Roles of Earth Observations for Disaggregation by Geographical Lens

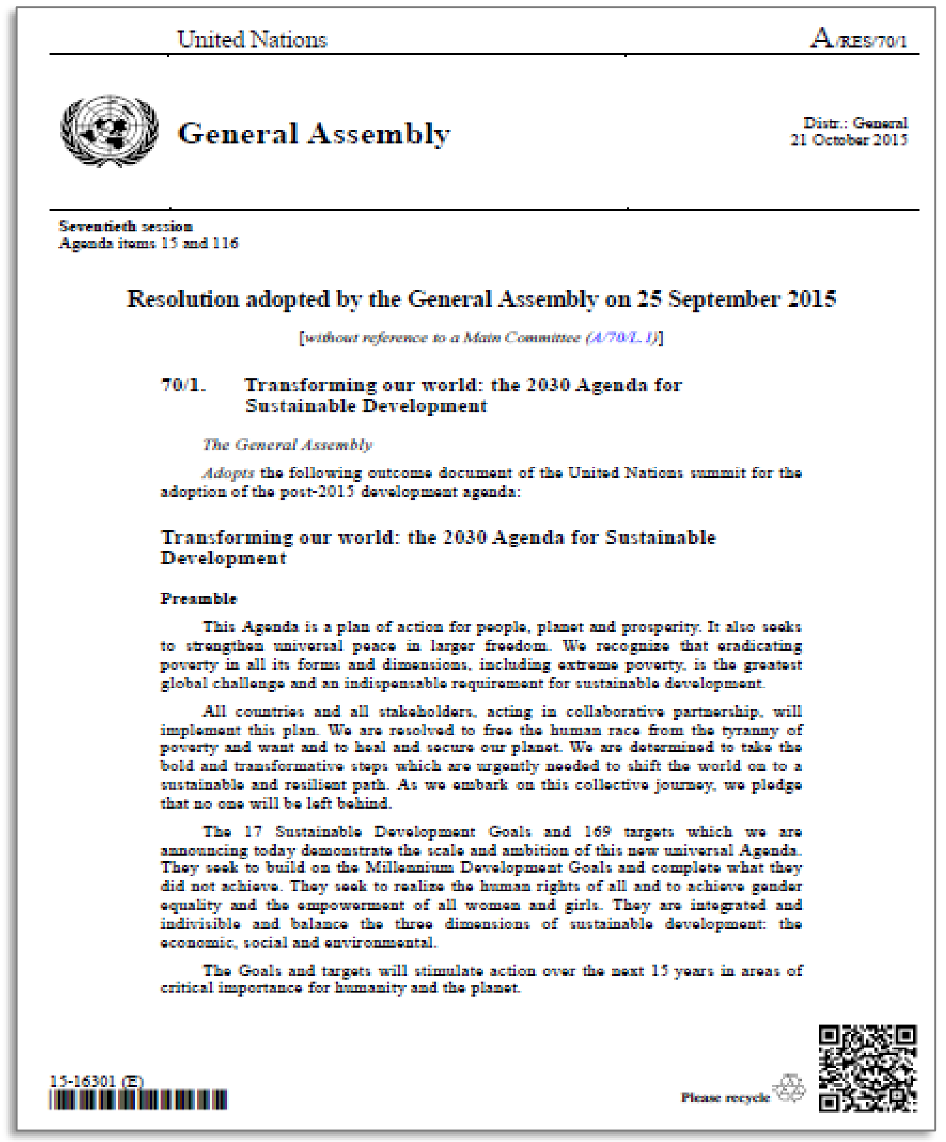
International Seminar on UN Global Geospatial Information Management
"Geospatial Information for Sustainable Development"
6-7 Dec 2018, Nairobi, Kenya

Chu Ishida, JAXA, EO4SDG Co-lead
Argyro Kavvada, NASA, EO4SDG Executive Secretary
Marc Paganini, ESA, CEOS SDG Ad-hoc Team Co-lead

Roles of Earth Observation in 2030 Agenda for Sustainable Development

2030 Agenda for Sustainable Development (NY, September 2015)

Follow-up and review
Article 76:
*We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, **including Earth observation and geo-spatial information,***


United Nations A/RES/70/1

General Assembly

Distr.: General
21 October 2015

Seventieth session
Agenda items 15 and 116

Resolution adopted by the General Assembly on 25 September 2015

[*without reference to a Main Committee (A/70/L.1)*]

70/1. Transforming our world: the 2030 Agenda for Sustainable Development

The General Assembly

Adopts the following outcome document of the United Nations summit for the adoption of the post-2015 development agenda:

Transforming our world: the 2030 Agenda for Sustainable Development

Preamble

This Agenda is a plan of action for people, planet and prosperity. It also seeks to strengthen universal peace in larger freedom. We recognize that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development.

All countries and all stakeholders, acting in collaborative partnership, will implement this plan. We are resolved to free the human race from the tyranny of poverty and want and to heal and secure our planet. We are determined to take the bold and transformative steps which are urgently needed to shift the world on to a sustainable and resilient path. As we embark on this collective journey, we pledge that no one will be left behind.

The 17 Sustainable Development Goals and 169 targets which we are announcing today demonstrate the scale and ambition of this new universal Agenda. They seek to build on the Millennium Development Goals and complete what they did not achieve. They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and girls. They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental.

The Goals and targets will stimulate action over the next 15 years in areas of critical importance for humanity and the planet.

15-16301 (E)

Please recycle

GEO Mexico City Declaration (November 2015)

*2. Affirm that GEO and its Earth observations and information will **support the implementation of , inter alia, the 2030 Global Goals for Sustainable Development,***

Roles of EO in 2030 Agenda

- Support the implementation of SDGs
- Monitor and review the progress of SDG implementation through the global indicator framework

SDGs and Earth Observations

Alignment of EO to the SDG Targets and Indicators:

GEO made a first assessment on potential uses of EO for SDGs.

ESA and CEOS are preparing compendium on the contribution of EO to SDG targets / indicators, with input from EO4SDG.

Sustainable Development Goals

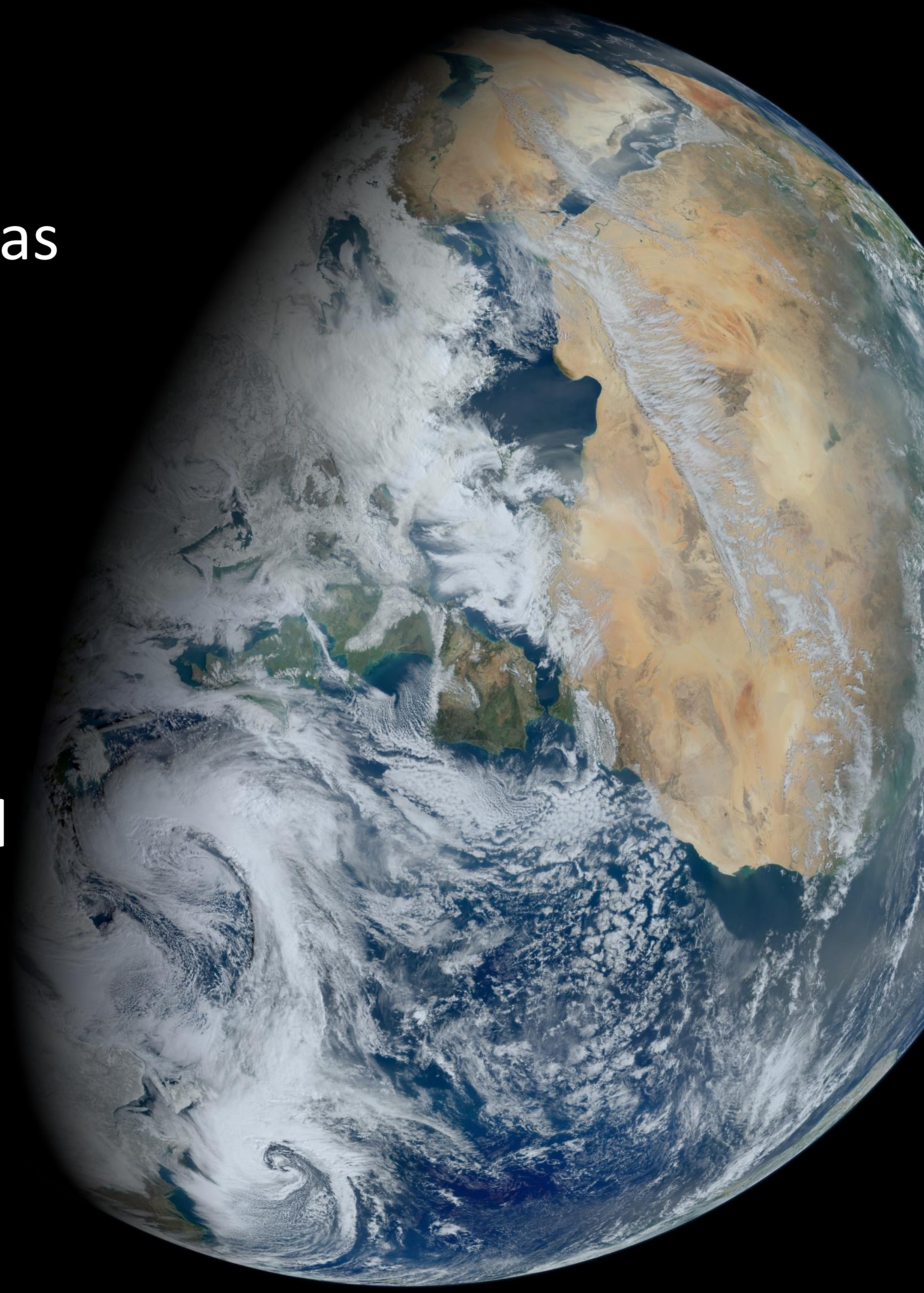
Earth Observations in Service of the *Agenda 2030*

Target — Contribute to progress on the Target yet not the Indicator per se									*Goal*	*Indicator* — Direct measure or indirect support				
							1.4	1.5	1	1.4.2				
						2.3	2.4	2.c	2	2.4.1				
					3.3	3.4	3.9	3.d	3	3.9.1				
									4					
								5.a	5	5.a.1				
		6.1	6.3	6.4	6.5	6.6	6.a	6.b	6	6.3.1	6.3.2	6.4.2	6.5.1	6.6.1
					7.2	7.3	7.a	7.b	7	7.1.1				
								8.4	8					
					9.1	9.4	9.5	9.a	9	9.1.1	9.4.1			
						10.6	10.7	10.a	10					
	11.1	11.3	11.4	11.5	11.6	11.7	11.b	11.c	11	11.1.1	11.2.1	11.3.1	11.6.2	11.7.1
				12.2	12.4	12.8	12.a	12.b	12	12.a.1				
					13.1	13.2	13.3	13.b	13	13.1.1				
		14.1	14.2	14.3	14.4	14.6	14.7	14.a	14	14.3.1	14.4.1	14.5.1		
	15.1	15.2	15.3	15.4	15.5	15.7	15.8	15.9	15	15.1.1	15.2.1	15.3.1	15.4.1	15.4.2
								16.8	16					
17.2	17.3	17.6	17.7	17.8	17.9	17.16	17.17	17.18	17	17.6.1	17.18.1			

SDGs with most opportunities:

Earth observations and geospatial information:

- Include **satellite**, **airborne**, **land-** and **marine-based** data, as well as model outputs.
- Are often **continuous in their spatial and temporal resolutions** – essential in capturing the sustainability of developments underpinning the SDG framework.
- Expand monitoring capabilities at **local, national, regional and global levels**, and **across sectors**.
- Can significantly **reduce the costs** of monitoring the aspirations reflected in the Goals and Targets.



Disaggregation Requirements for Selected SDG Indicators

Indicator	Tier	Custodian Agency	WGGI short list	EO applicability by GEO	Disaggregation requirements
2.4.1 Proportion of agricultural area under sustainable agriculture	III	FAO	XX	X	Agriculture type Regional/country/sub-national
6.3.2 Proportion of bodies of water with good ambient water quality	II	UNEP	XX	X	Country/sub-national
6.6.1 Change in the extent of water-related ecosystem over time	II	UNEP Ramsar	XX	X	Ecosystem type Country/sub-national
11.3.1 Land consumption rate over population growth rate	II	UN-Habitat	XX	X	Country/sub-national
11.6.2 Annual mean levels of the particulate matter in cities	I	WHO		X	PM2.5 Cities
13.1.1 Number of death, missing persons and directly affected persons attributed to disasters	II	UNISDR		X	Affected persons Country/sub-national
14.1.1 Coastal eutrophication	III	UNEP		X	Regional/country/sub-national
15.1.1 Forest area as a proportion of total land area	I	FAO	XX	X	Forest type Regional/country/sub-national
15.3.1 Proportion of land that is degraded over total land area	II	UNCCD	XX	X	Land use, land cover class Regional/country/sub-national
15.4.2 Mountain Green Cover Index	I	FAO	X	X	Regional/country/sub-national

Roles of Earth Observations (satellite and in-situ) for Disaggregation by Geographical Lens

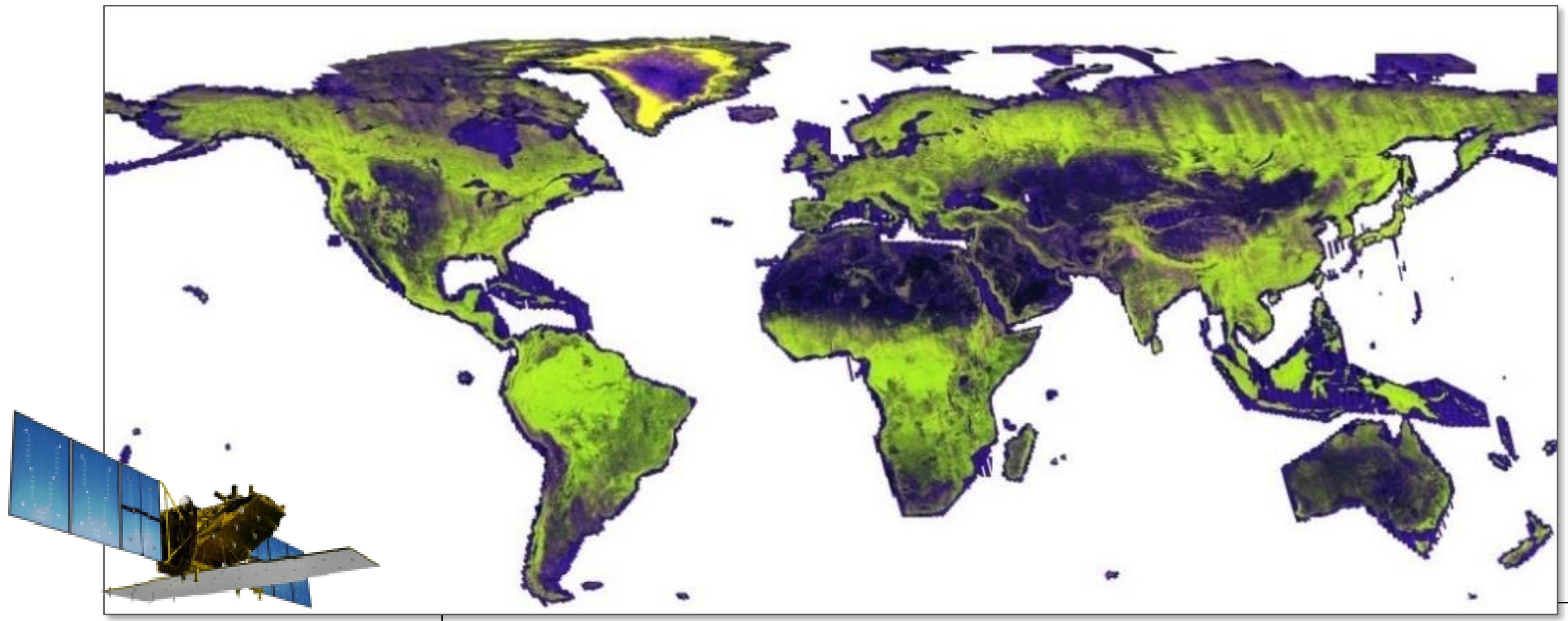
- Coverage: EO (satellite-based and in-situ) can cover global, regional, national and local scale monitoring. Satellite-based EO can provide transboundary and remote area data where in-situ data are not available.
- Timeliness: EO provide time-series data. Data are stored, near real-time and real time. EO system is designed to respond to sampling and data latency requirements.
- Continuity: Long-term measurements and long time-series data are essential for change detection.
- Consistency and Accuracy: EO systems needs calibration and validation to ensure consistency and accuracy.
- Comparability: EO systems are often cross-calibrated and cross-validated among systems.
- Diversity: Various EO systems (including more than 150 satellites carrying over 300 instruments) provides various geophysical/chemical data, including ECVs for climate monitoring.
- Complementarity: EO can complement traditional method of surveys and statistics
- Data integration and downscaling: EO data is integrated with other observation data through data assimilation model, i.e. meteorology, water cycle, chemical/aerosol transport. From global models, data downscaling is possible for local simulation and prediction.

Cases of EO use for disaggregation by geographical locations

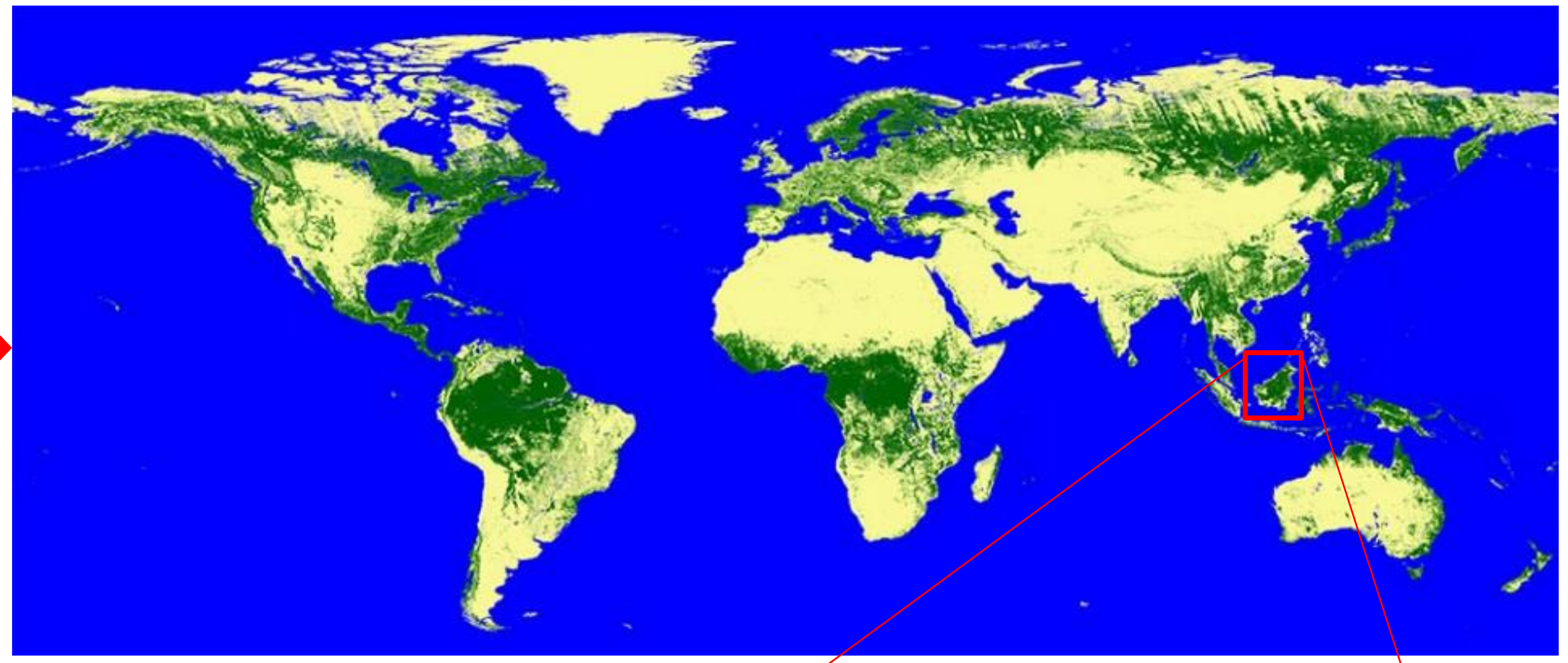
- Global forest monitoring and its change detection at local level
- Agriculture monitoring in support of food security
- Ocean eutrophication monitoring

Sustainable Forest Management:
Monitoring Forest Changes for More Than 20 Years

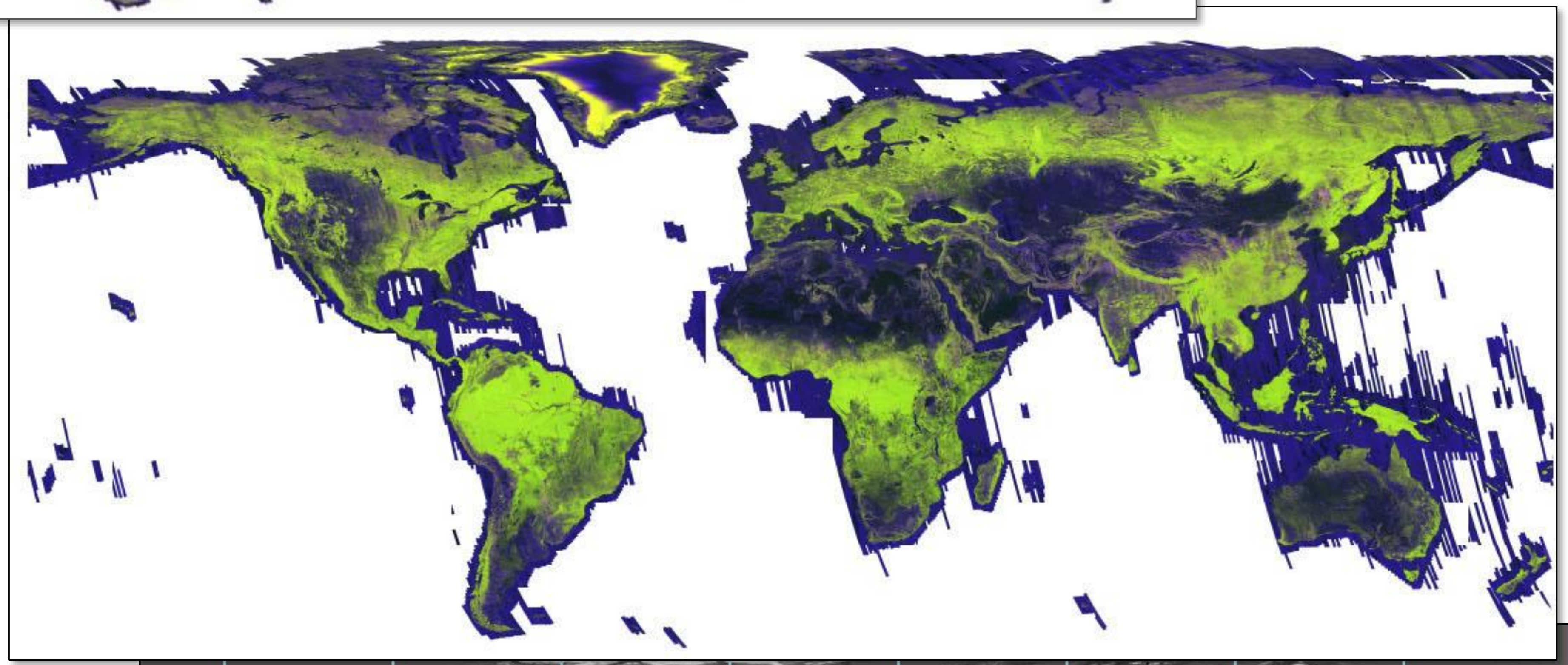
- JAXA has released annual global mosaic and Forest / Non-Forest (FNF) map by SARs
- JERS-1 (1996) ~ ALOS (2007-2010) ~ ALOS-2 (2014-2017) > <u>Changes over 20 years</u>



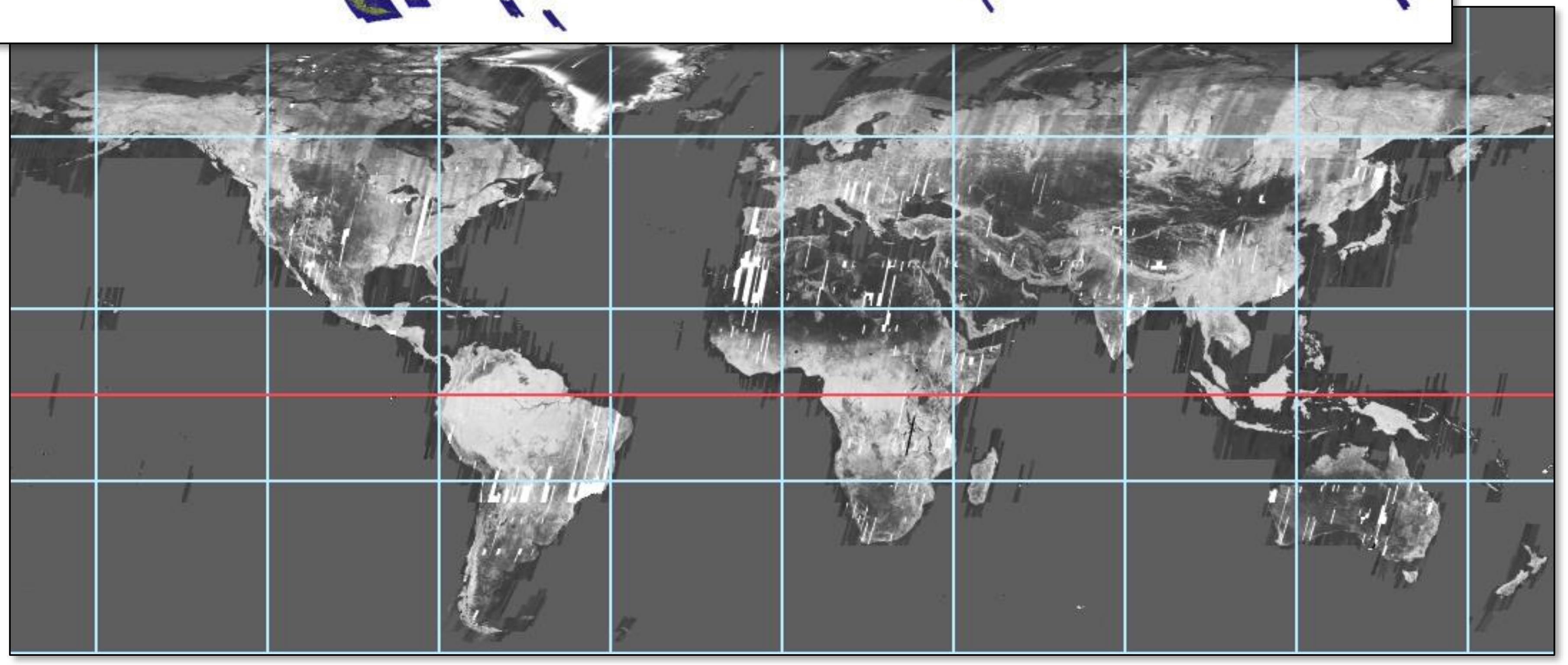
2017 ALOS-2



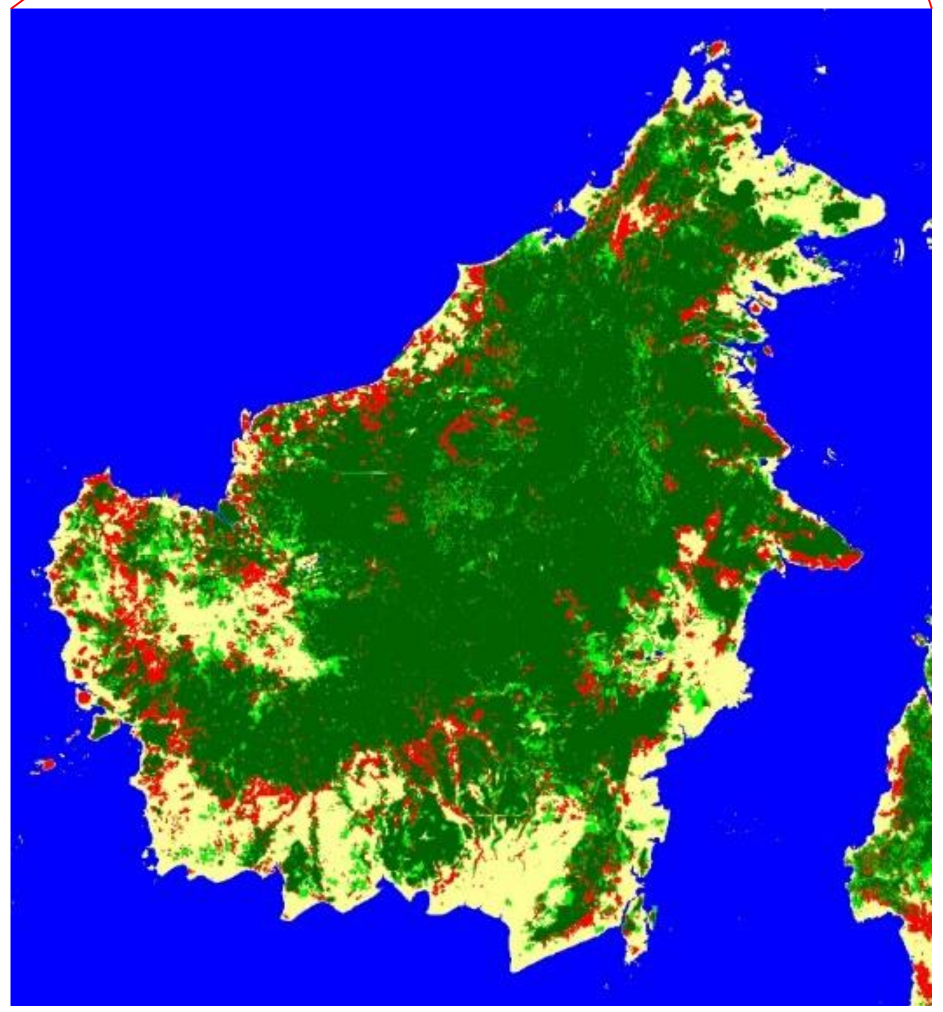
2017 FNF Map by ALOS-2




2009 ALOS



1996 JERS-1
(only HH-pol.)



Forest change between 2008 and 2016. (red: deforestation, light green: reforestation)

Comparison of the PALSAR-PALSAR-2-FRA

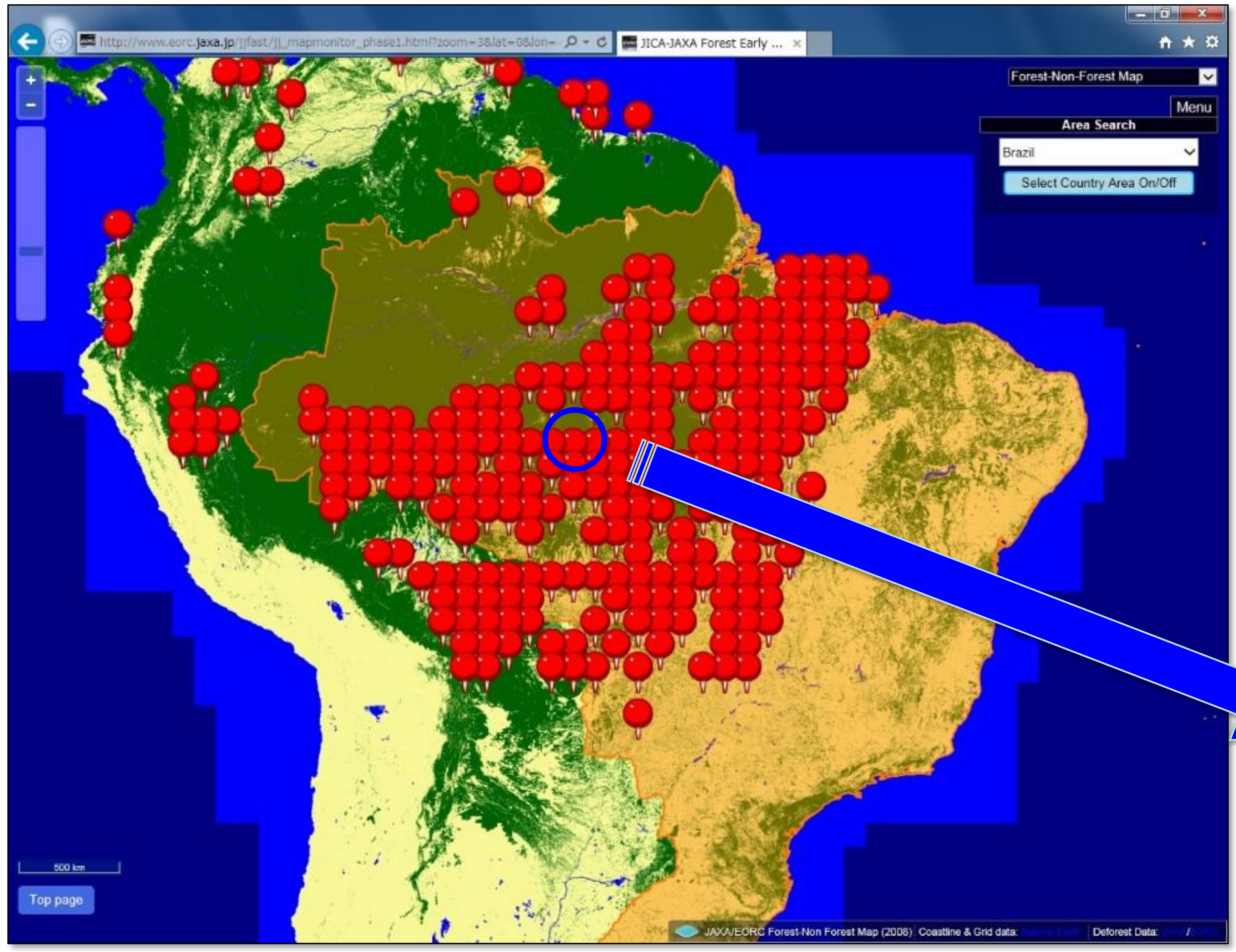
FRA: Global Forest Resources Assessments

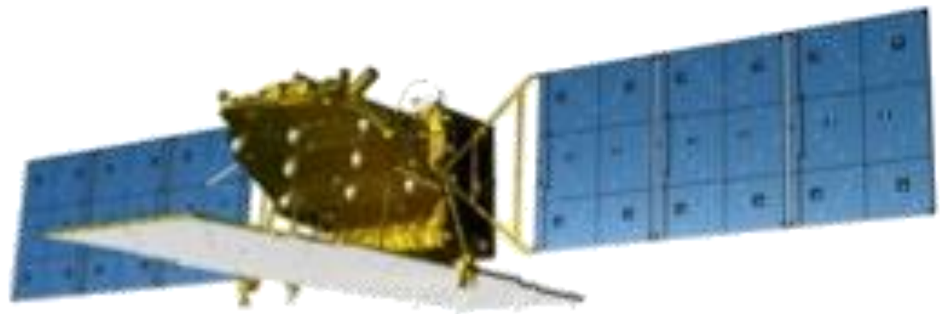
Area	2010			2015		
	PALSAR(2010) [1000ha]	FRA(2010) [1000ha]	Relarive Error (±) [%] (PALSAR vs FRA)	PALSAR-2(2015) [1000ha]	FRA(2015) [1000ha]	Relarive Error (±) [%] (PALSAR vs FRA)
Indonesia	103,811	94,432	9.93%	95,703	91,010	5.16%
South America	811,082	843,995	-3.90%	789,918	833,881	-5.27%
Africa	653,447	638,187	2.39%	599,593	624,009	-3.91%
Brazil	436,358	498,458	-12.46%	435,823	493,538	-11.69%
Colombia	77,667	58,635	32.46%	73,117	58,502	24.98%
Peru	76,266	74,811	1.95%	74,656	73,973	0.92%
Venezuela	56,890	47,505	19.76%	52,856	46,683	13.22%
Ecuador	17,472	12,942	35.01%	16,794	12,548	33.84%
Indonesia	103,811	94,432	9.93%	95,703	91,010	5.16%
Papua New Guinea	31,124	33,573	-7.29%	31,916	33,559	-4.90%
Malaysia	17,964	22,124	-18.80%	18,578	22,195	-16.30%
Congo (Kinshasa)	167,631	154,135	8.76%	165,012	152,578	8.15%
Mozambique	26,961	38,972	-30.82%	24,359	37,940	-35.80%
Tanzania	27,029	47,920	-43.60%	25,584	46,060	-44.45%
Central African Republic	52,781	22,248	137.24%	51,521	22,170	132.39%
Congo (Brazzaville)	24,610	22,411	9.81%	24,499	22,334	9.69%
Gabon	23,861	22,000	8.46%	23,867	23,000	3.77%
Cameroon	36,565	19,916	83.59%	36,003	18,816	91.34%
Nigeria	28,317	9,041	213.21%	18,576	6,993	165.64%

PALSAR, PALSAR-2 meets FRA generally. In average 95% agreement

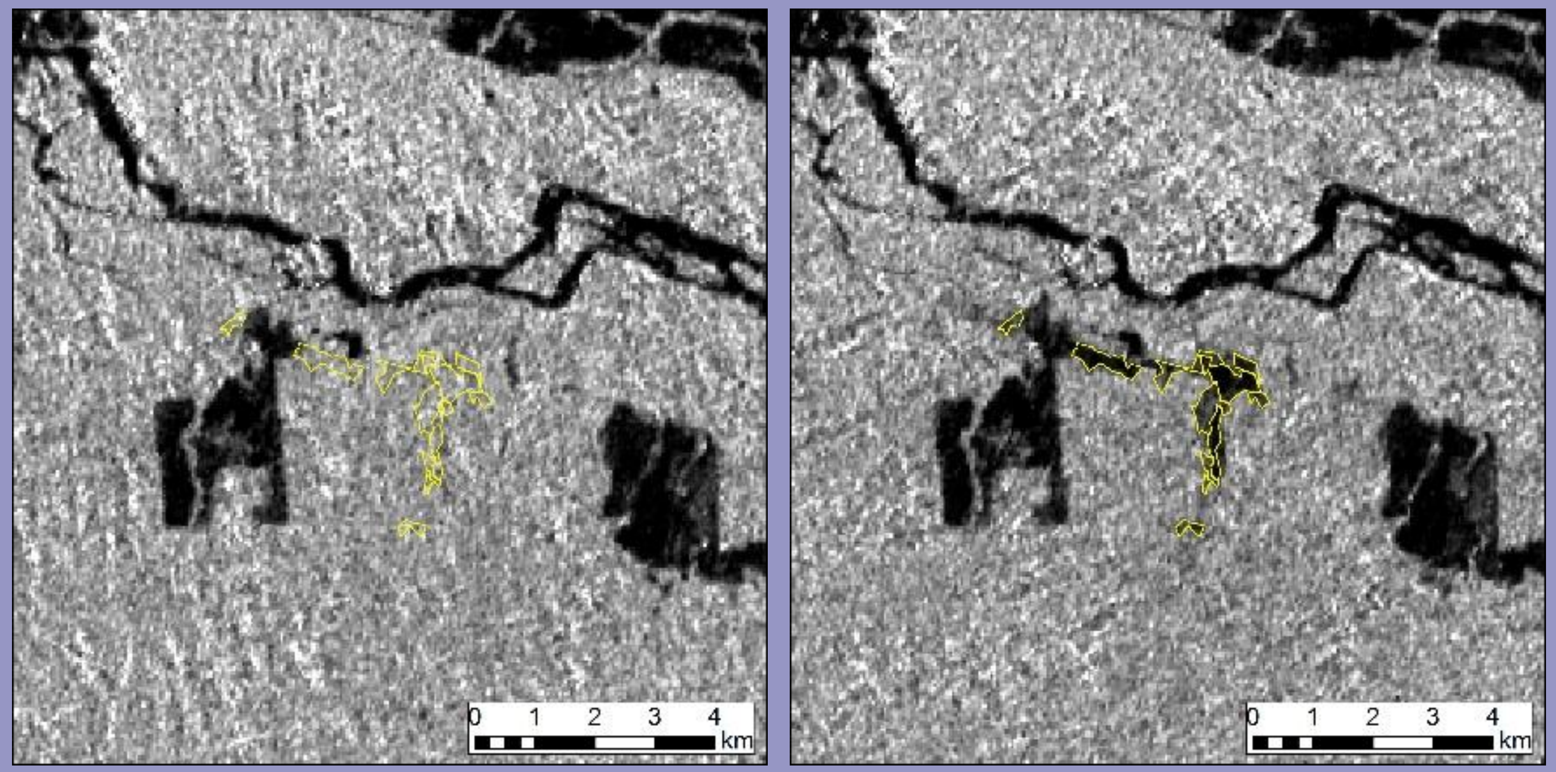
15 LIFE ON LAND

JICA-JAXA Forest Monitoring System: JJ-FAST

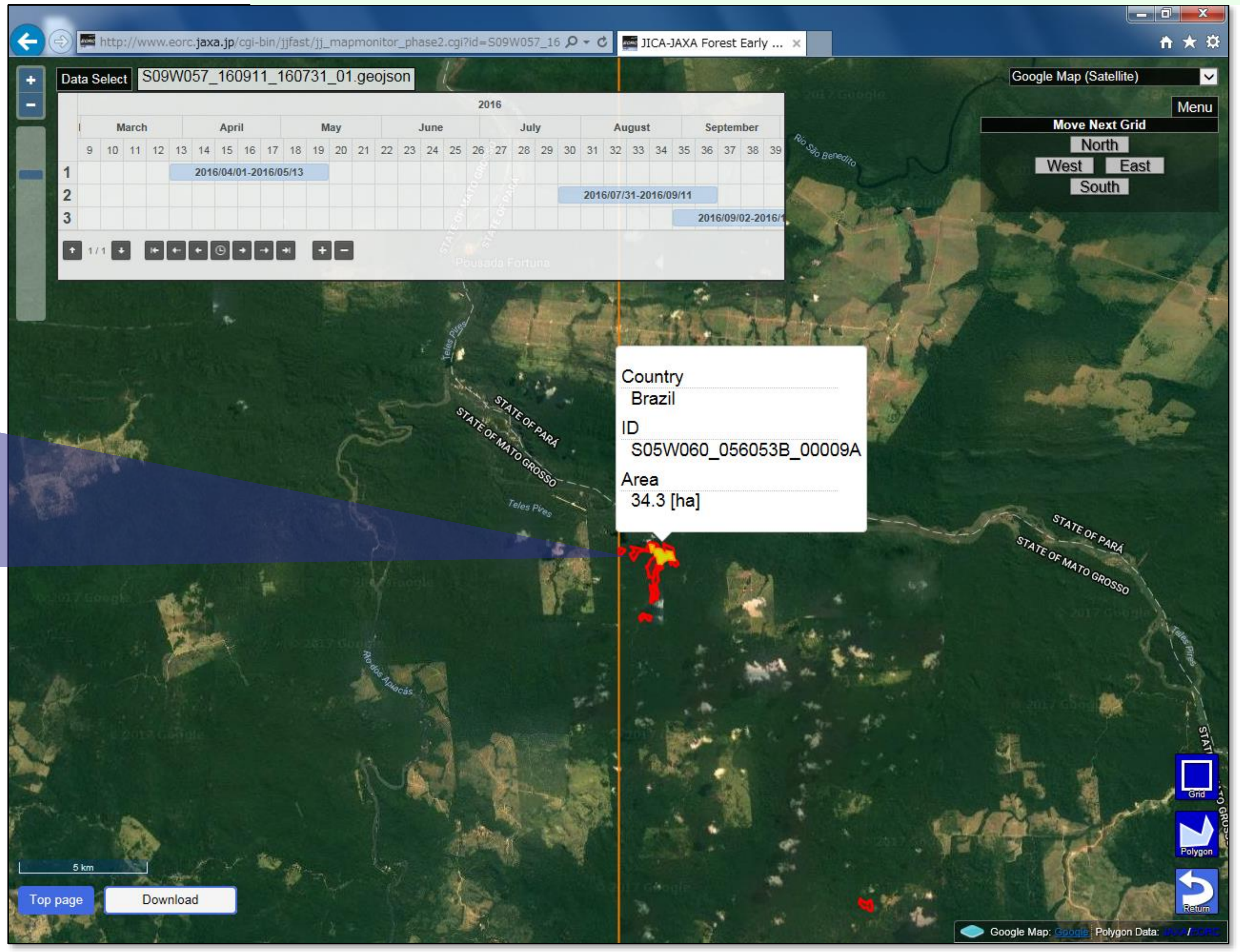




- ❖ Logging areas are detected by comparing HV polarization data at two timings. Use of multi-polarization data and multi-temporal data are being studied.



PALSAR-2/2016.07.31. PALSAR-2/2016.09.11.



GEOGLAM – Information Fueling Proactive Response

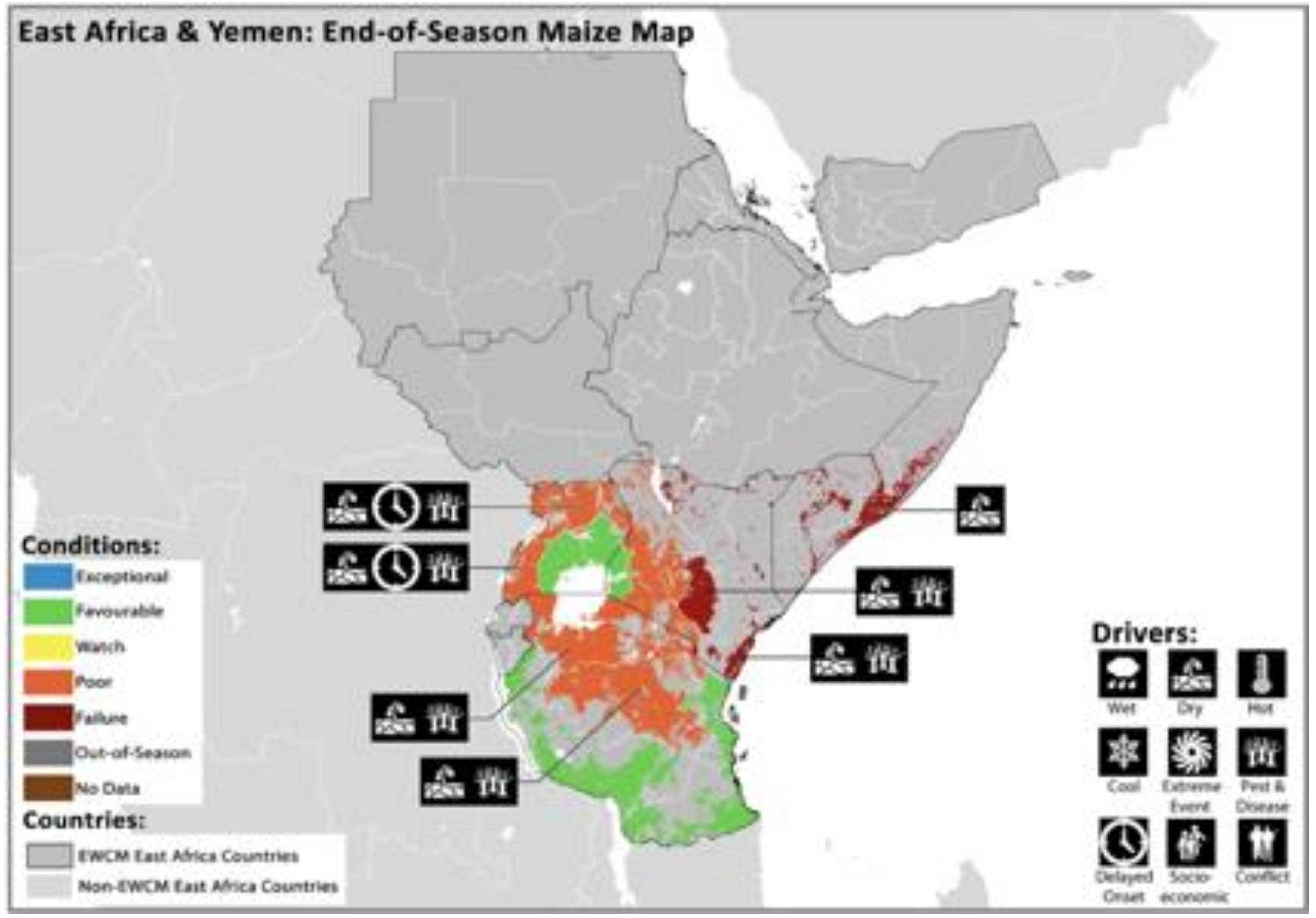
2 ZERO HUNGER

EO Supported timely Food Security Response in Karamoja Uganda, 2017

- By May 2017 it was evident from the Ugandan crop monitor that there was a high likelihood of widespread crop failure due to drought
- The early warning provided by Earth observations were able to give the government time to mitigate loss and damage
- Satellite data triggered the Disaster Risk Financing (DRF) fund to scale-up public works projects in Karamoja, Uganda, off-setting agricultural losses by supporting 31,386 households - roughly 150,000 people

"In the past we always reacted to crop failure, spending billions of shillings to provide food aid in the region. 2017 was the first time we acted proactively because we had clear evidence from satellite data very early in the season"
Martin Owor, Commissioner Office of the Prime Minister (OPM)

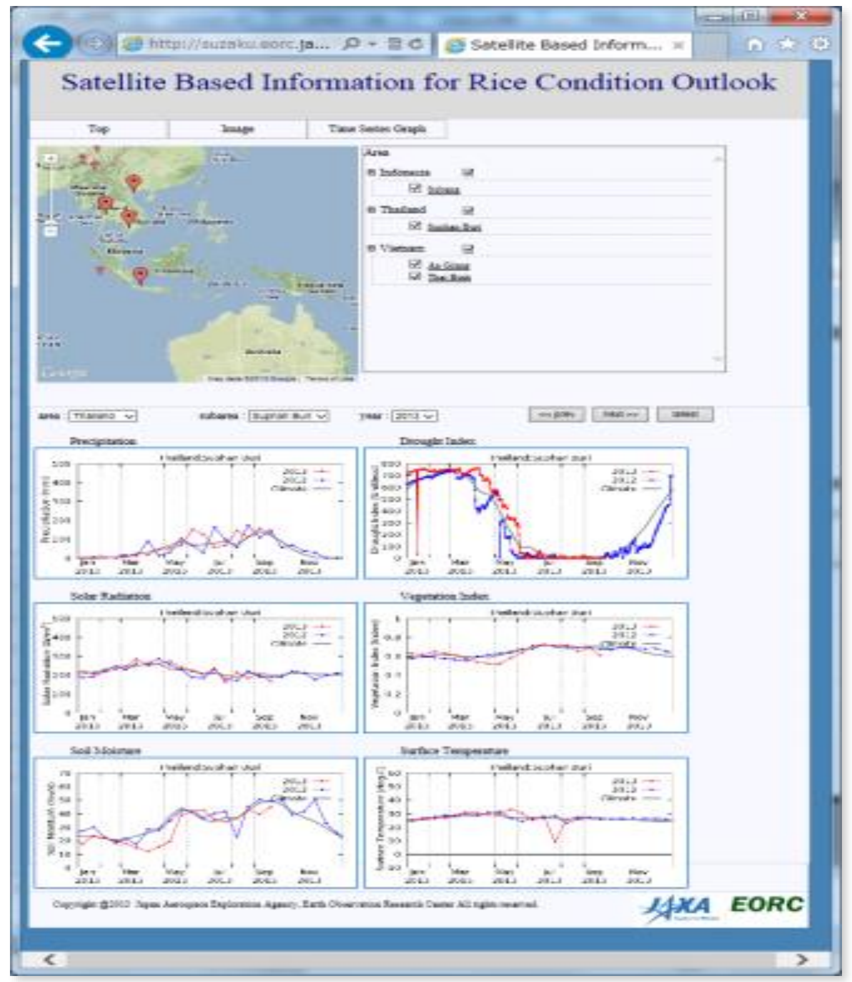
GEOGLAM Crop Monitor
August 2017 for Uganda



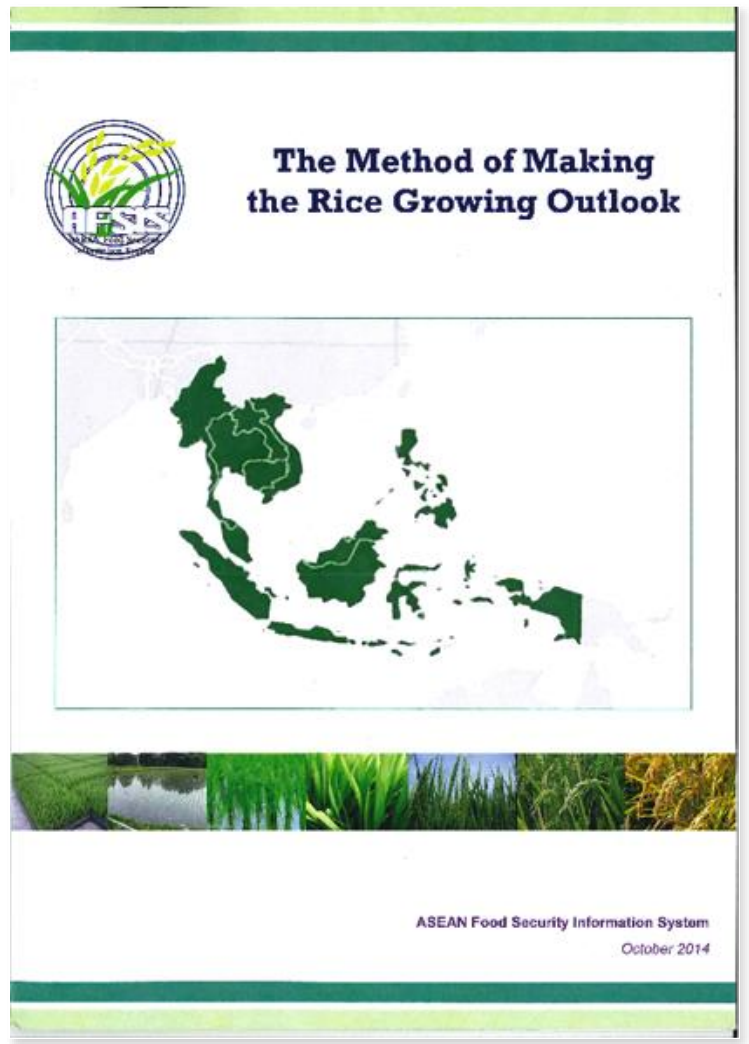
GEOGLAM
Global Agricultural Monitoring

@G20_GEOGLAM
www.geoglam.org

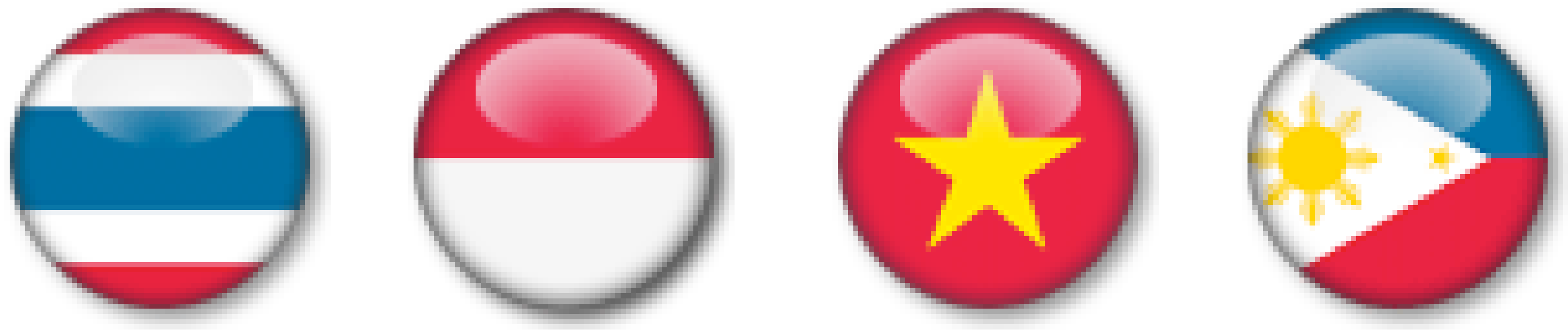
Rice Growing Outlook Report for FAO AMIS



Satellite Agro-Met Data

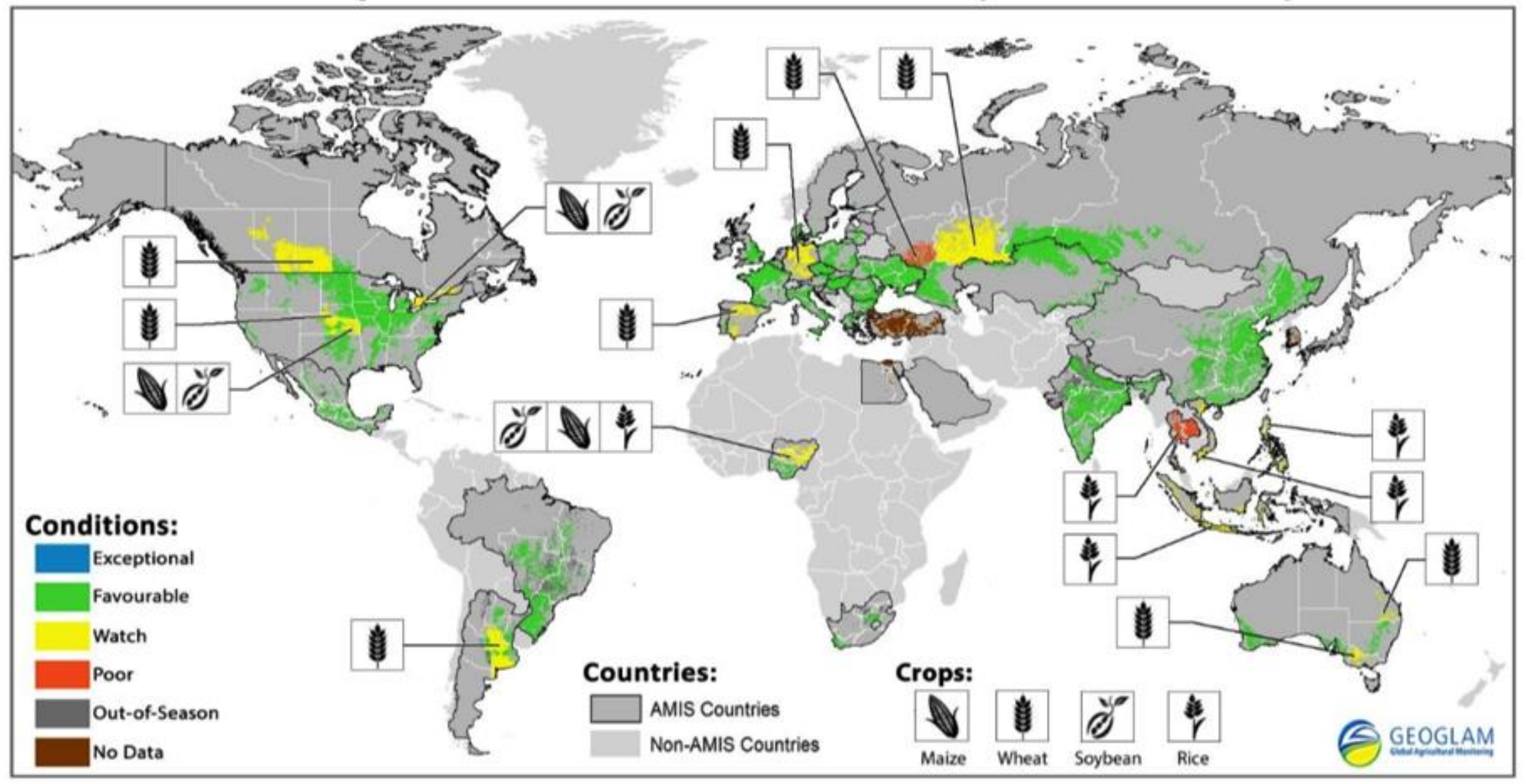


AFSIS Support



Agricultural Statistician

Crop Conditions in AMIS countries (as of June 28th)

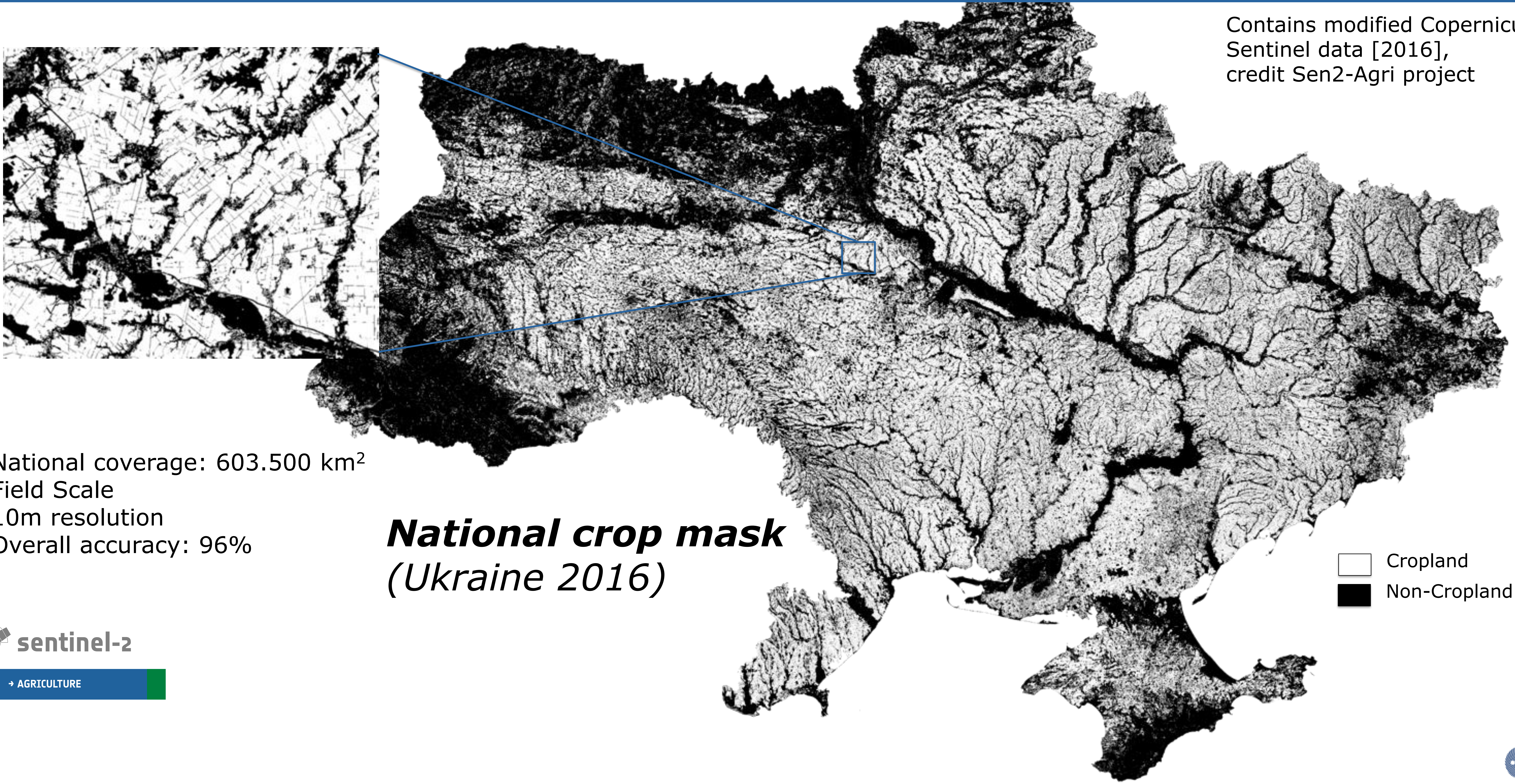


Provide rice growing outlook to FAO AMIS on a monthly basis

EO products in support of SDG indicators
Crop masks and crop types for SDG 2.4.1 (sustainable agriculture)

2 ZERO HUNGER

Contains modified Copernicus Sentinel data [2016], credit Sen2-Agri project



National coverage: 603.500 km^2
Field Scale
10m resolution
Overall accuracy: 96%

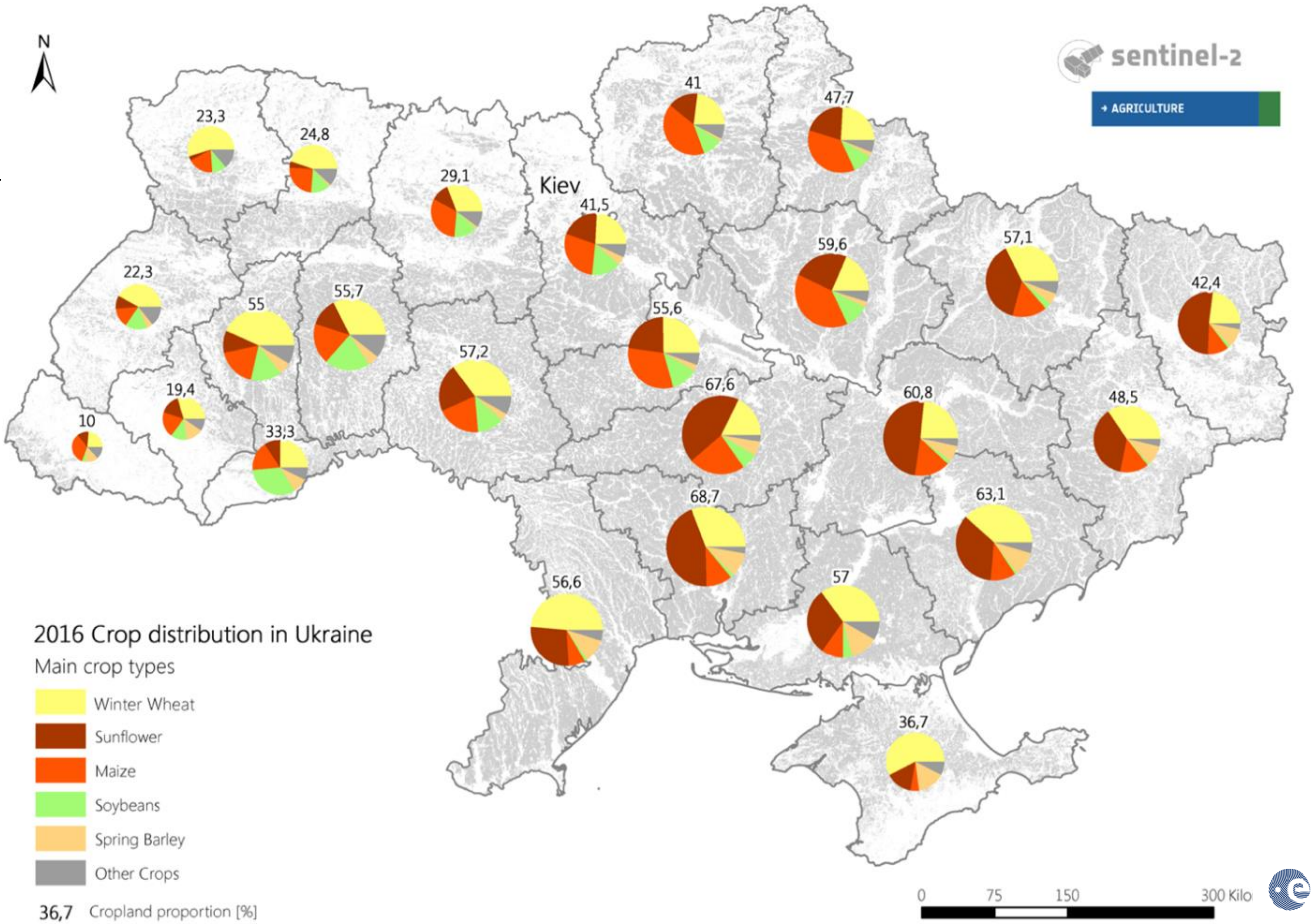
National crop mask
(Ukraine 2016)

sentinel-2
→ AGRICULTURE

esa

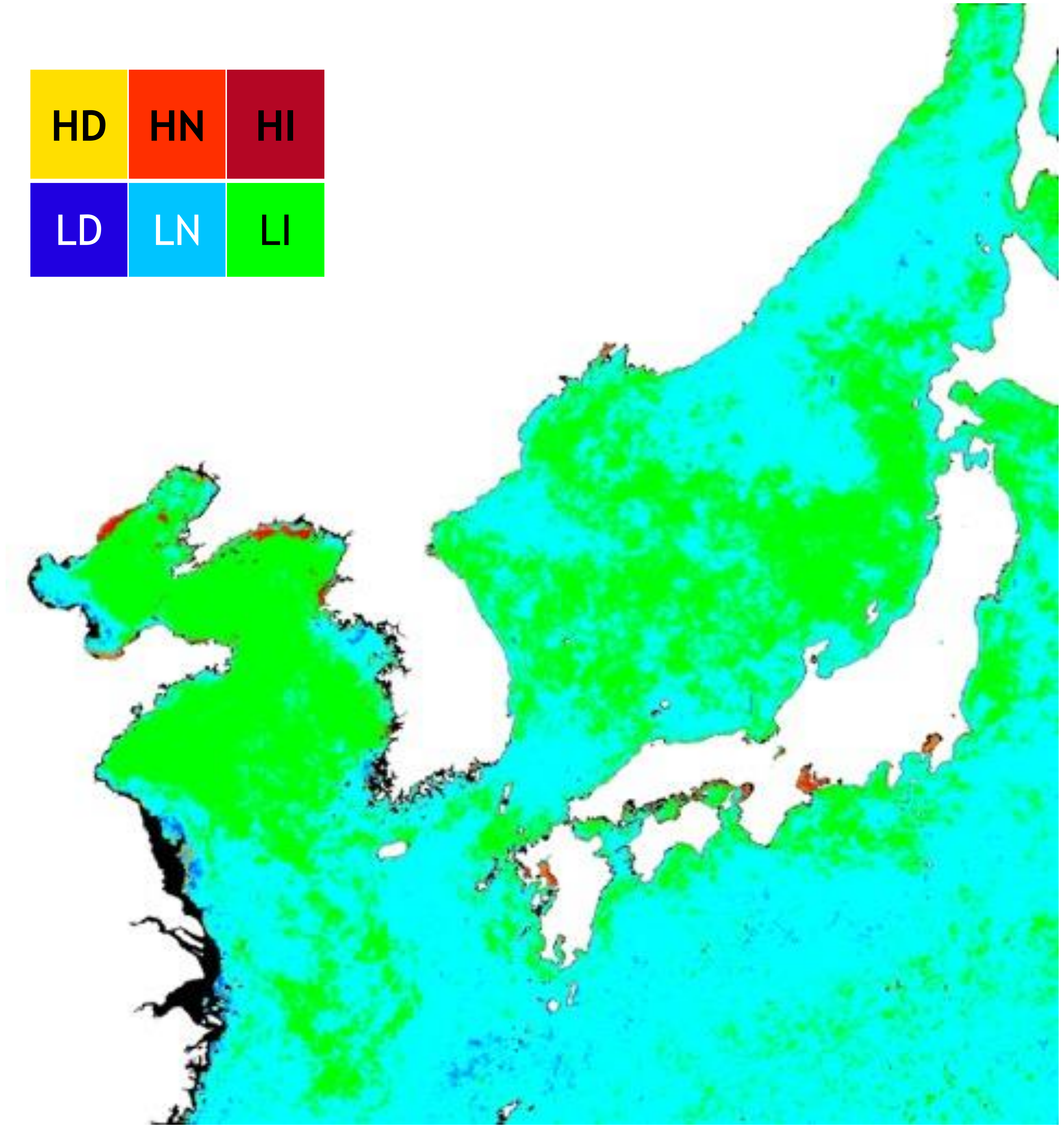
EO products in support of SDG indicators
Crop masks and crop types for SDG 2.4.1 (sustainable agriculture)

National crop statistics by admin. units
(Ukraine 2016)



esa

Assessment of eutrophication in the Northwest Pacific Region with satellite Chl-a from 1998 to 2015



14.1.1
Index of coastal eutrophication and floating plastic debris density

Coordinated by UNEP

ICE model is being developed with satellite Chl-a data and in-situ nutrient data

Terauchi et al (2018)

Summary and Way Forward

- EO has clear roles for disaggregation by geographical locations, by providing scalable (global, regional, country, local scales), timely(meeting data-latency requirements) and accurate (calibrated and validated) data.
- EO system and data flows need to be designed or adjusted to meet the disaggregation requirements.
- WGGI task stream2 will provide important opportunities to work with end users for monitoring and reporting the indicators, including identifying and meeting disaggregation requirements.