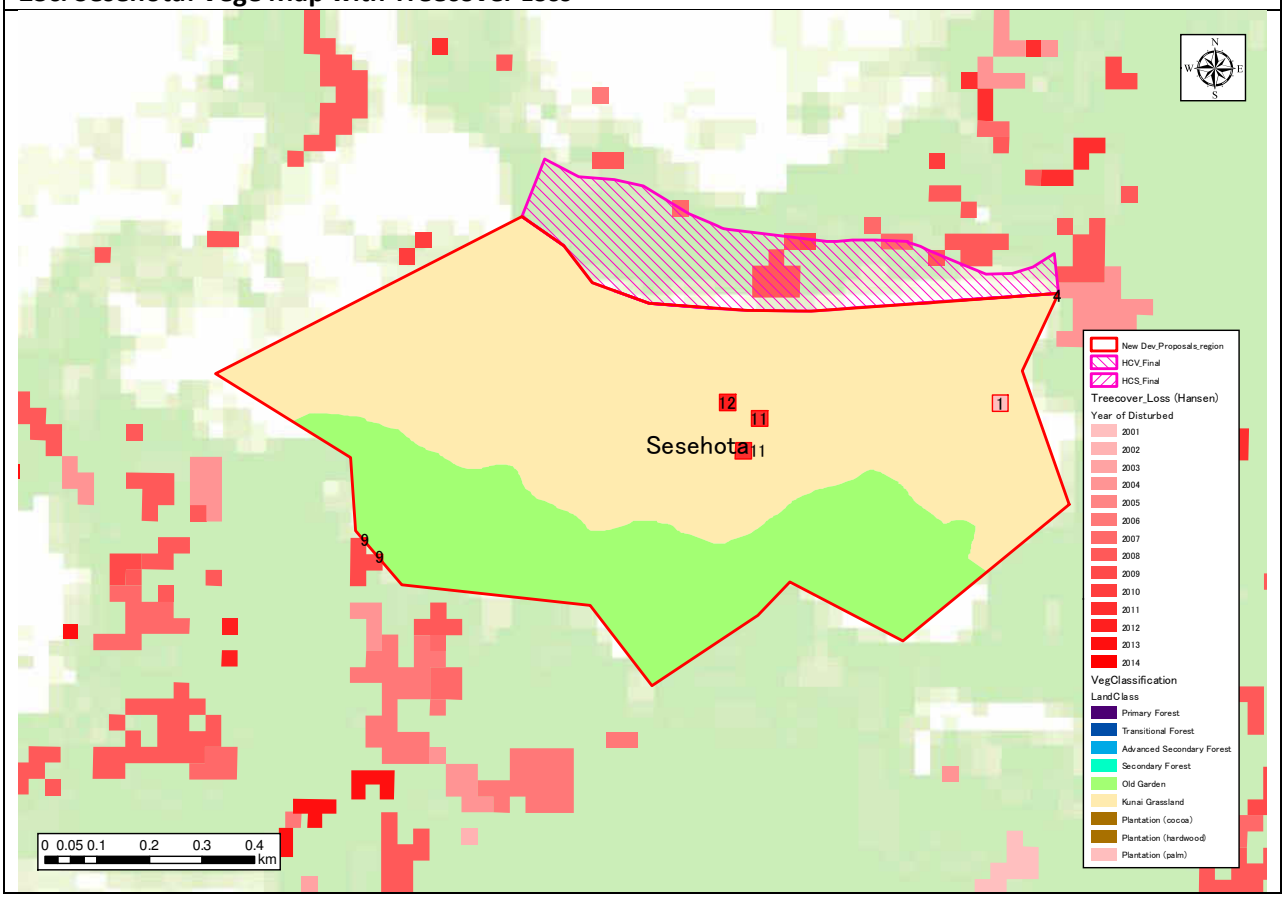
23a. Sesehota: Landsat 2000 as Baseline Data



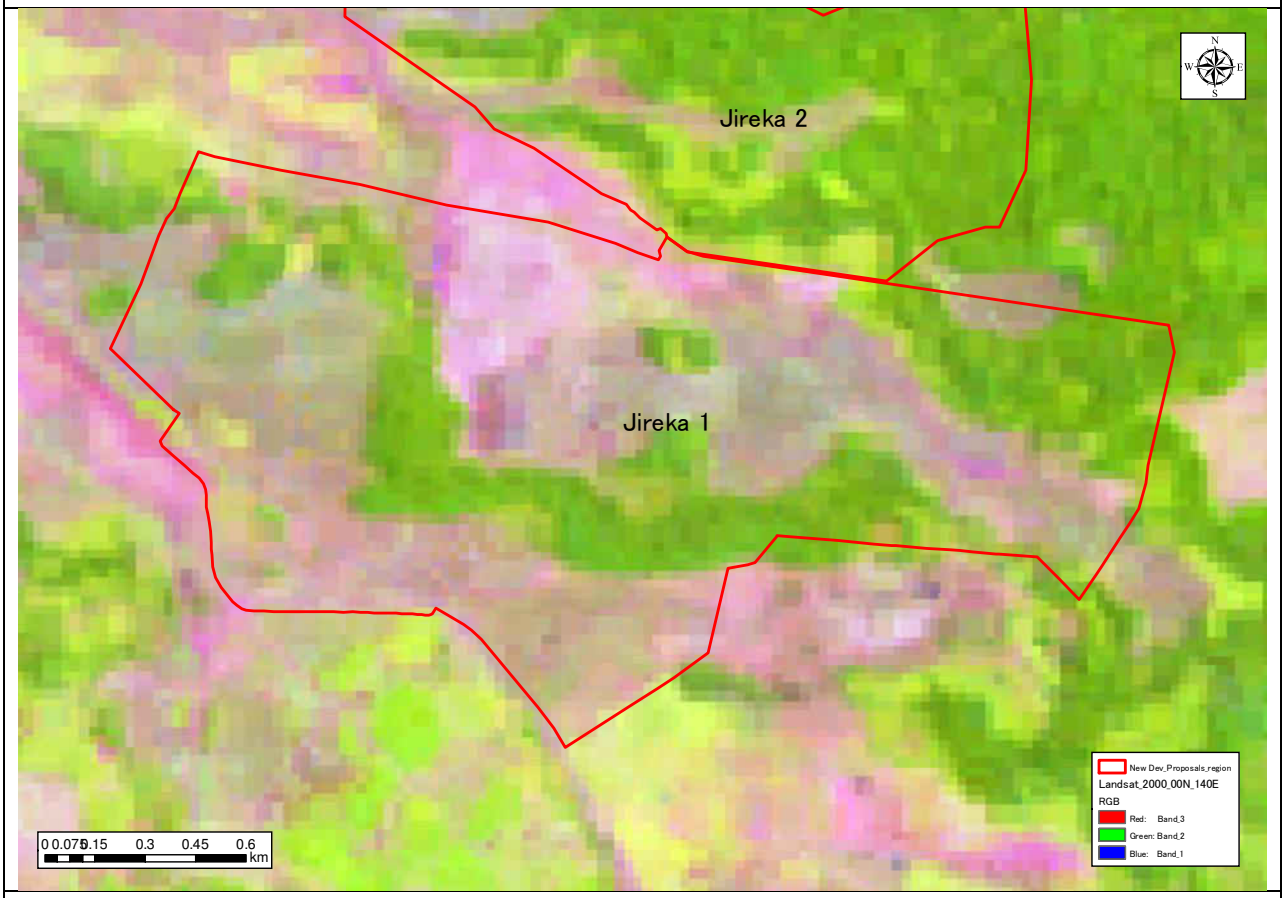
23b. Sesehota: Landsat 2015 with Treecover Loss



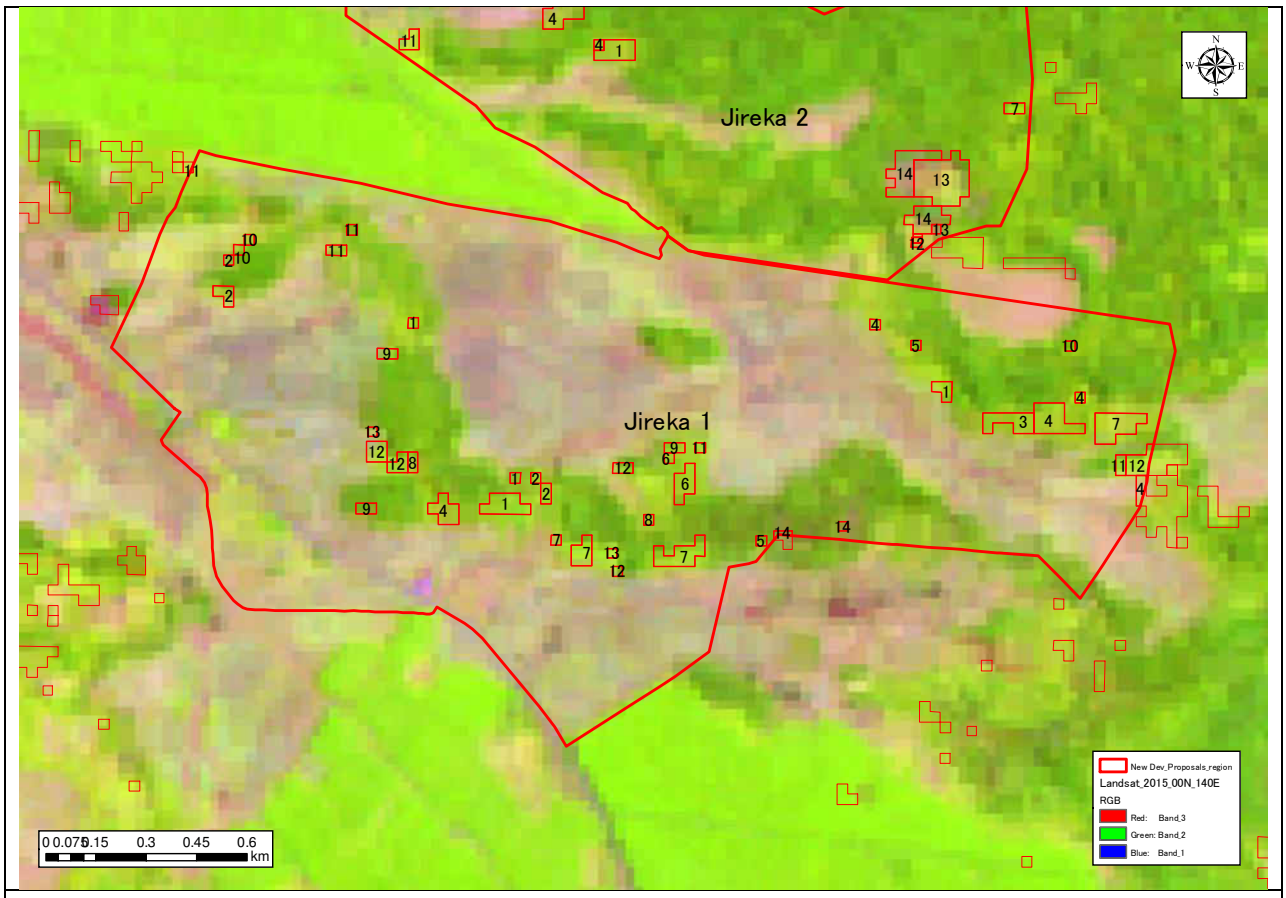
23c. Sesehota: Vege Map with Treecover Loss



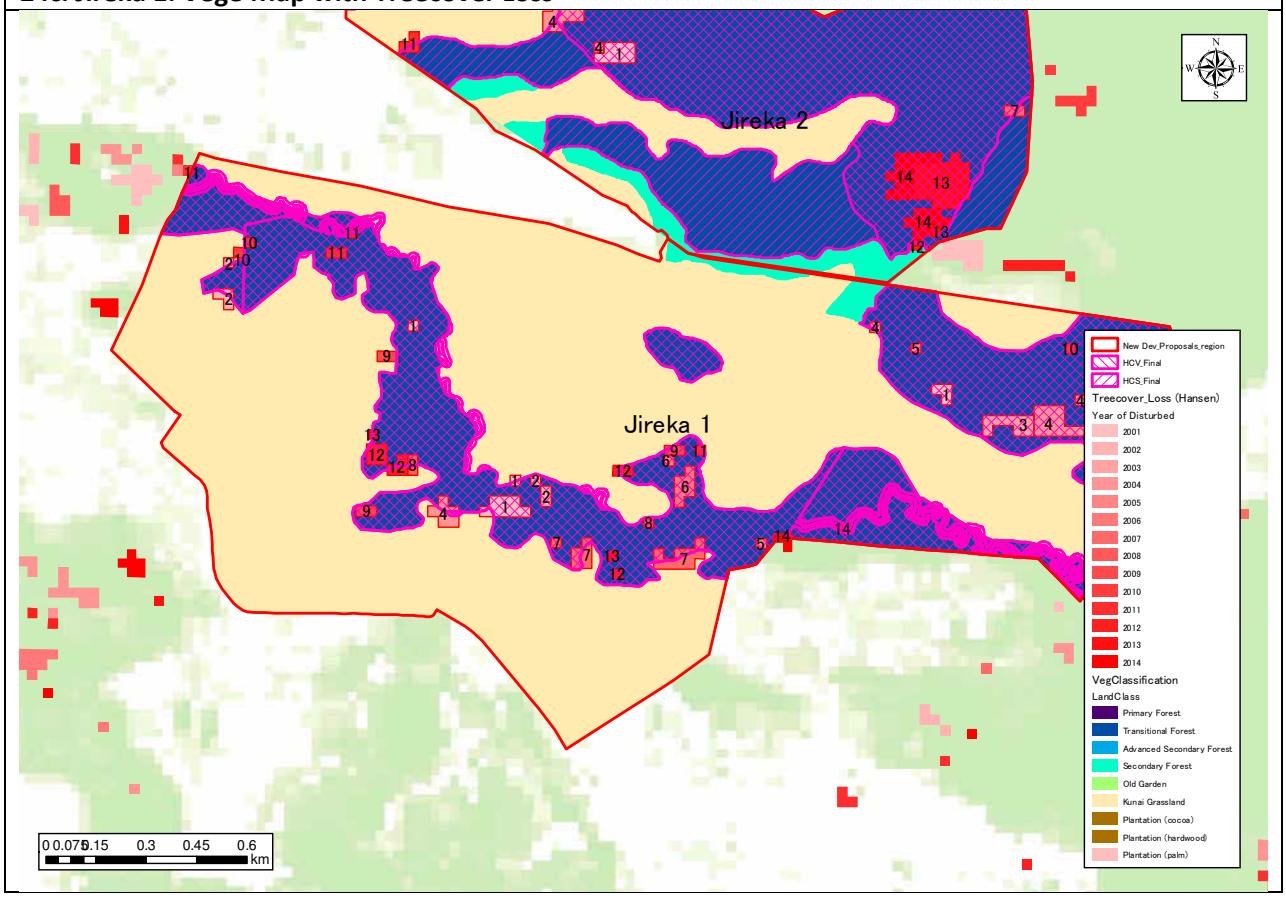
24a. Jireka 1: Landsat 2000 as Baseline Data



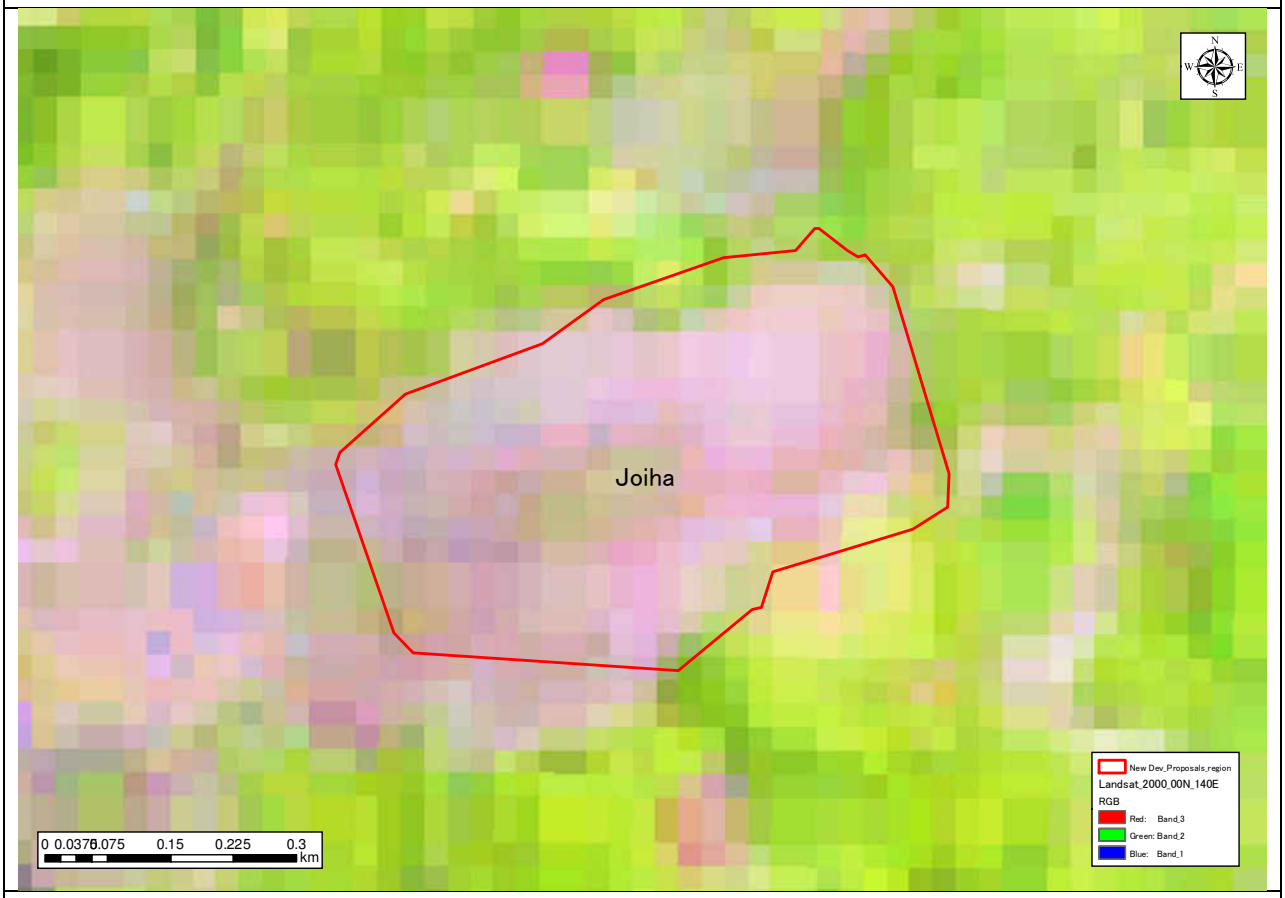
24b. Jireka 1: Landsat 2015 with Treecover Loss



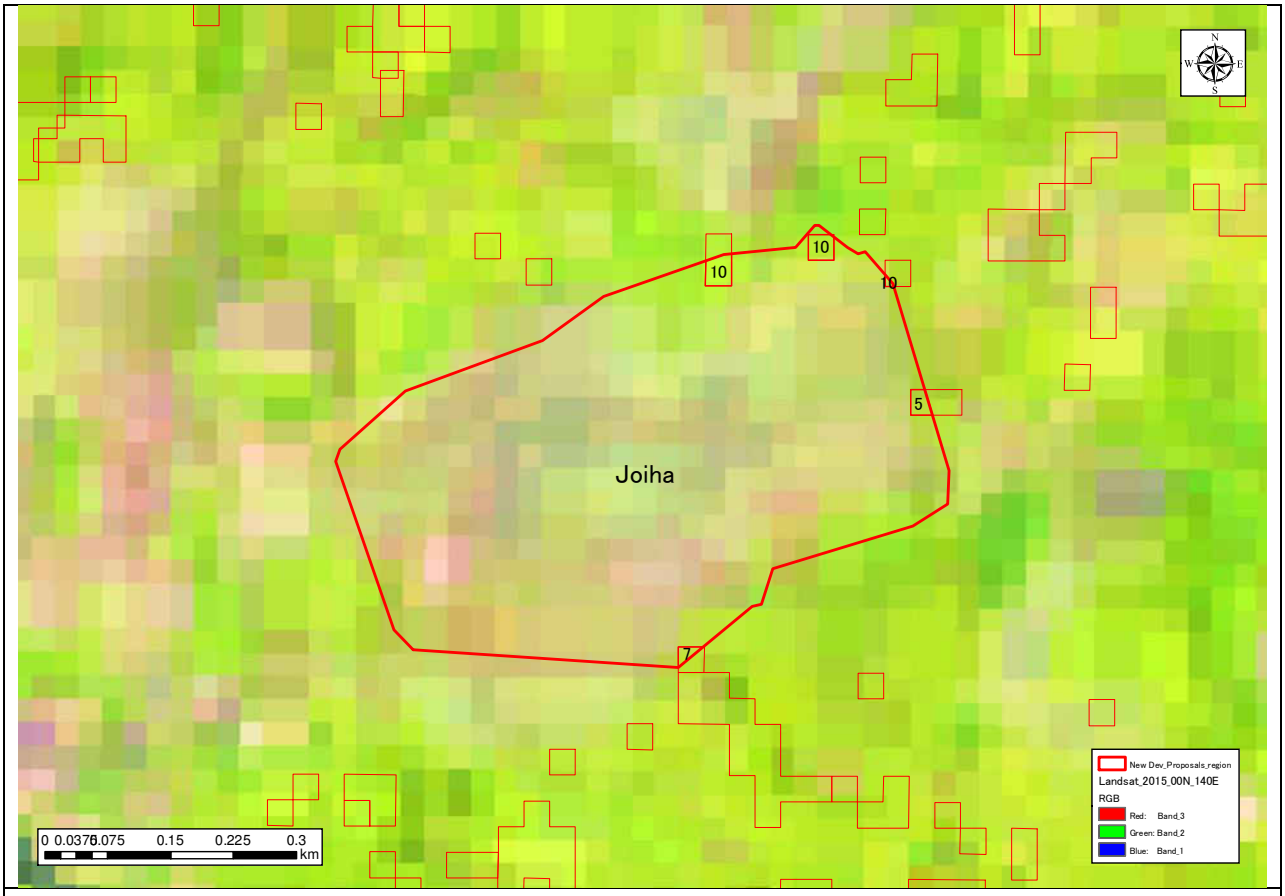
24c. Jireka 1: Vege Map with Treecover Loss



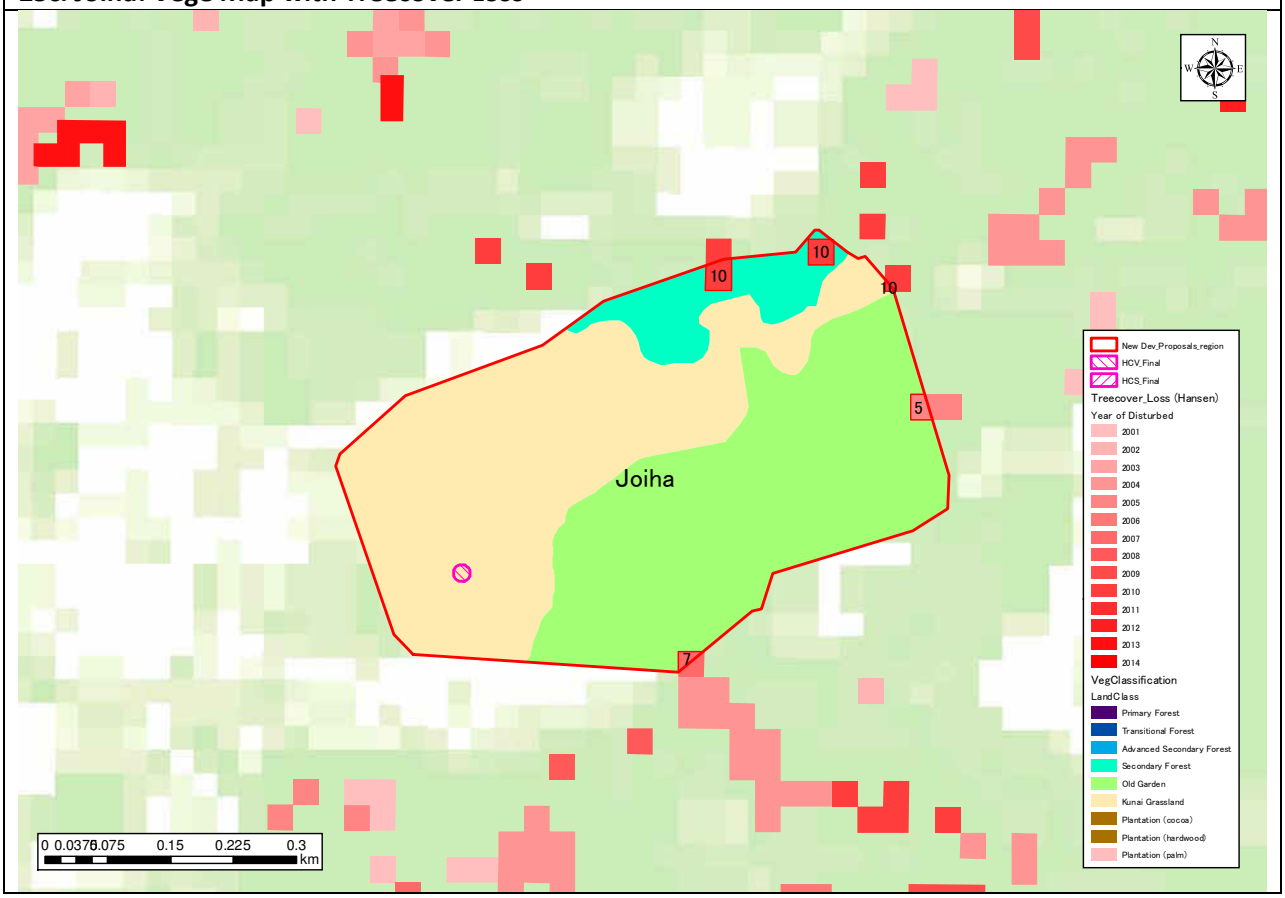
25a. Joiha: Landsat 2000 as Baseline Data



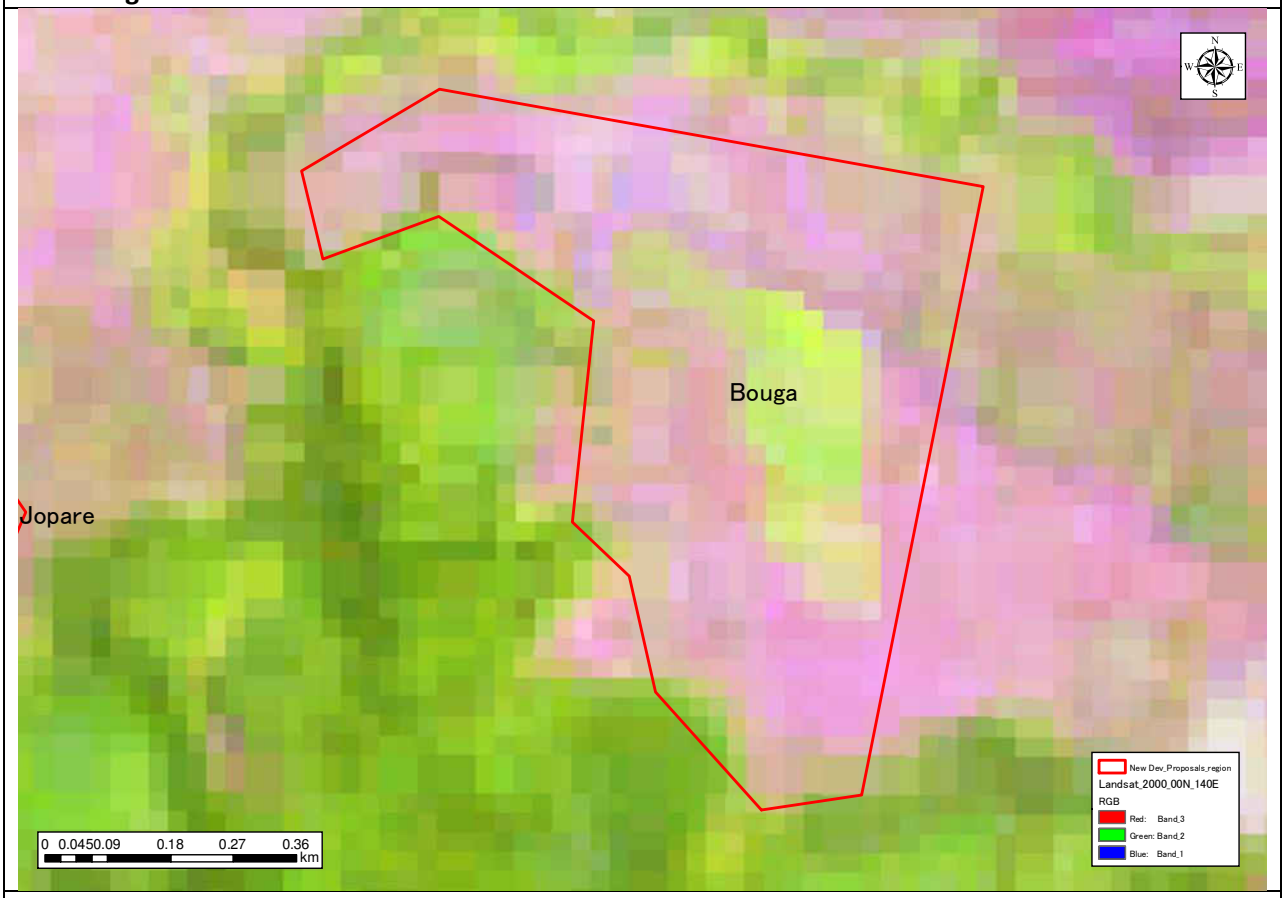
25b. Joiha: Landsat 2015 with Treecover Loss



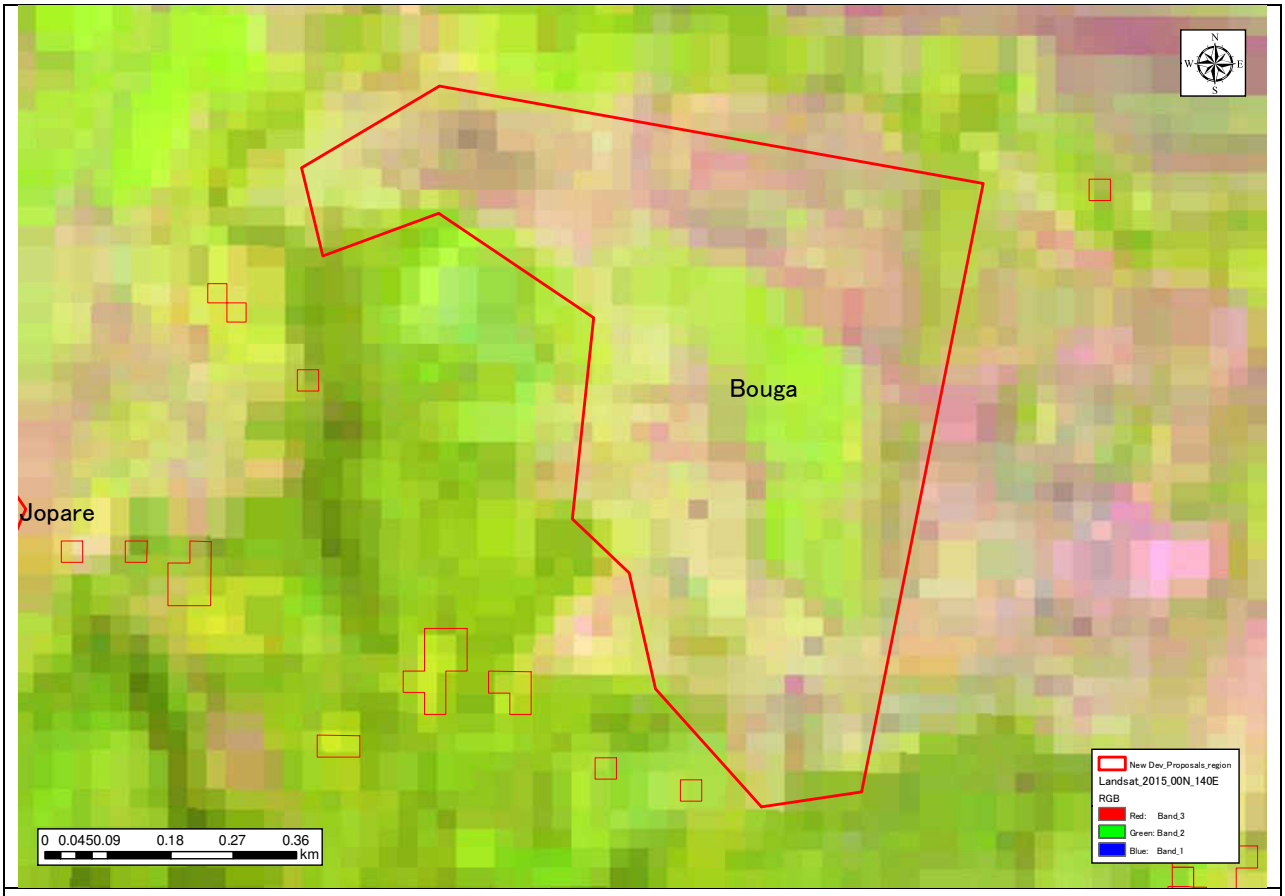
25c. Joiha: Vege Map with Treecover Loss



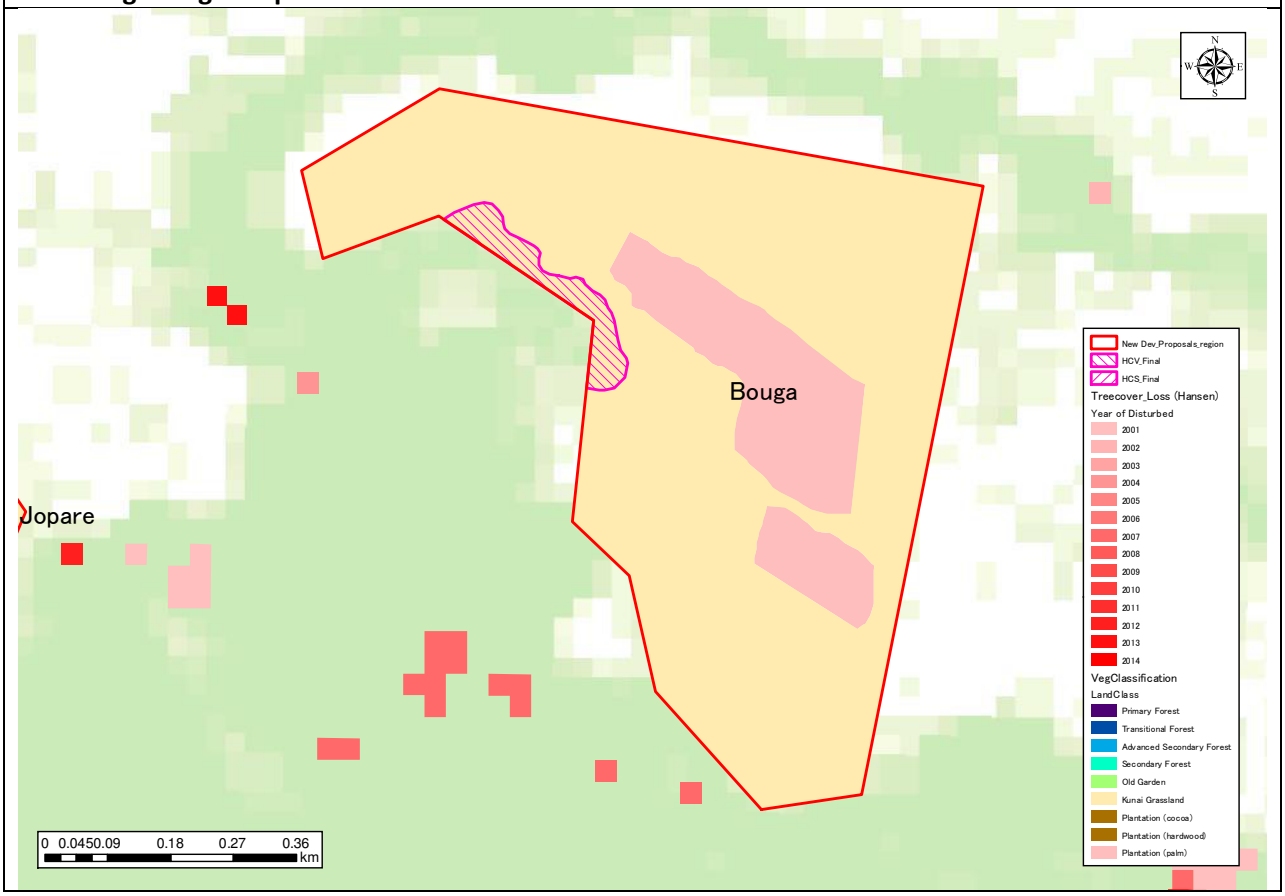
26a. Bouga: Landsat 2015 as Baseline Data



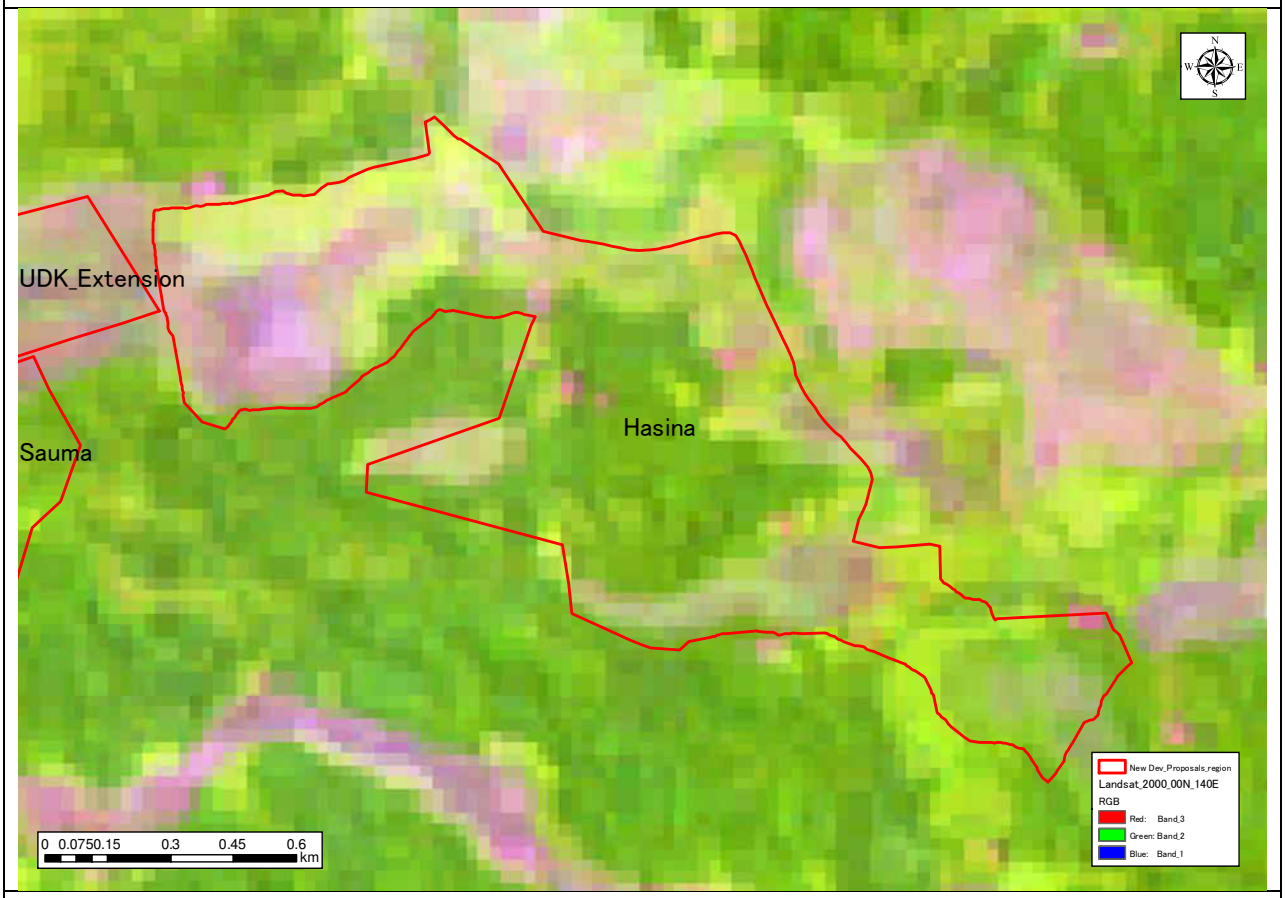
26b. Bouga: Landsat 2015 with Treecover Loss



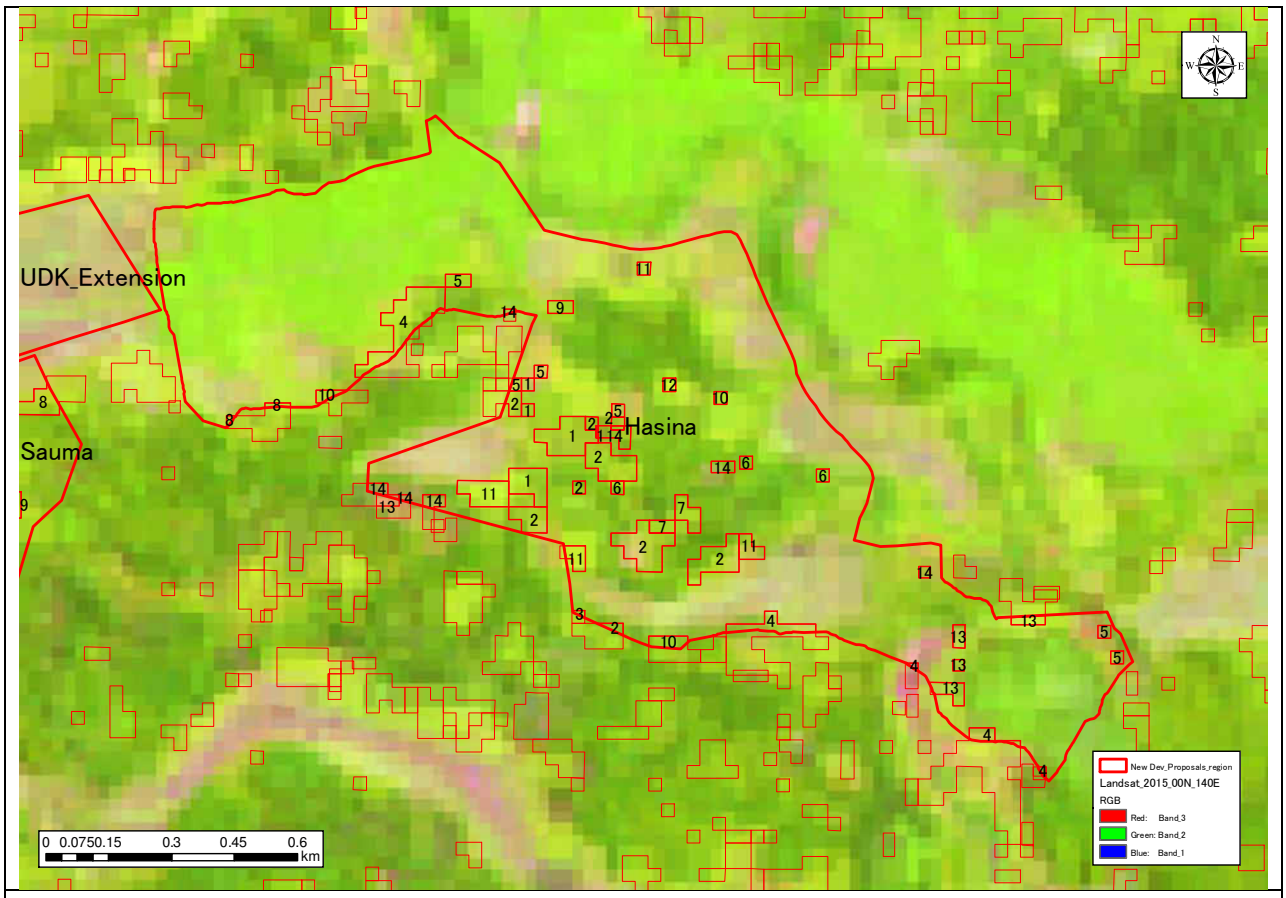
26c. Bouga: Vege Map with Treecover Loss



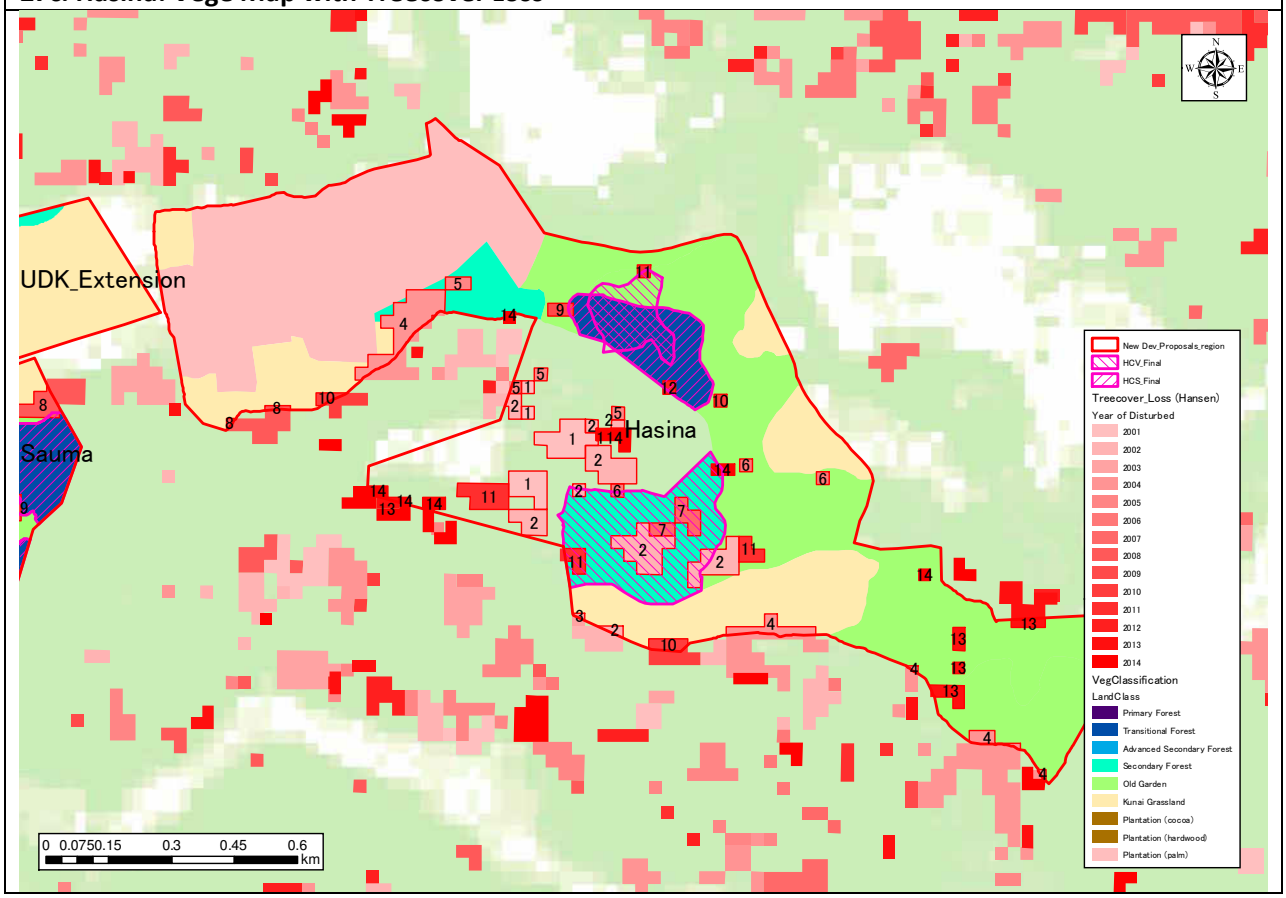
27a. Hasina: Landsat 2000 as Baseline Data



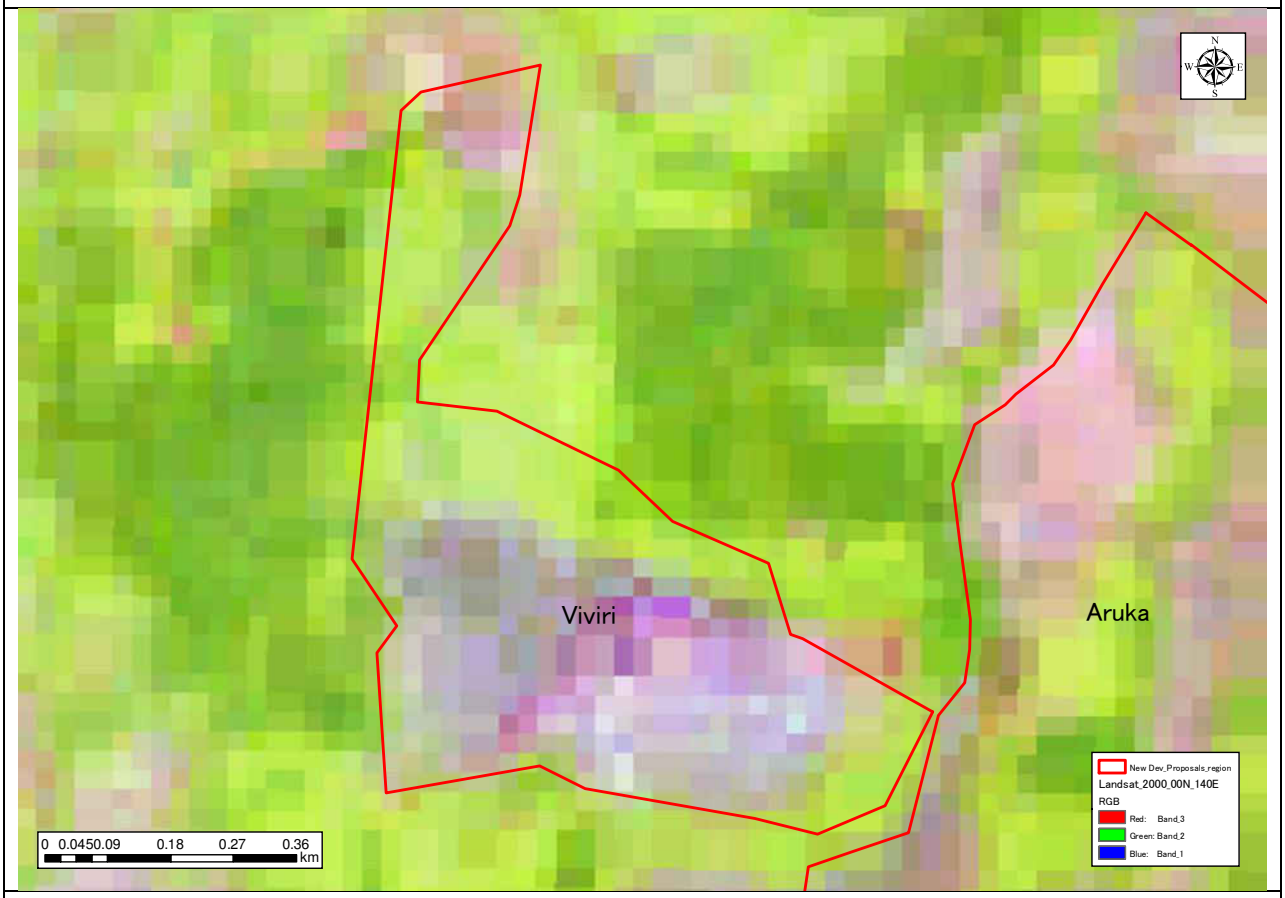
27b. Hasina: Landsat 2015 with Treecover Loss



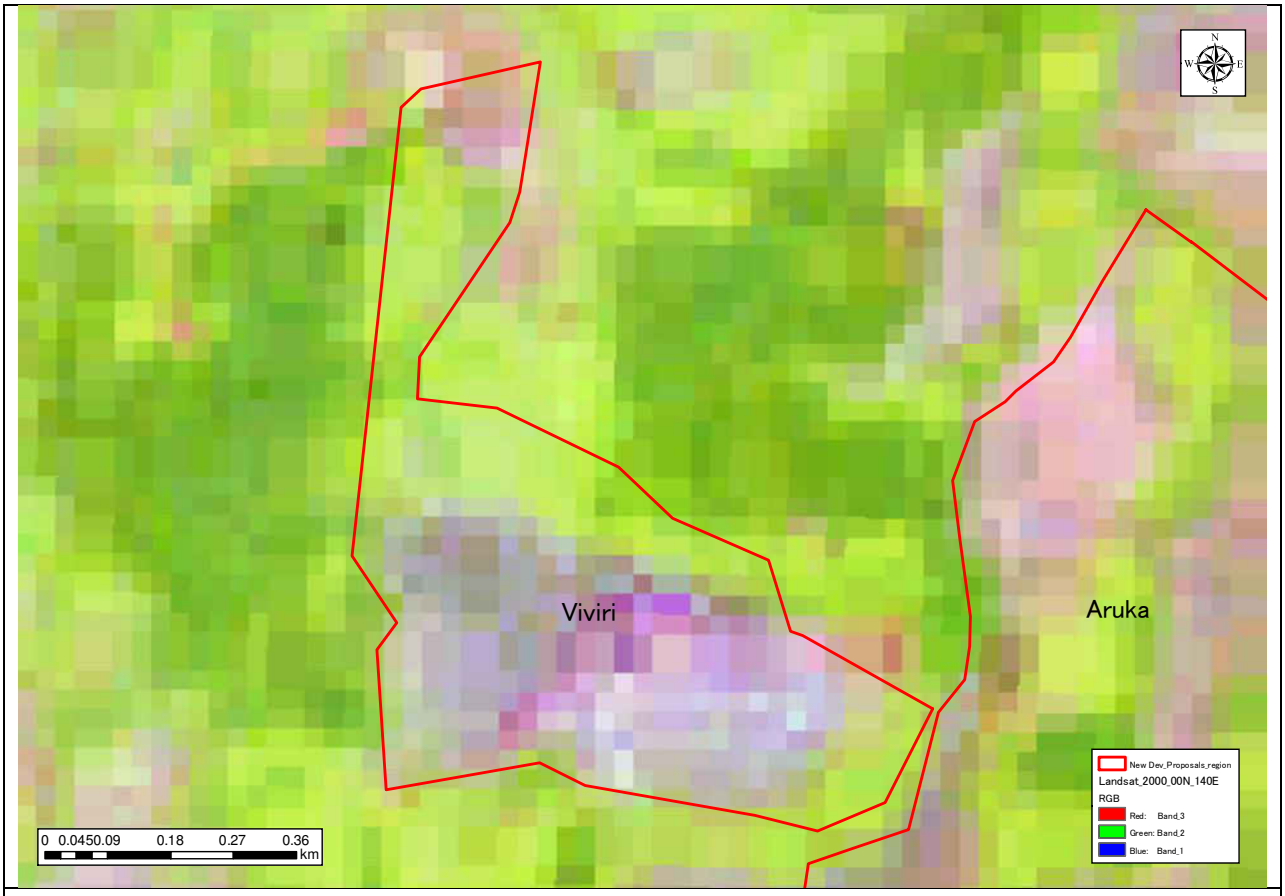
27c. Hasina: Vege Map with Treecover Loss



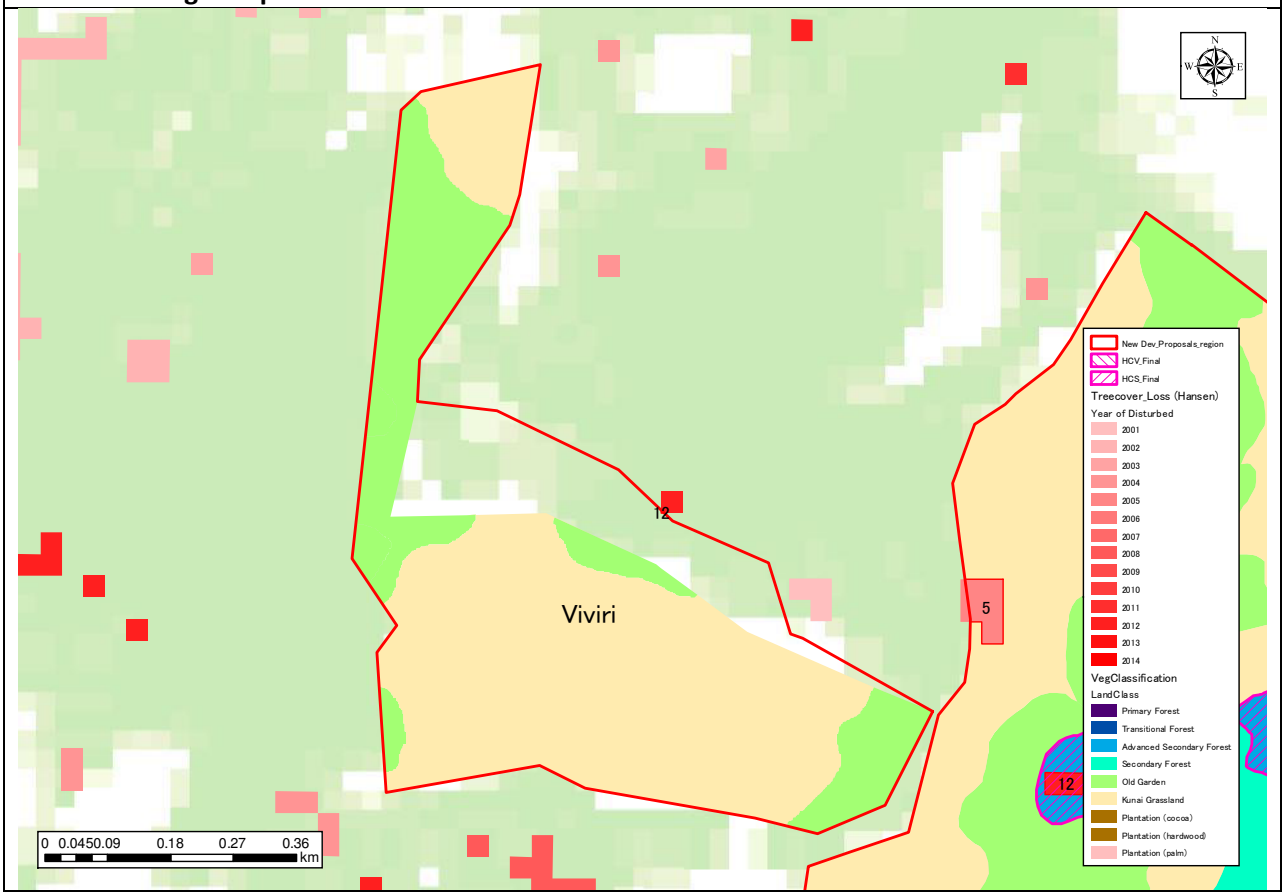
28a. Viviri: Landsat 2000 as Baseline Data



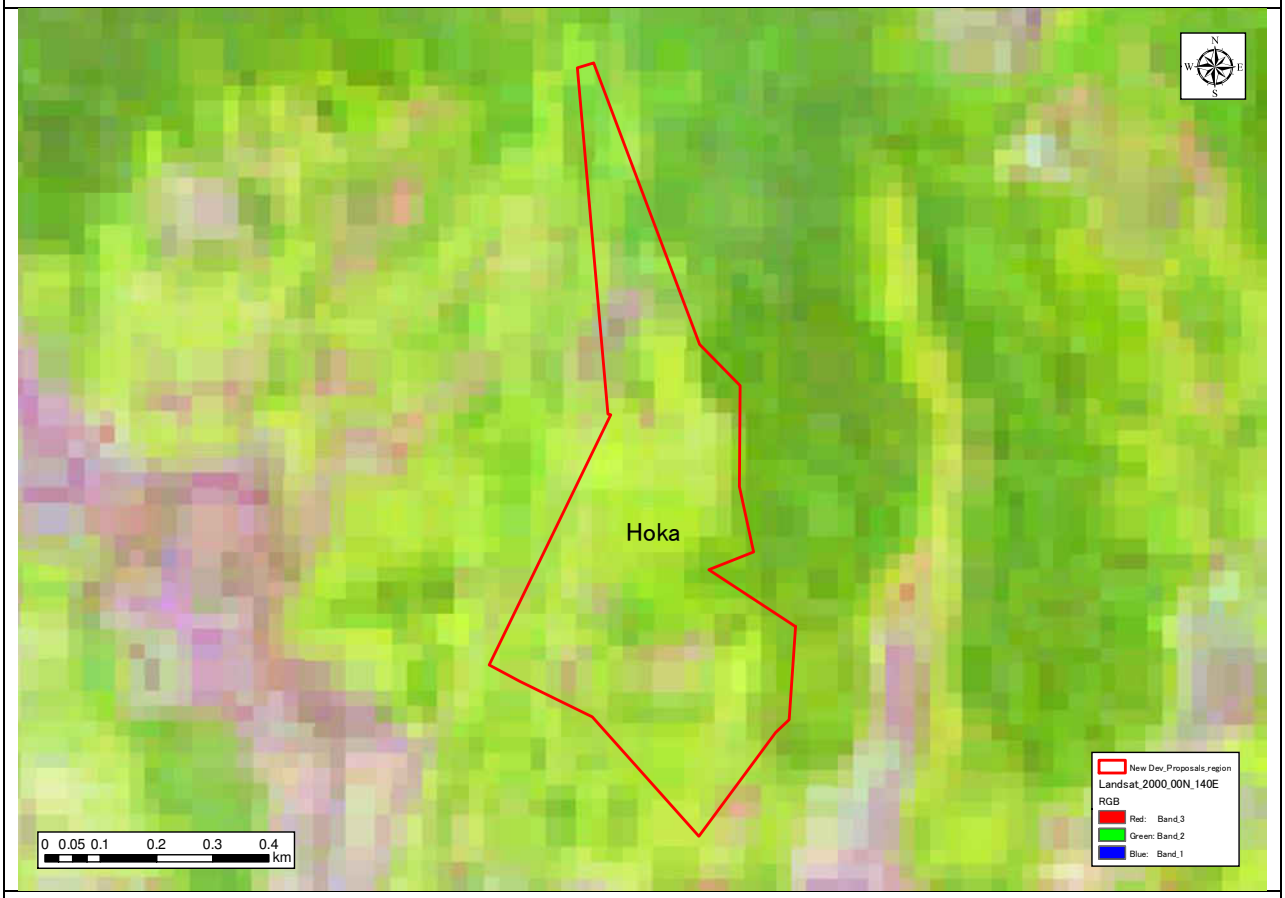
28b. Viviri: Landsat 2000 as Baseline Data



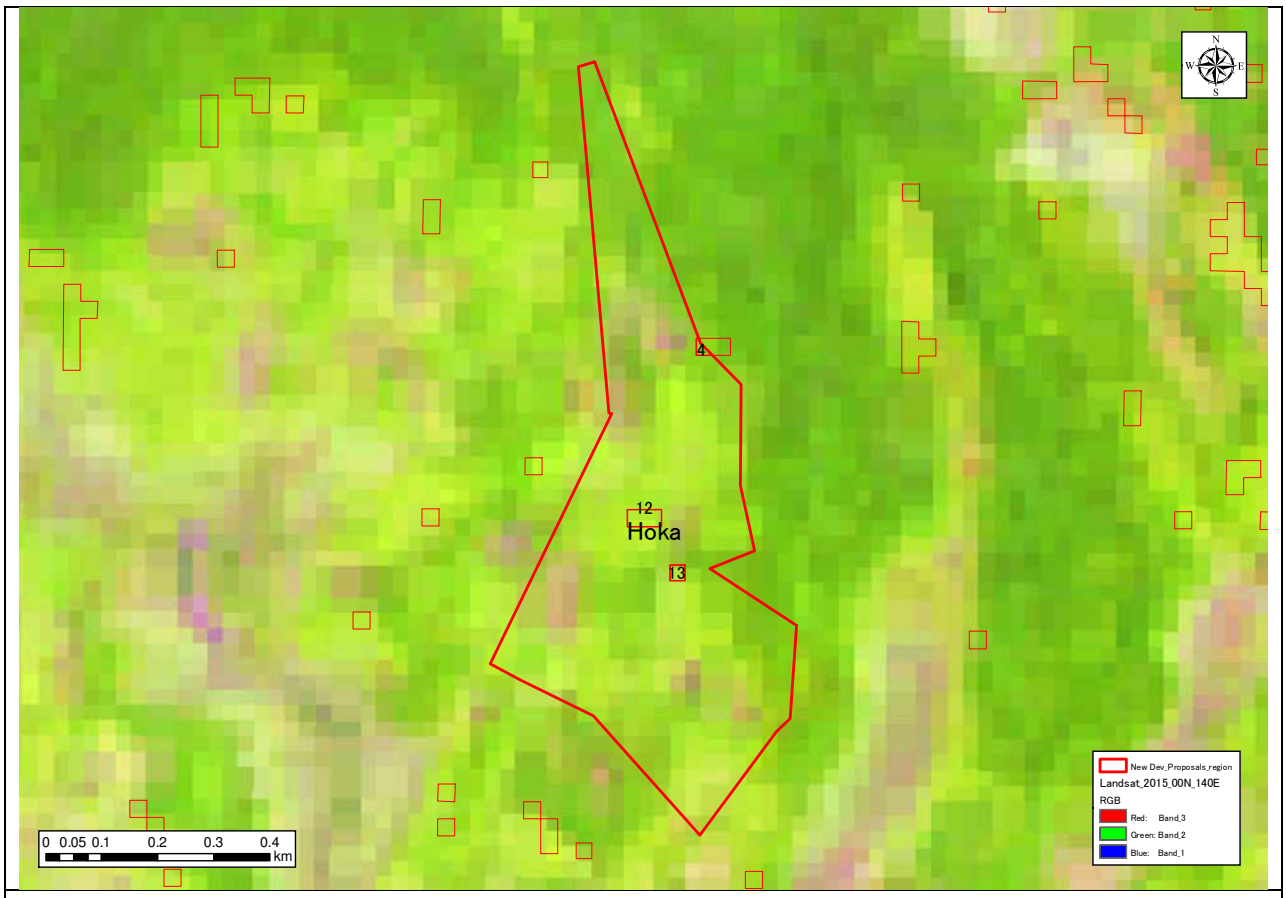
28c. Viviri: Vege Map with Treecover Loss



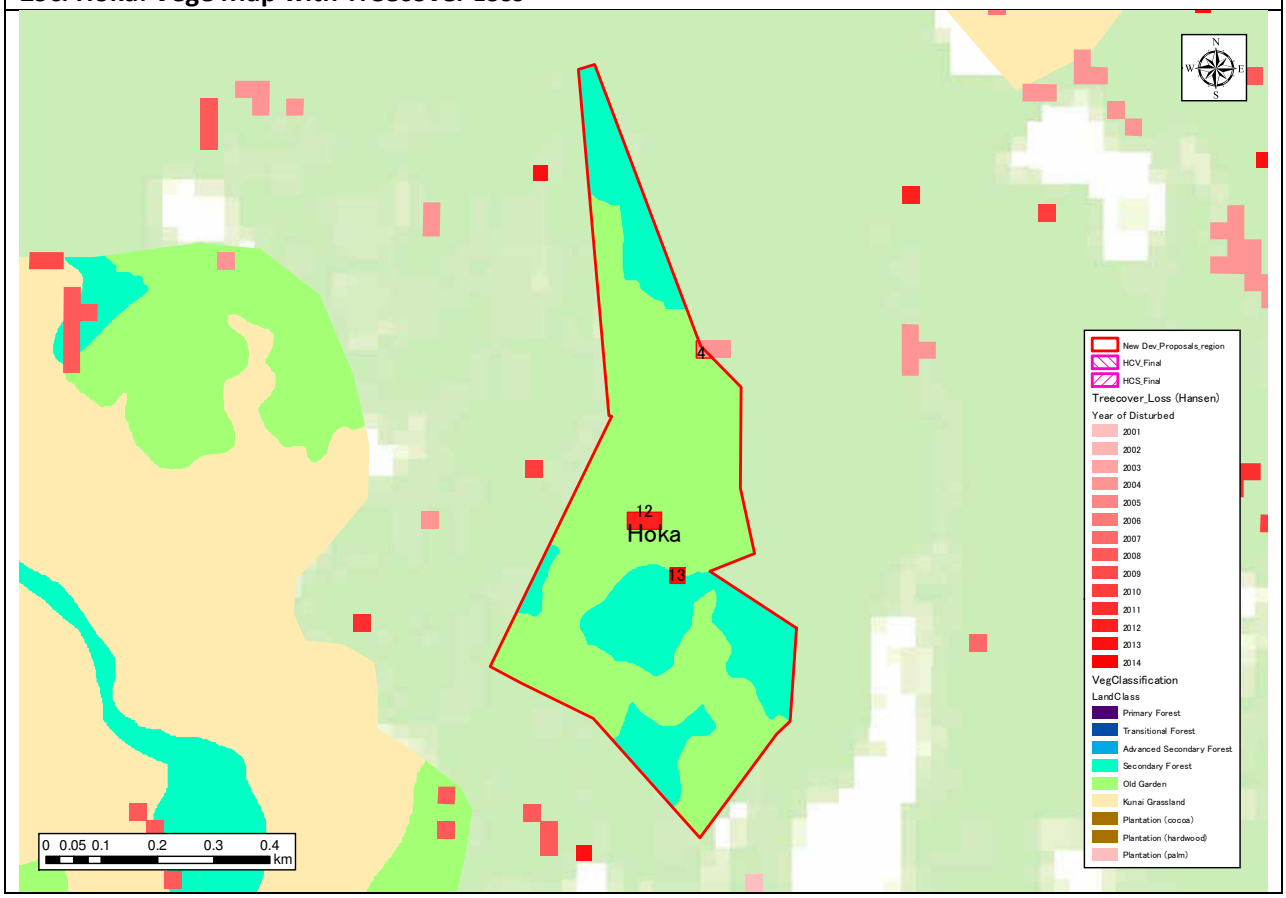
29a. Hoka: Landsat 2000 as Baseline Data



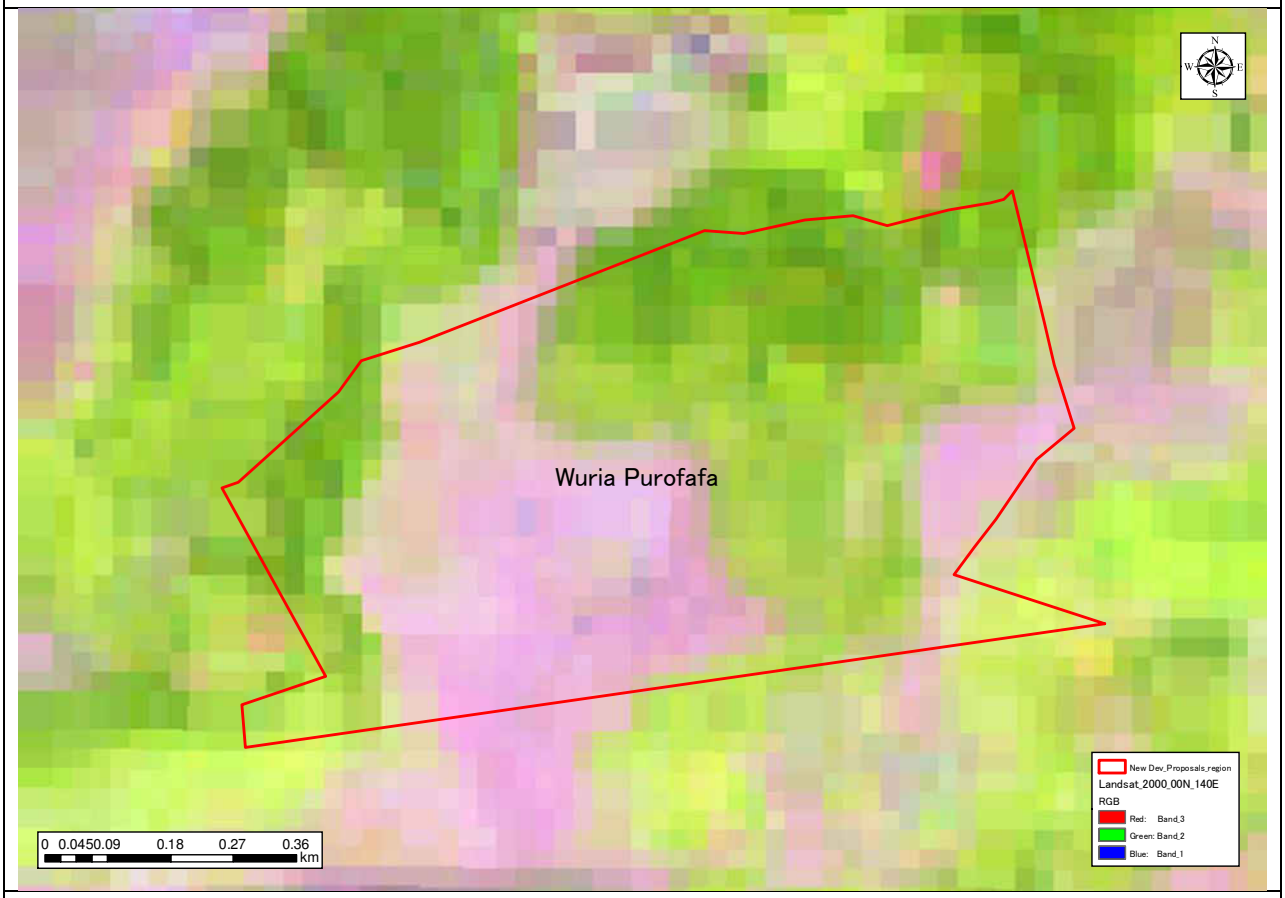
29b. Hoka: Landsat 2000 with Treecover Loss



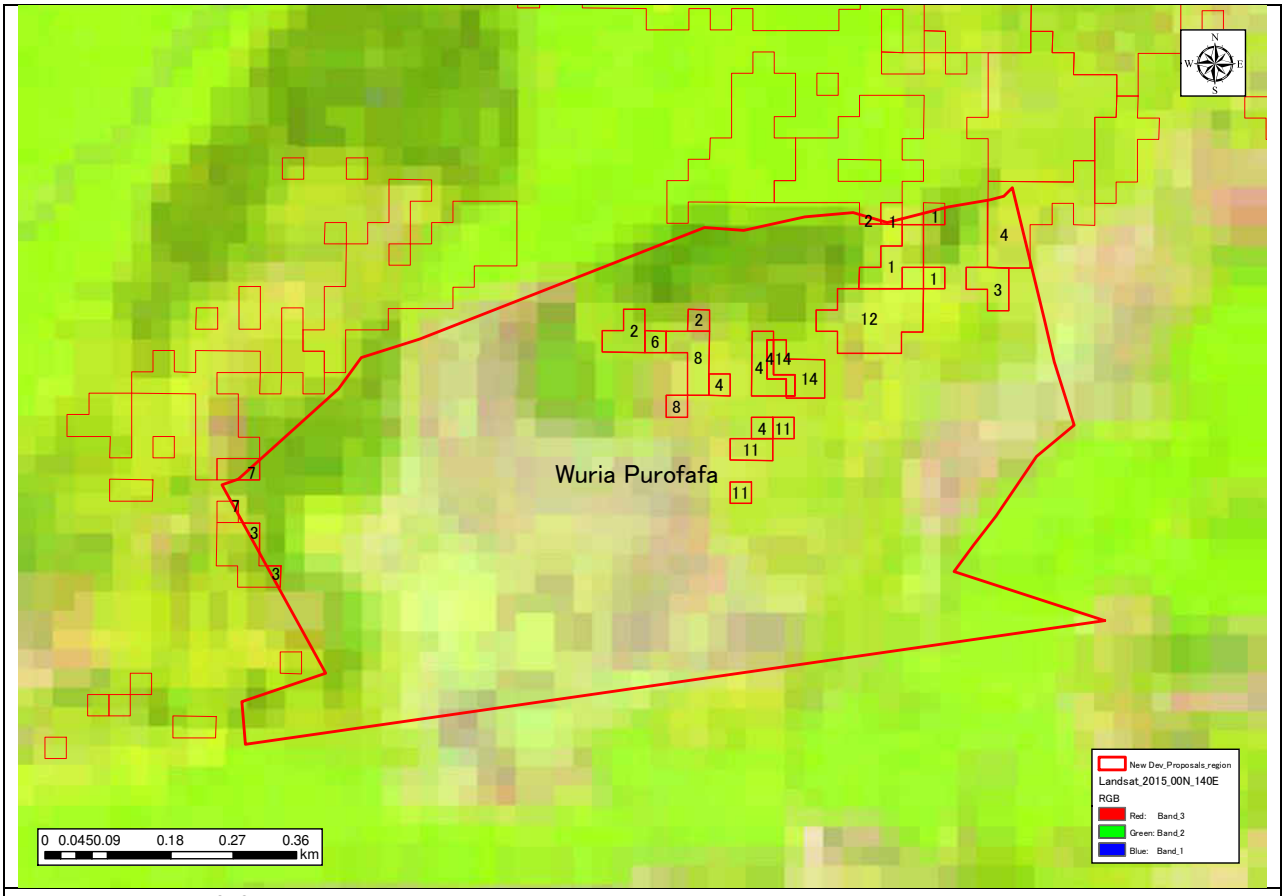
29c. Hoka: Vege Map with Treecover Loss



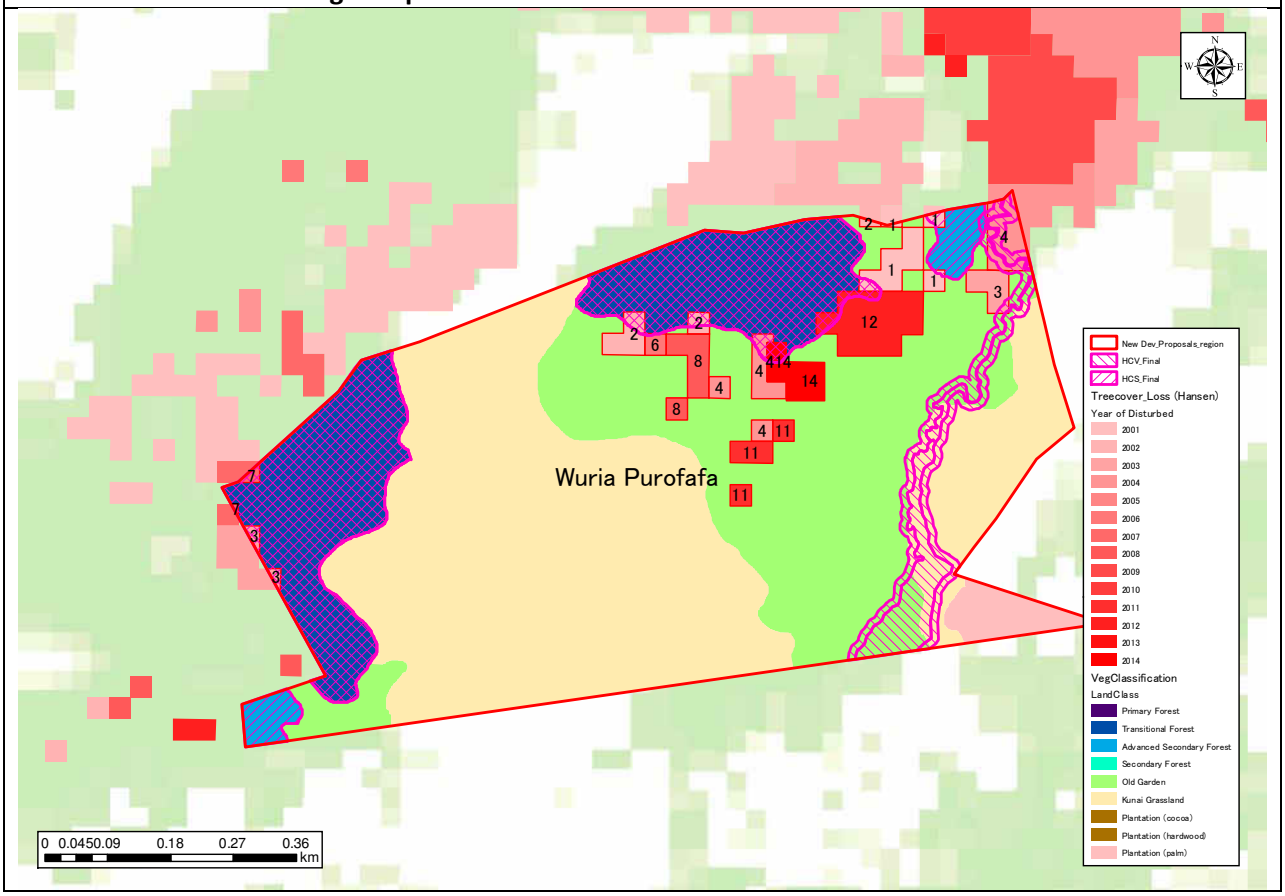
30a. Wuria Purofafa 1: Landsat 2000 as Baseline Data



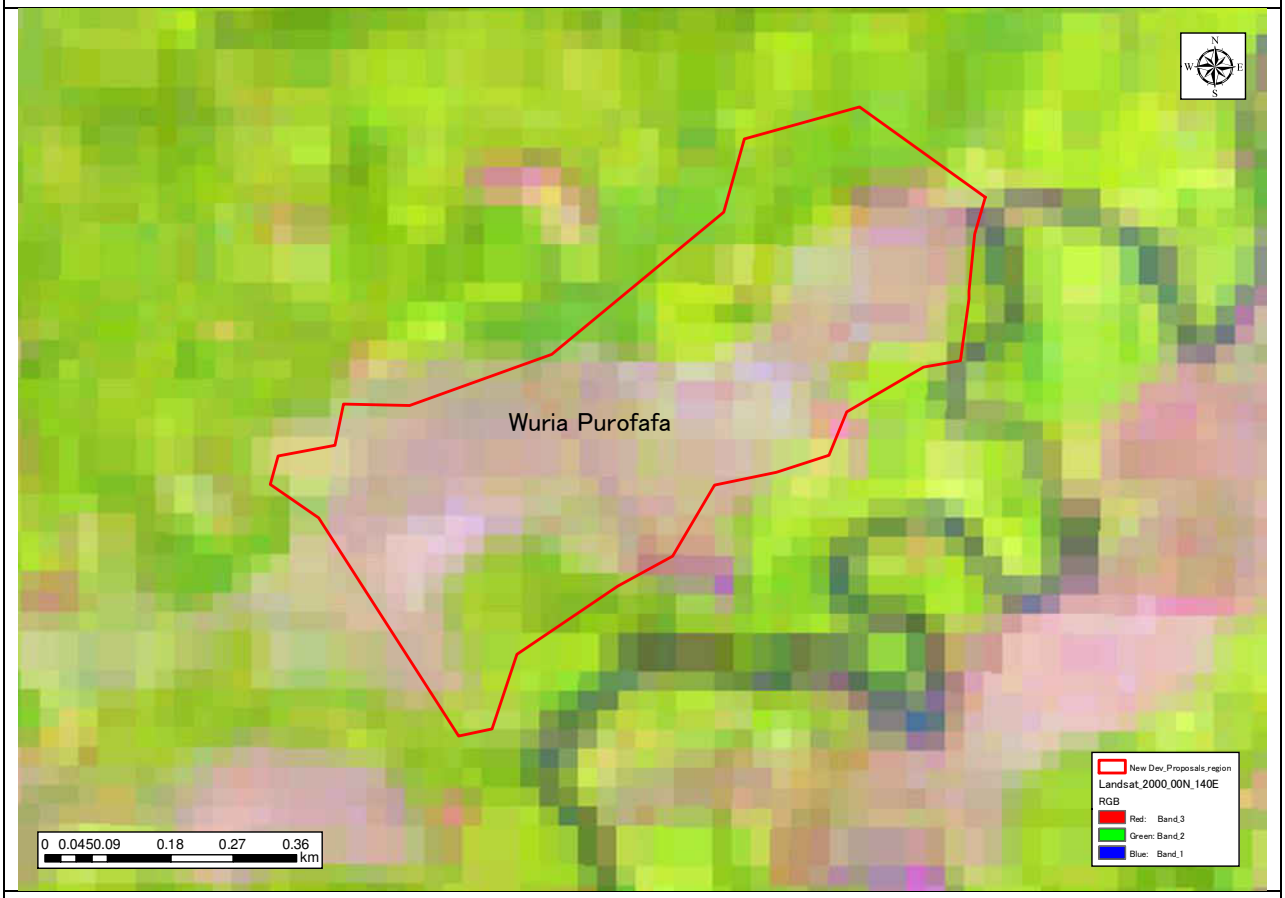
30b. Wuria Purofafa 1: Landsat2015 with Treecover Loss



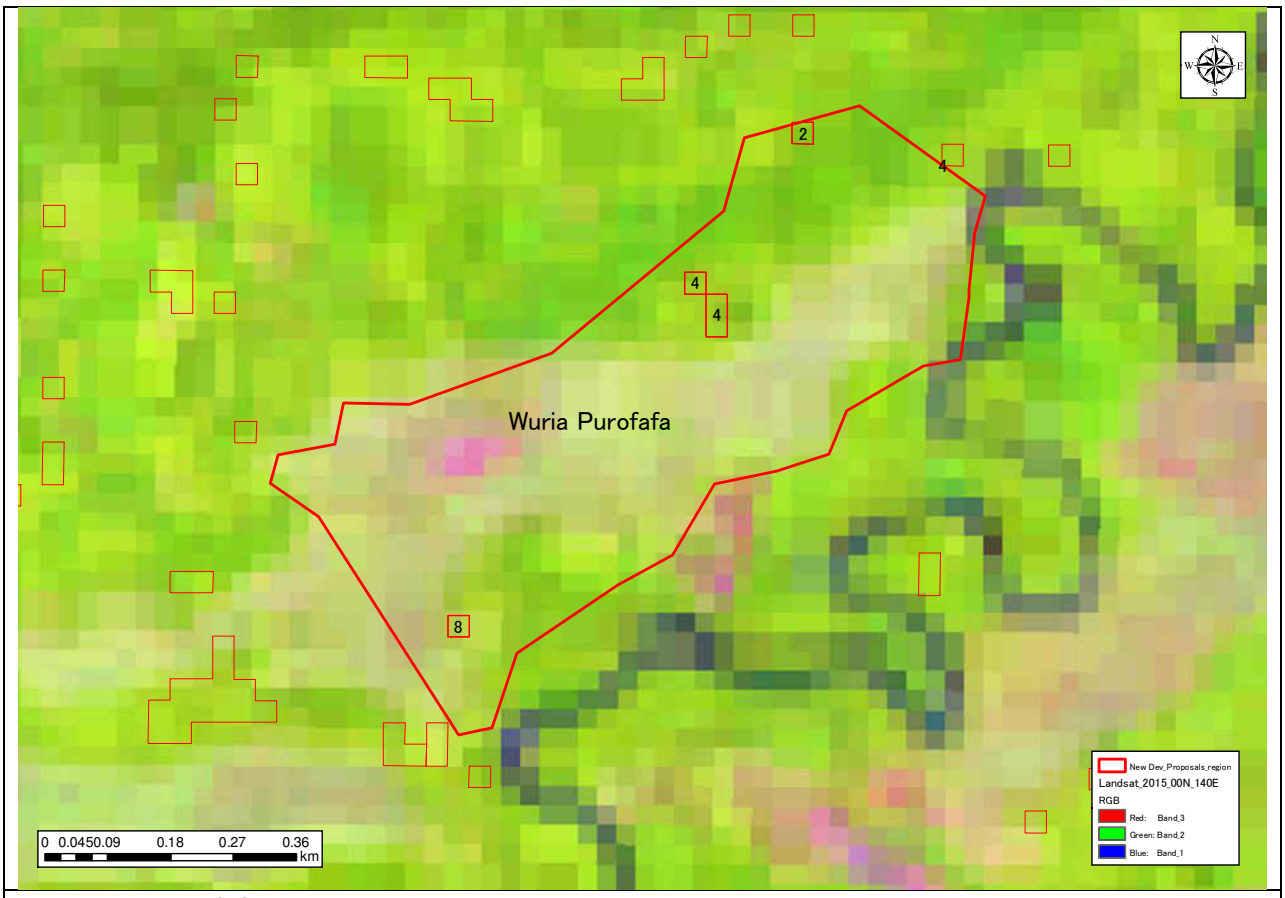
30c. Wuria Purofafa 1: Vege Map with Treecover Loss



31a. Wuria Purofafa 2: Landsat2000 as Baseline Data



31b. Wuria Purofafa 2: Landsat2015 with Treecover Loss



31c. Wuria Purofafa 2: Vege Map with Treecover Loss

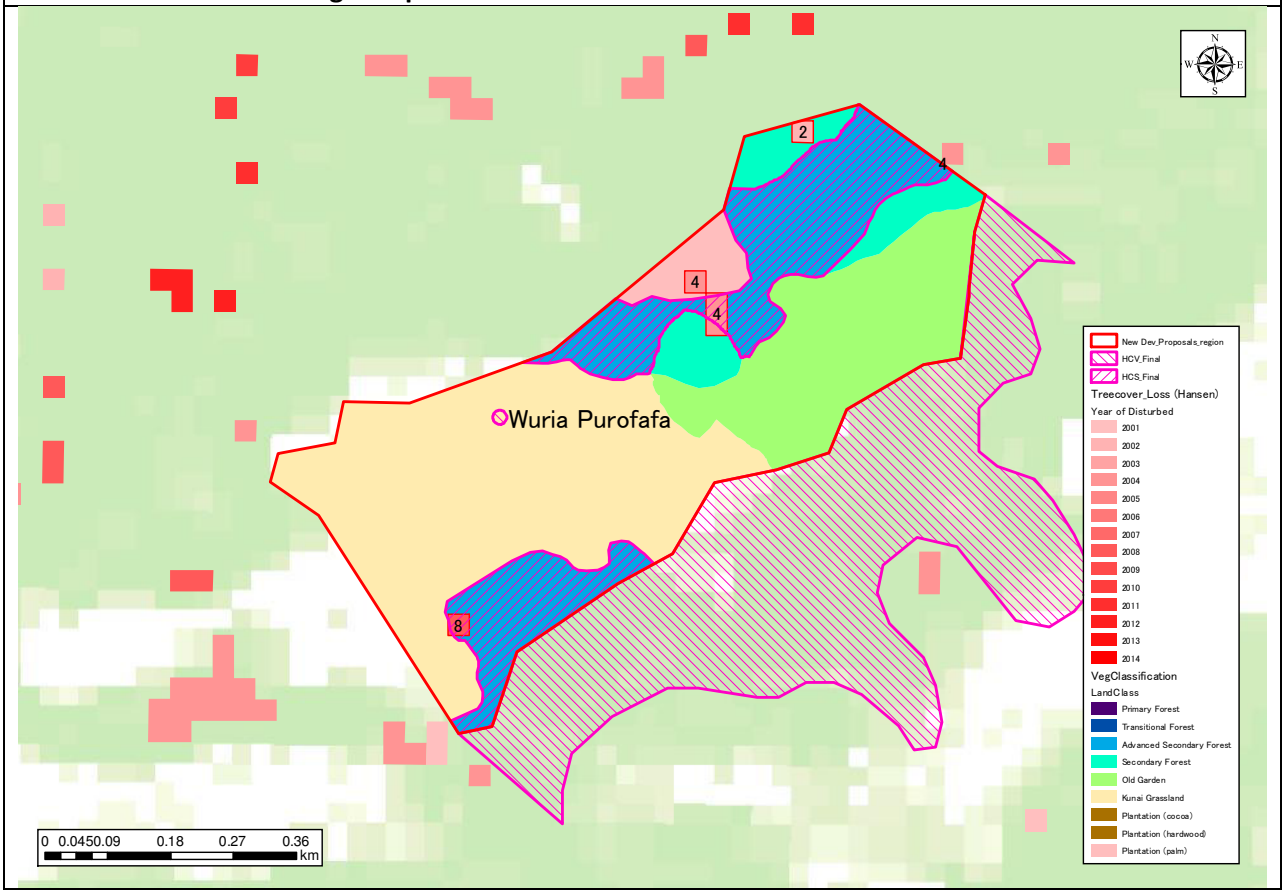


Table 11. Summary of Tree Cover Loss in Proposed Areas

ID	SITE_NAME	AREA	Y2001	Y2002	Y2003	Y2004	Y2005	Y2006	Y2007	Y2008	Y2009	Y2010	Y2011	Y2012	Y2013	Y2014	TOTAL
1	Serembe	426	2.356033	2.595579	1.695176	1.962985	0	2.089578	0	3.087462	1.514915	2.625264	2.241731	1.494933	3.301259	1.672519	26.637434
2	Aruka	101	0	0.010206	0.002558	0.093887	0.40408	0.154773	0.034847	0.628256	0.002506	0.511745	1.081893	0.187774	0.076048	0.684433	3.873006
3	Ufenapa	124	0	1.406561	0.26291	4.869003	1.779996	0.187749	0.098623	0.469379	0	2.68885	5.914188	2.19923	4.486326	1.079505	25.44232
4	Sigu	47	0.093881	0	0	0	0	0	0	0	0	0	0	0.731625	0.076043	0.04043	0.941979
5	Mohamei	56	0	0.276677	0	0	0	0	0.093856	0	0	0	0	0.469283	0.210721	0.532168	1.582705
6	Ase	33	0	0.274016	0	0	0	0	0	0	0	0.187786	0.238999	0.407558	0.396612	0.532379	2.03735
7	BBGI	343	0.37521	0.187608	0.375218	0.150333	0	0.750421	0.323134	0.217502	0.187611	0.37522	0	0.286996	1.092868	0.882926	5.205047
8	Soropa	584	0	0.0939	0.093897	2.723016	0	0.751207	0	1.40851	0.187802	0	0	0.281697	0	0	5.540029
9	Akute	58	0.938604	0	0.25485	0.097638	0	0	0	0	0.296068	0	0	0	0.000938	1.553202	3.1413
10	Boruga Pusute	74	0	0	0	0	0	0	0	0	0.093882	0	0	0	0	0	0.093882
11	Darau	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Hoemba	59	0	0	0	0	0	0	0	0	0	0	0.187746	0	0.076036	0	0.263782
13	Hopanda	41	0.776506	0	0	0.027029	0	0	0	0.657098	0.657096	0	0.563231	0.62833	0.532247	0.608286	4.449823
14	Sauma	23	0	0	0	0	0	0	0	0.525082	0.938731	0	0	0	0	0	1.463813
15	Sipari	70	0	0	0	0	0	0	0	0.283479	0.281645	0.144465	0	0	0	0	0.709589
16	Isatapa	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Bana	59	0	0.187751	0	0	0	0	0.187752	0	0.375503	0.32685	1.12651	0	0.367694	0	2.57206
18	Jireka 2	147	0.659708	0	0	1.126418	0	0	0.187737	0	0	0	0.295238	0.187736	2.280985	2.813217	7.551039
19	Takoh	43	0	0	0	0	0	0.154302	0	0	0	0	0.281601	0	0.152065	0	0.587968
20	Mena Extension	23	0.377555	0	0	0	0	0	0	0	0	0	0	0	0	0	0.377555
21	UDK_Extension	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Bakito Extension	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Sesehota	84	0.093857	0	0	0.000937	0	0	0	0	0.015011	0	0.187713	0.093857	0	0	0.391375
24	Jireka 1	317	1.220248	0.657057	0.75093	2.000478	0.187732	0.657056	2.440501	0.281595	0.563191	0.281599	0.572287	1.417878	0.152061	0.159938	11.342551
25	Joiha	25	0	0	0	0	0.066217	0	0.036583	0	0	0.205364	0	0	0	0	0.308164
26	Bouga	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Hasina	130	1.783611	3.76268	0.034405	2.254939	0.637633	0.281623	0.563245	0.10009	0.18775	0.46482	1.274857	0.093875	0.713129	0.879352	13.032009
28	Viviri	38	0	0	0	0	0	0	0	0	0	0	0	0.001063	0	0	0.001063
29	Hoka	32	0	0	0	0.045224	0	0	0	0	0	0	0	0.187784	0.076052	0	0.30906
30	Wuria Purofafa	101	0.640115	0.49741	0.365603	1.366564	0	0.09388	0.055733	0.563286	0	0	0.37552	1.12657	0	0.456258	5.540939
31	Jopare	23	0	0	0	0	0	0	0	0.469314	0	0	0	0	0	0	0.469314
	TOTAL	3,262	9.315328	9.949445	3.835547	16.718451	3.075658	5.120589	4.022011	8.691053	5.301711	7.811963	14.341514	9.796189	13.991084	11.894613	123.865156
	RATE		0.29%	0.31%	0.12%	0.51%	0.09%	0.16%	0.12%	0.27%	0.16%	0.24%	0.44%	0.30%	0.43%	0.36%	3.80%