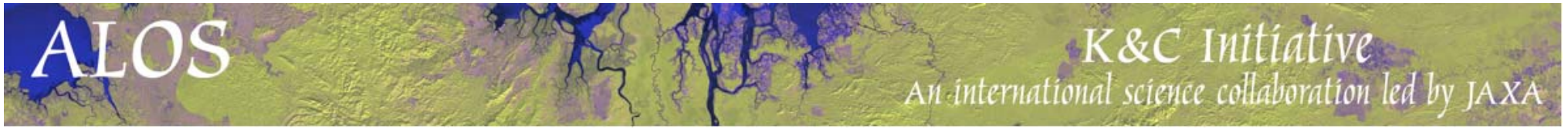


K&C Phase 3 – Brief project essentials

Land Cover Mapping of Sulawesi using ALOS PALSAR

Mulyanto Darmawan

Center for Land Resources Survey
National Coodinating Agency for Surveys and Mapping
(Bakosurtanal)

Science Team meeting #16 – Phase 3 Kick-off
JAXA TKSC/RESTEC HQ, Tsukuba/Tokyo, October 17-21, 2011

INTRODUCTION

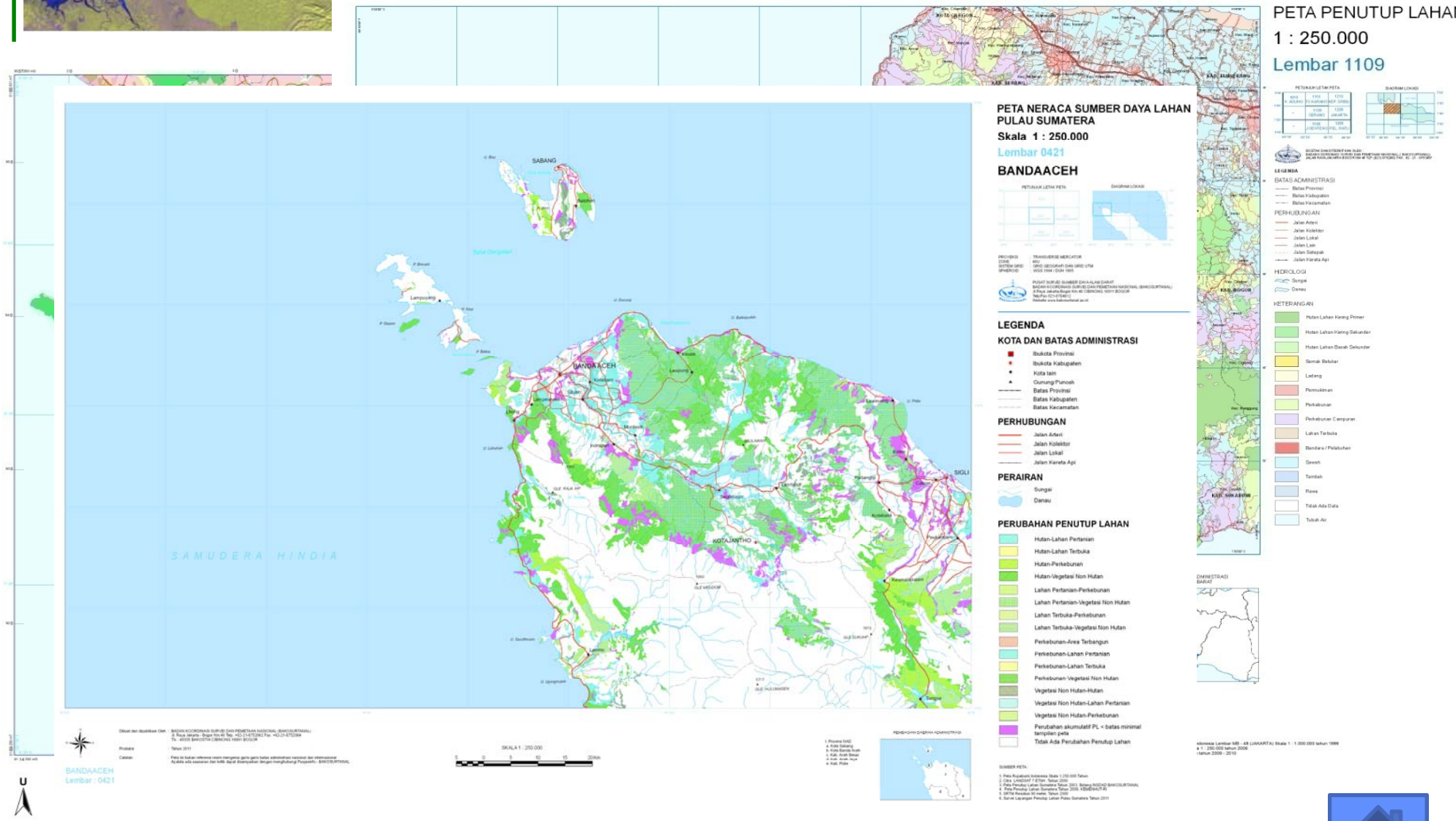
- JAXA (Japan Aerospace Exploration Agency) has successfully launched the Advanced Land Observing Satellite (ALOS) in January 2006, which carries two optical instrument-PRISMS and AVNIR- and the Phased Array type L-band Synthetic Aperture Radar (PALSAR).

- Although ALOS Program was terminated in April 2011, but as part of the international commitment, the Kyoto and Carbon Initiative which started in 2002 and was completed in January 23 2010 for phase 2, JAXA intends to continue for K&C Phase 3 in April 2011.

- K&C phase 3 is the Challenge for international working group cooperation for collaborative program on land and forest cover monitoring

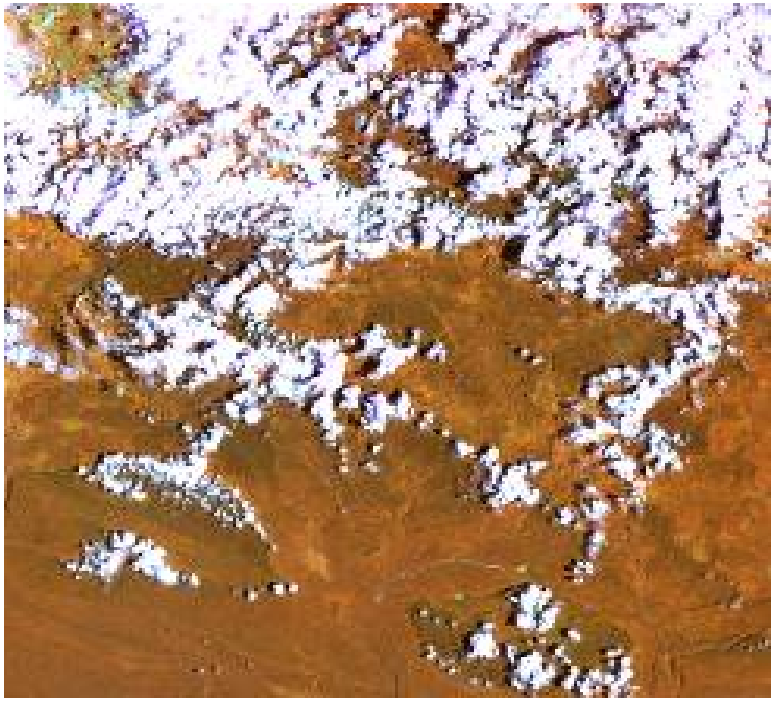
Why Landcover: The important of Landcover map

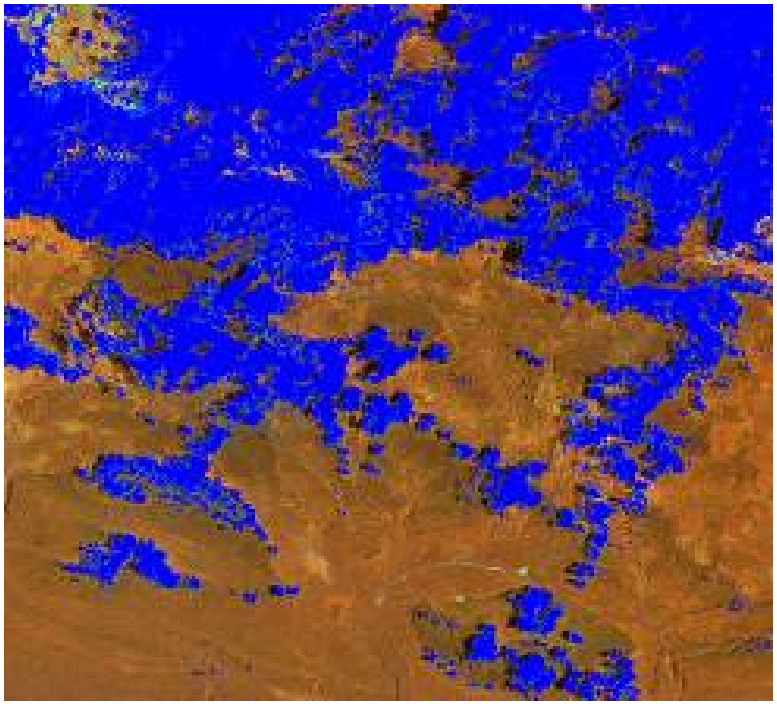
- Land cover mapping in Indonesia is very important, and has been performed periodically By BAKOSURTANAL to produce one layer of the National Topographic Map (Peta Rupabumi Indonesia) at various scale and to support other thematic mapping.


PETA NERACA SUMBER DAYA LAHAN
PULAU SUMATERA
Skala 1 : 250.000
Lembar 0421
BANDAACEH
LEGENDA
KOTA DAN BATAS ADMINISTRASI
PERHUBUNGAN
PERAIRAN
PERUBAHAN PENUTUP LAHAN
SAMUDERA HINDIA
BANDAACEH
SABANG
KOTAJANTHO
SIGLI
PETA PENUTUP LAHAN
1 : 250.000
Lembar 1109

Cloud problem

- We have been working very hard to make cloud masking as much as possible, some manual digitizing is still required as well as automatic.



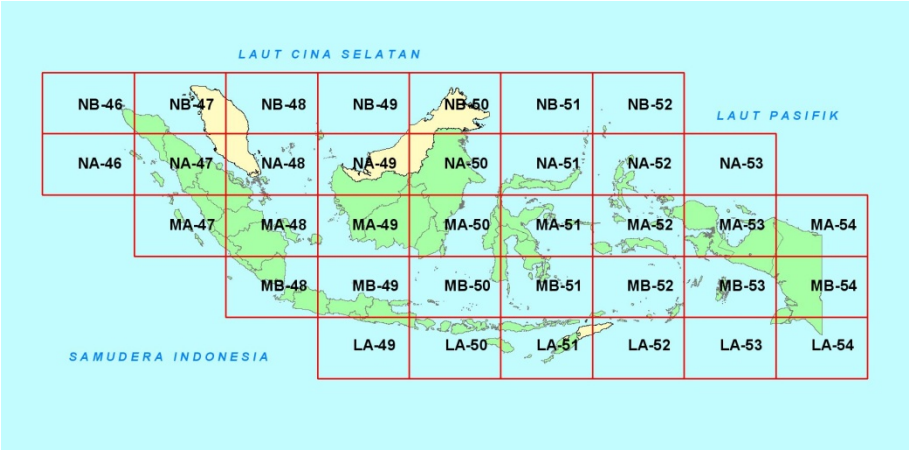


The PALSAR is the Challenge for Landcover mapping

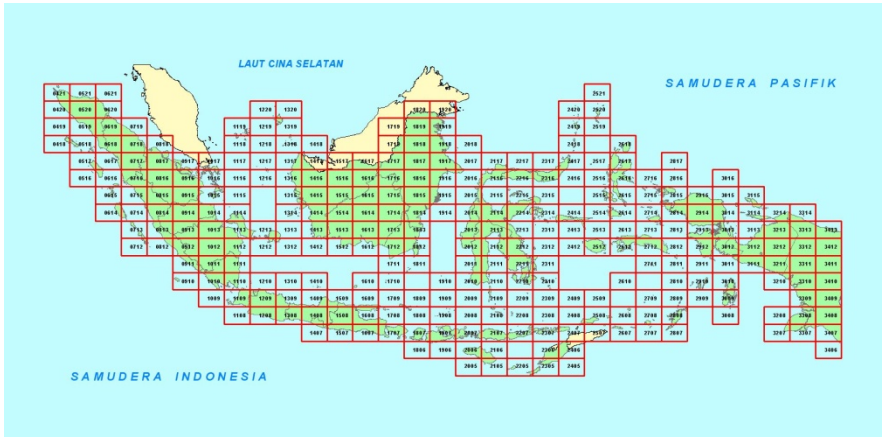
- Land cover mapping in Indonesia mainly use Optical remote sensing data. However due to geographical position of Indonesia the application of optical remote sensing for land cover mapping is hampering by cloud cover.
- The availability of ALOS which carries three on-board sensors including the Phased Array type L-band Synthetic Aperture Radar (PALSAR) is the challenge to aim at day-and-night and all-weather observation for landcover mapping.

SYSTEMATICAL MAPPING SCALES

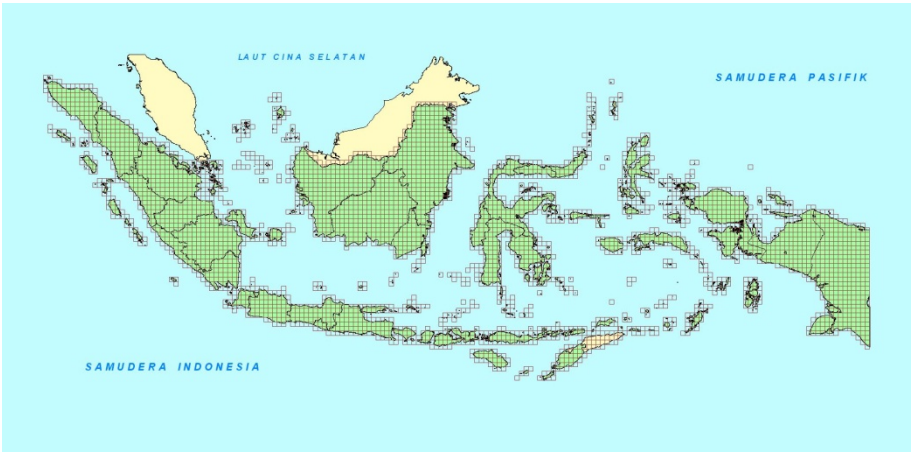
Skala 1 : 1.000.000 – 36 sheets



Skala 1 : 250.000 – 314 sheets



Skala 1 : 50.000 – 3861 sheets



Scale 1 : 25.000 – 1734 sheets

Chapter 1: Project Area : Sulawesi

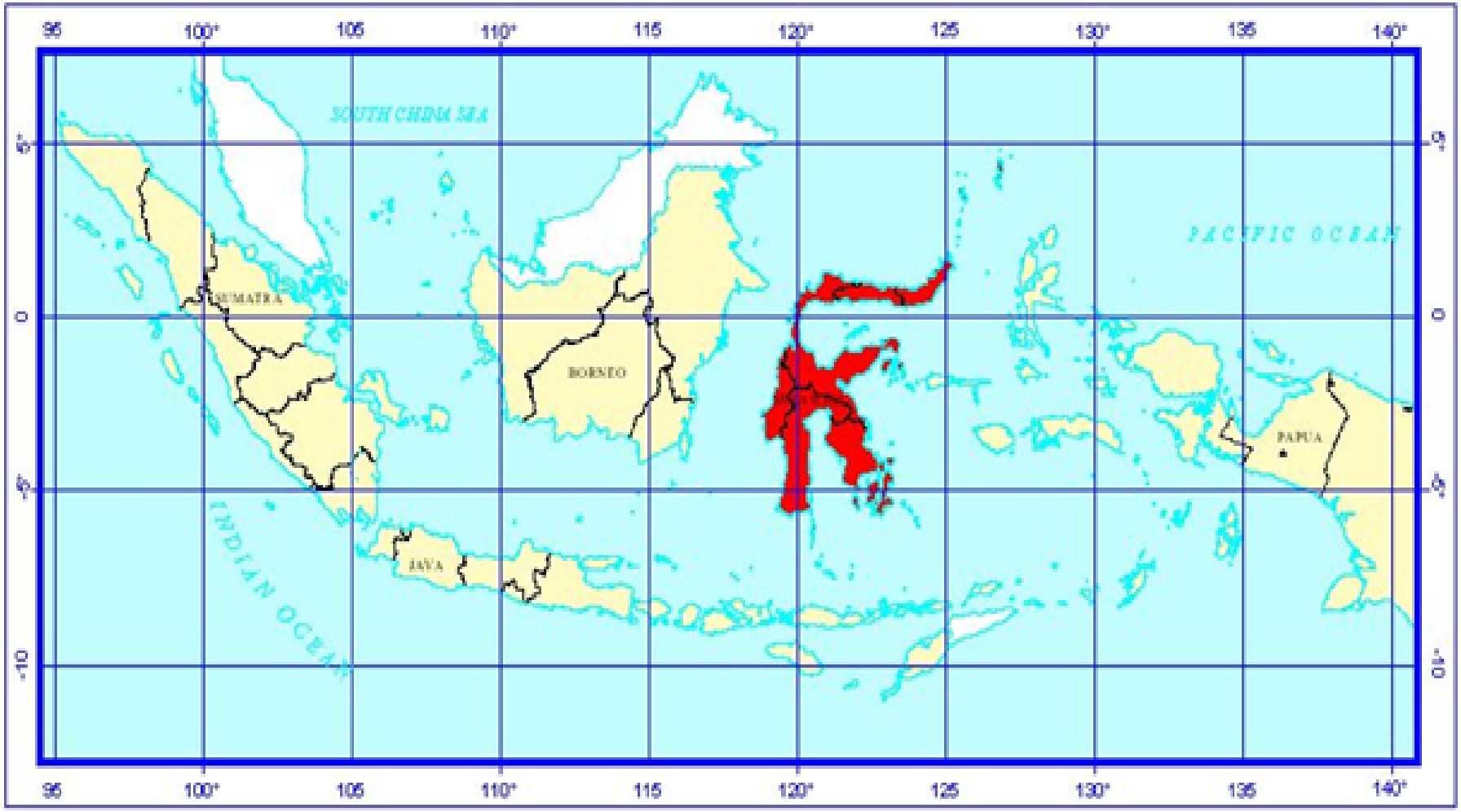
Why Sulawesi

- So far, forest cover mapping activities by most community more focused in Sumatera and Kalimantan Islands and less focused in Sulawesi Island.
- Sulawesi Island with huge potencies is still lack of information on land and forest cover. In order to promote and reveal the potency of Sulawesi Island, this project is designed in this island

Sulawesi : → Challange for Research and Production

- The population density of Sulawesi is fairly dense next after the island of Java and Sumatra. The Population density affects directly to the intensive change of land use in Sulawesi.
- The largest environmental issue in Sulawesi is deforestation. In 2007, the Ministry of Forestry (MoF) reported that deforestation in Sulawesi Island has been significantly increasing by years, especially concentrated in lowlands and mangroves.
- Since the year of 1980s Forests have been subjected for logging and agricultural extension. The loss of forest has threatened endemic species of Sulawesi Island.

Project area : Sulawesi



Chapter 2: Objective of the Project

The Project focus with the following themes :

1. **To explore ALOS PALSAR for land cover mapping and landcover change of Sulawesi Island**
2. **Estimation of Net Primary Production and biomass for carbon stock estimation in Sulawesi Island**

Project Schedule from 2012

Year	Products	Methods	Data	Area of Interest
2012	**Mapping of land and forest Cover**			
	Land and forest cover map of Sulawesi Island	1) scattering entropy calculation, by using decompotition of covarian matrix; 2) multilayer segmentation (HH, VV, and scattering entropy) by using region growing segmentation algorithm; 3) Generate classification of segmented polygon by Battacharya Classification algorithm; 4) Ground truth investigation and accuracy assessment.	ALOS PALSAR and (2010 and 2007), FBS	Sulawesi island
2013	**Landcover and land use change**			
	LULUCF 2000-2010	Sub-space method applied to the time series of palsar dual-pol mosaic	JERS (FBS/2000) ALOS PALSAR (FBS/2010)	Sulawesi island

2014	BIOMAS and NPP estimation for priority area in Coastal wetland Ecosystem			
	Biomas Map	Above ground biomass and stem volume prediction will be estimate by field observation and backscattering value on ALOS PALSAR image. The field observation will using some sample plots which will be used to generate the stem volume model using basal area (BA) as the predictor. The tree basal area was estimated and up scaled into per hectare measure. The stem volume estimation will be based on the allometric equation developed from the dataset. Above ground biomass was estimated applying diameter at breast height (dbh) – dry weight AGB equation	The 50-m resolution orthorectified mosaic ALOS PALSAR	Sulawesi Island
	Estimation of Net Primary Production for carbon calculation of the annual C balance for sulawesi forests.	The approach for estimation NPP is conducted using NASA-CASA model. This model is based on the relationship of monthly production of plant biomass is estimated as a product of time-varying surface solar irradiance (Sr) from MODIS and NDVI from the ALOS satellite, plus a constant light utilization efficiency term (*emax*) that is modified by time-varying stress scalar terms for temperature (T) and moisture (W) effects.	ALOS AVNIR-2/ MODIS	Sulawesi island

Chapter 3: Support to JAXA's Global Forest Mapping effort

- The Japan Aerospace Exploration Agency (JAXA) has generated maps of the global forest and non-forest area distribution (in 2007 and 2009) using 10-meter resolution images of PALSAR (Phased Array type L-band Synthetic Aperture Radar)
- However, during two year (2009-2011) there were a significant change occured in Indonesia such as Moratorium policy and land adjudication reform in which cause landuse change.
- therefore understanding the current status of forests and its change over time on a global scale is important **to give input for such revision.**

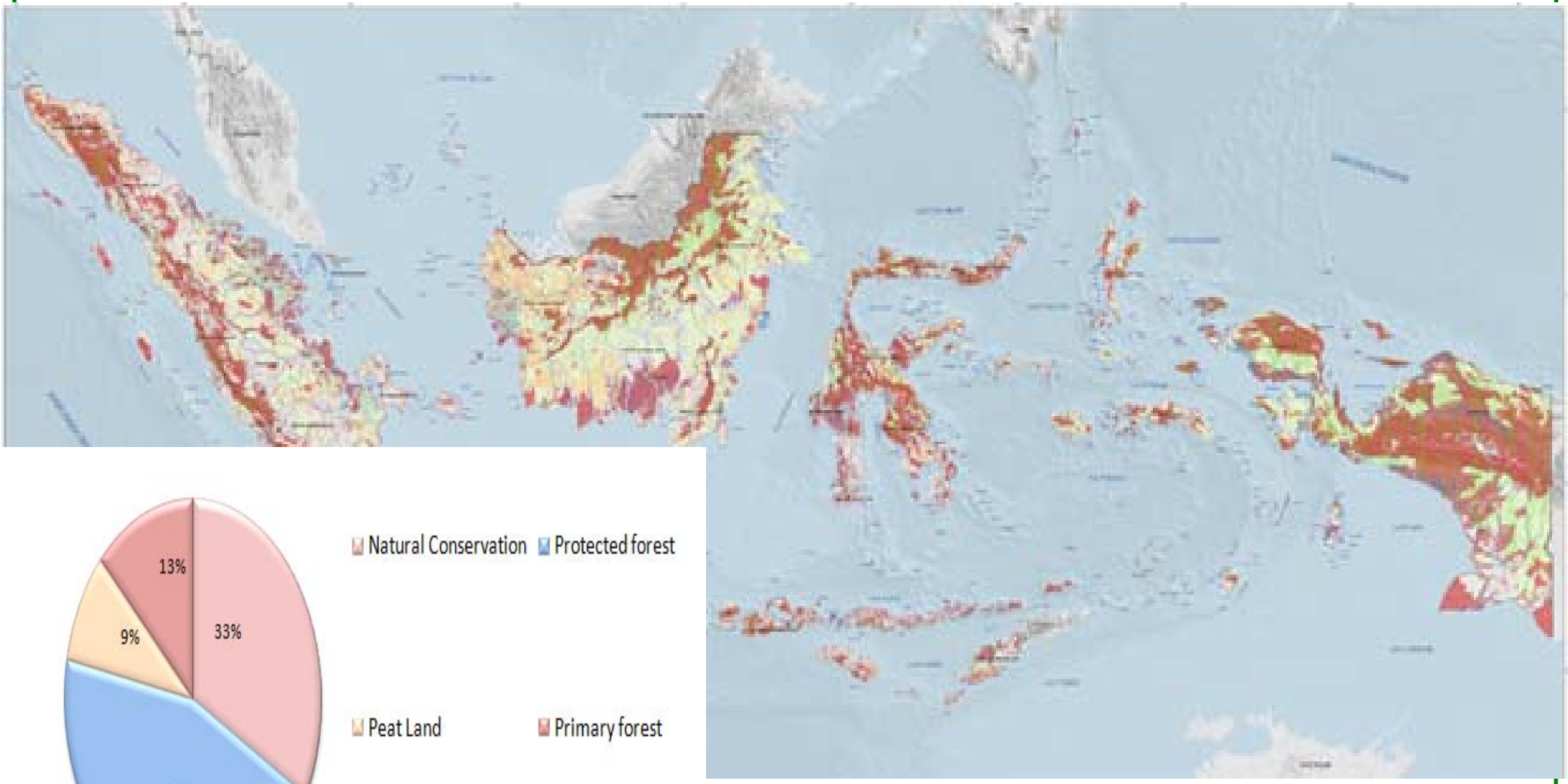
Project Support for Environment Protection

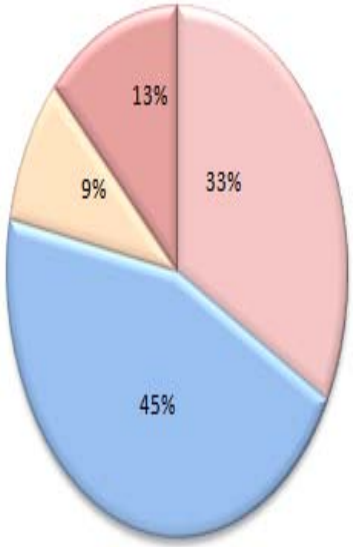
- In long term the availability of landcover map periodically will be used to support national and international conservation through presenting of a dynamic of landuse change.
- Recently GOI has issued Presidencial decree no 10/2011 about moratorium of all activity in primary forest and peat land.
- Acoording to this decree Bakosurtanal has responsible to monitor of peta indicative penundaan ijin baru (indicative map of moratorium for new permit)
- In long term this moratorium aim reduce emision from forest and peat land as well as to maintain of carbon cycle

ALOS

K&C Initiative

An international science collaboration led by JAXA





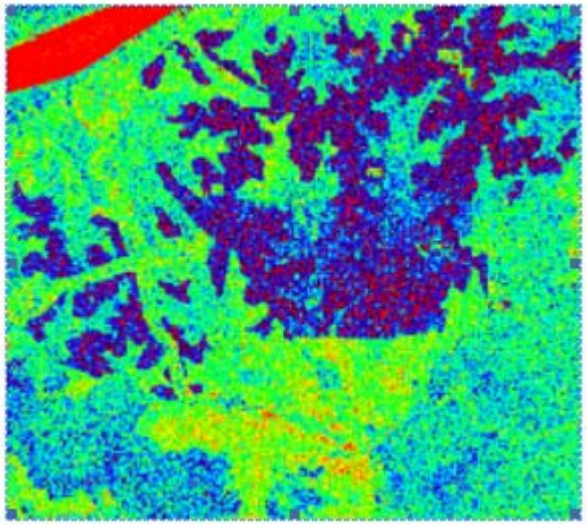
Natural Conservation
Protected forest
Peat Land
Primary forest

Methods

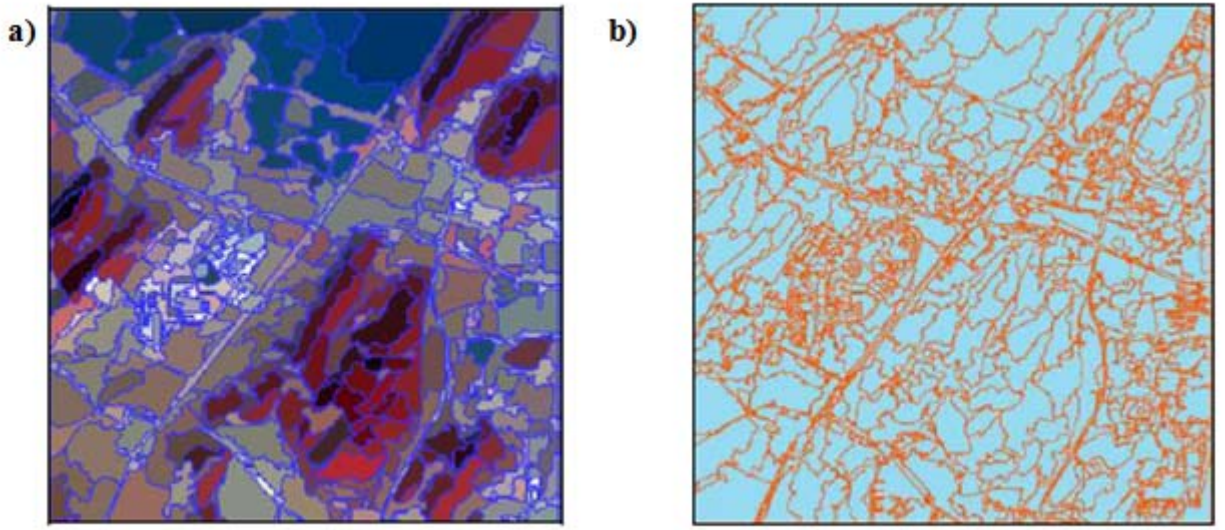
The proposed method for extracting the land cover and forest cover from ALOS PALSAR can be divided into 4 phases;

1. scattering entropy calculation, by using decomposition of covariance matrix;
2. multilayer segmentation (HH, VV, and scattering entropy) by using region growing segmentation algorithm;
3. Generate classification of segmented polygon by Bhattacharya Classification algorithm;
4. Ground truth investigation and accuracy assessment.

Landcover clasification

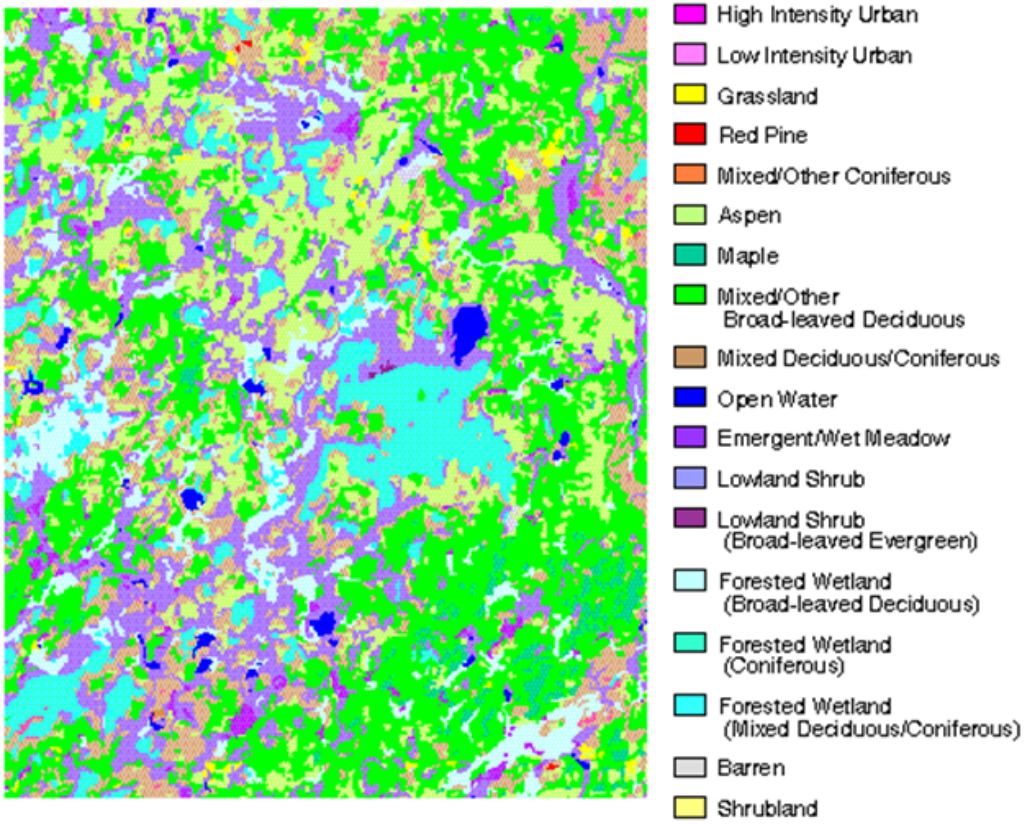


Scattering entropy of Radar image



Segmentation image (a) and segmentation result in vector (b)

Classification Result



Cahpter 4: Project Deliverable

Sharing of satellite data and in situ data between jaxa and K&C team member is important issue.

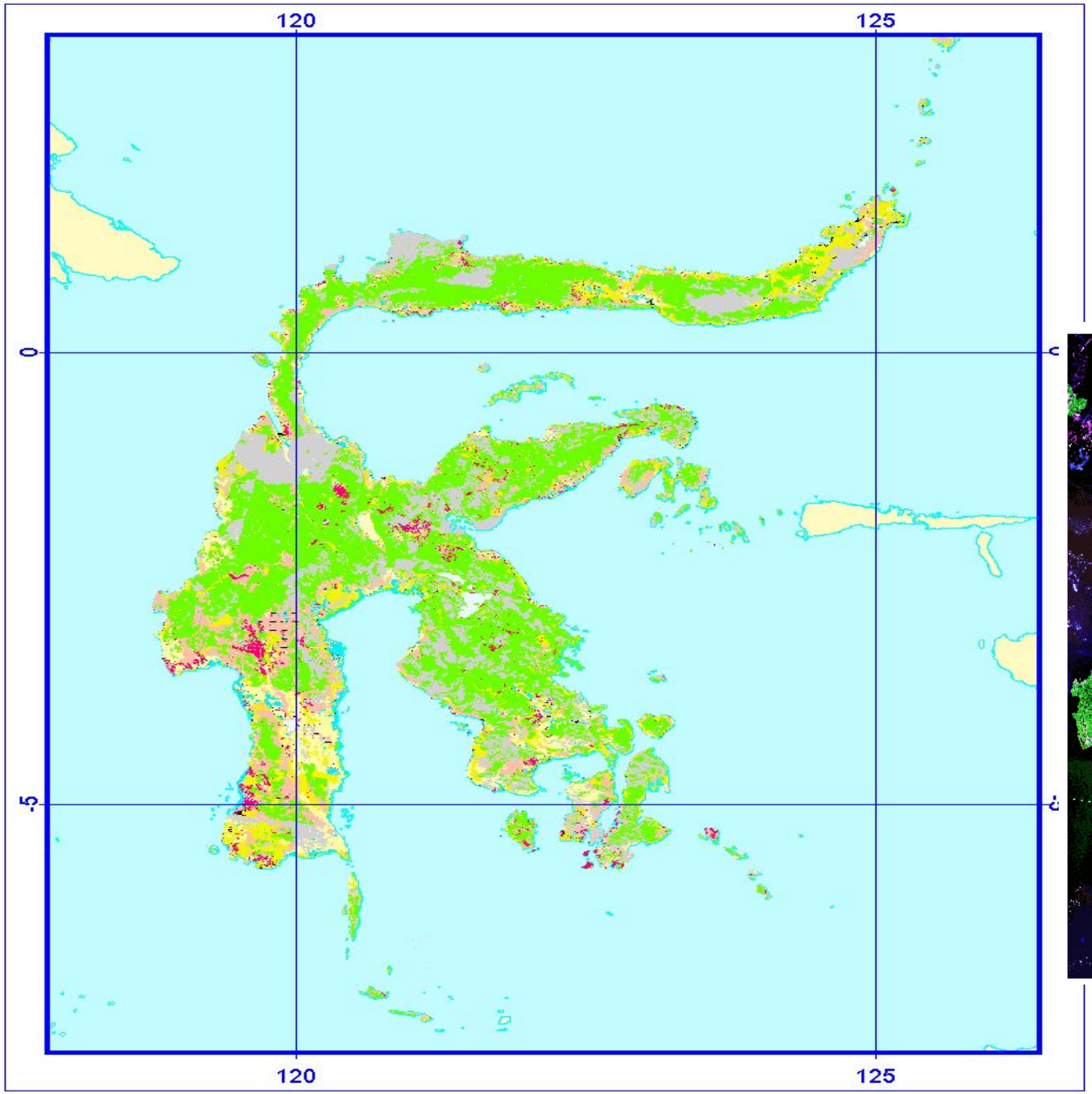
Deliver or sharing product asre as follow :

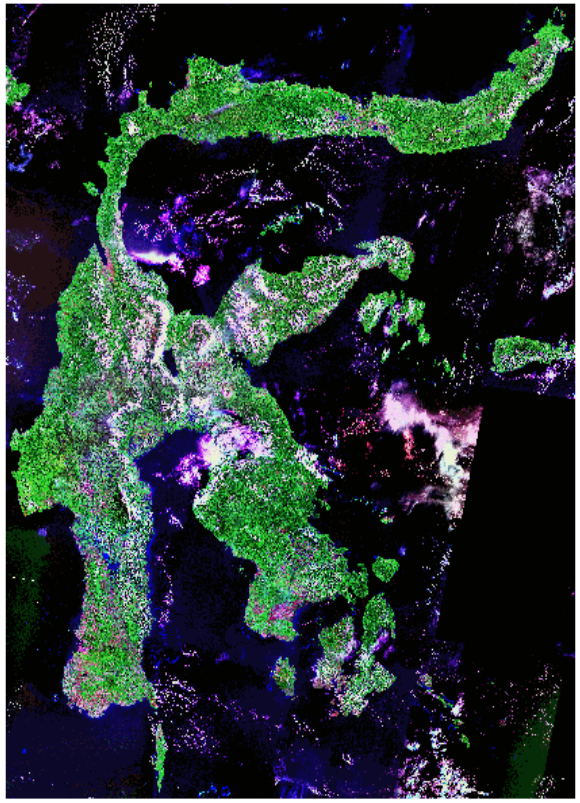
1. **Generating over Sulawesi for ins situ data based on our local knowledge as follows:**
   - **land cover map arround 2012**
   - **landcover change map arround 2012**
   - **if posible Biomas map of sulawesi in priority area 2014**
3. **Ground validation for forest in Sulawesi will be share.**
4. **Making necesasry revision on ALOS value added product over Sulawesi such as forest and non forest map arround 2012**

K&C Initiative

ional science collaboration led by JAXA

)09





THANK YOU VERY MUCH