International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

science for global insight

Global forest mask and other applications of Geo-Wiki validation platform

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REDD pac

GLOBBIOMASS

CROWDLAND
Project reference: 617754
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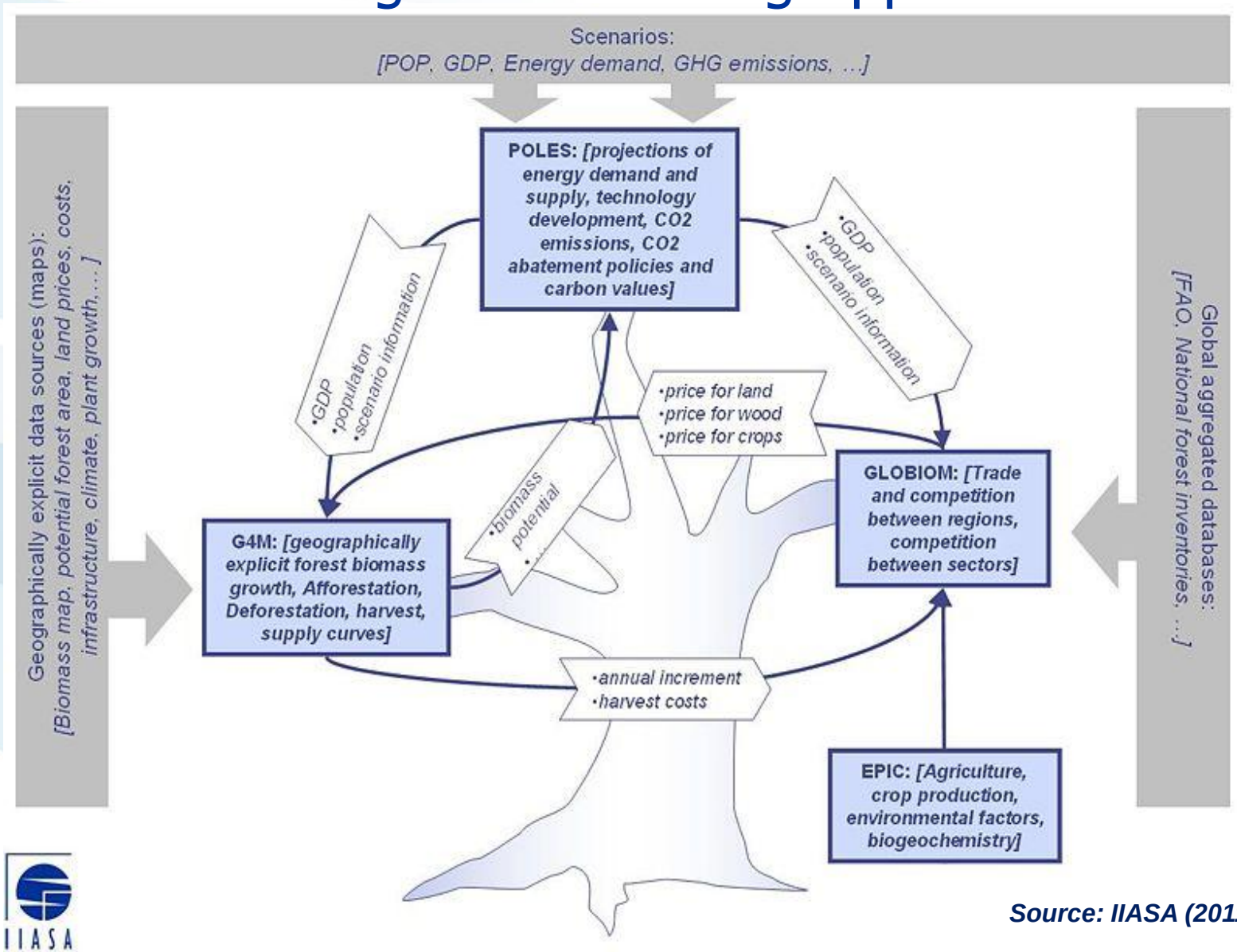
GEO-Wiki

Modeling Biomass Supply at Global Scale

An Integrated Modeling Approach

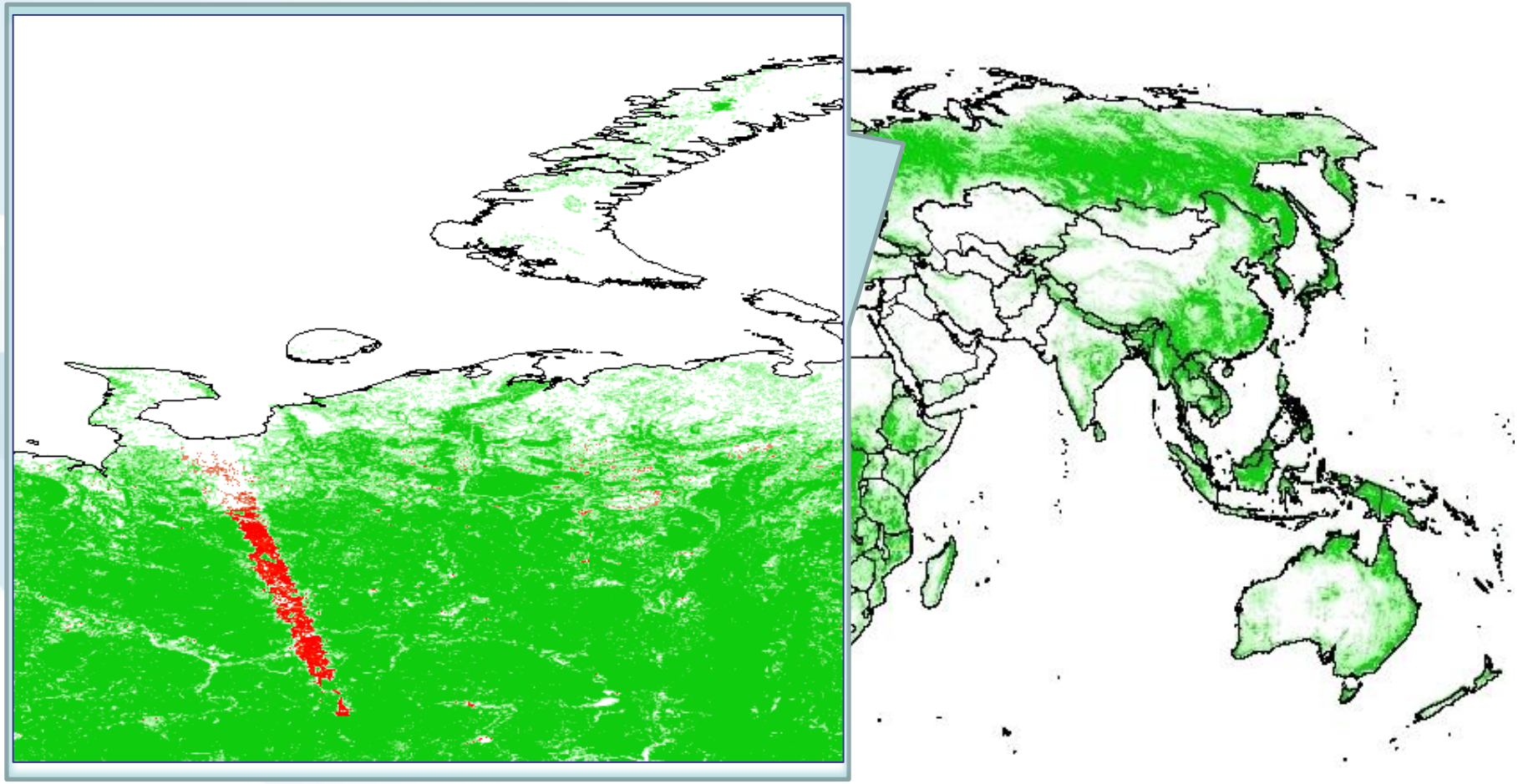


Source: IIASA (2011)

Available Global Forest Cover Datasets

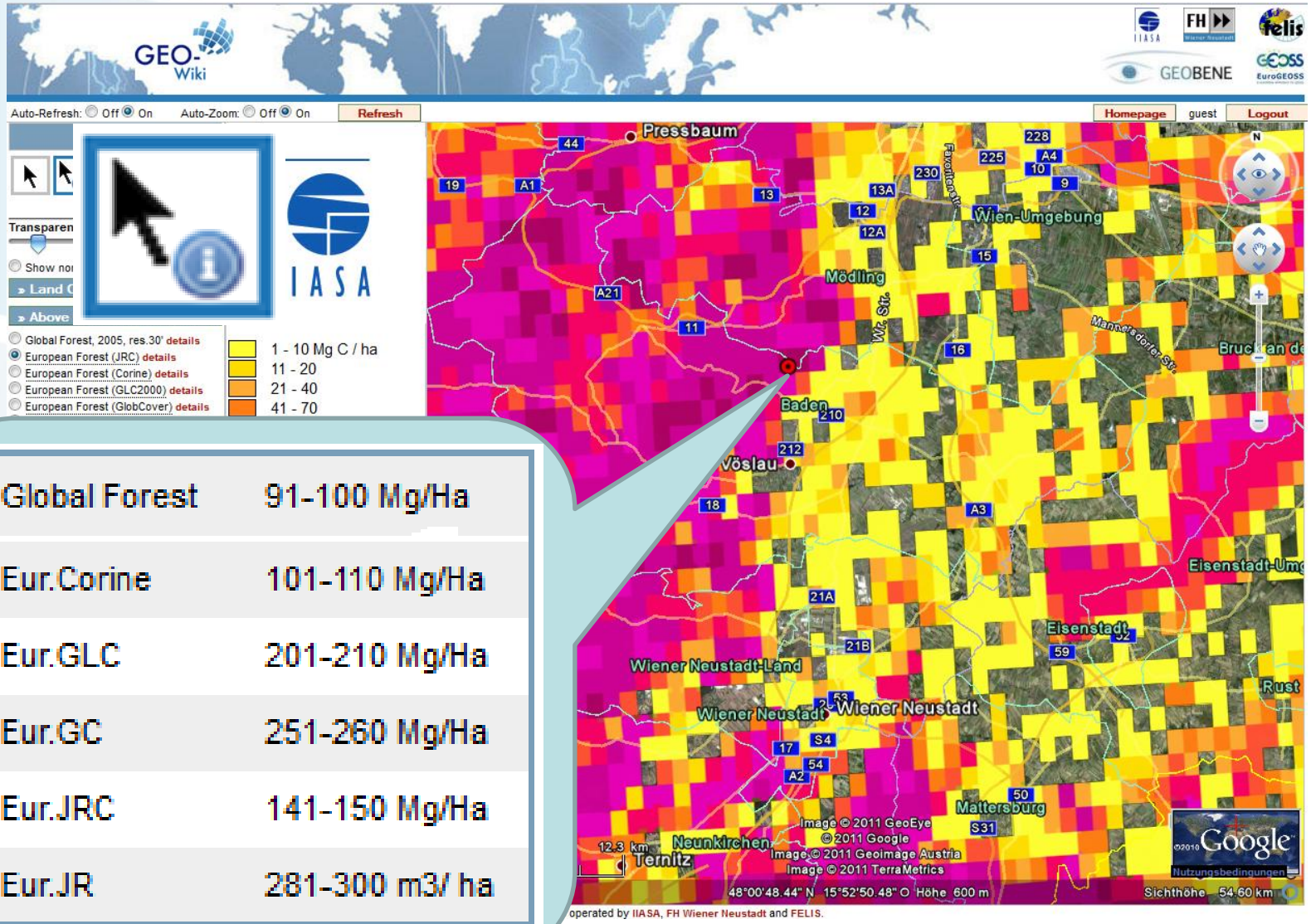
- Land cover (e.g. MODIS LC, GlobCover, GLC2000, CCI LC, GlobeLand30)
- Vegetation Continuous Fields (MODIS VCF, FAO world's forest map)
- Landsat-based forest cover (Sexton et al., 2013; Hansen et al., 2013)
- Radar-based (e.g. Jaxa Palsar forest mask)
- Hybrid (e.g. GLC-SHARE by FAO)

Jaxa PALSAR forest mask
(25m resolution)



http://www.eorc.jaxa.jp/ALOS/en/palsar_fnf/fnf_index.htm

Uncertainties of forest biomass estimation



Global Forest	91-100 Mg/Ha
Eur.Corine	101-110 Mg/Ha
Eur.GLC	201-210 Mg/Ha
Eur.GC	251-260 Mg/Ha
Eur.JRC	141-150 Mg/Ha
Eur.JR	281-300 m3/ ha

Crowdsourcing / Citizen Science

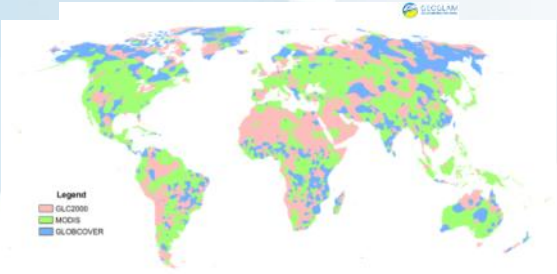
- Outsourcing to the crowd (Howe, 2006)
  - e.g. Amazon's Mechanical Turk
- Using the crowd to collect data, solicit ideas, analyze data, do voluminous tasks that could otherwise not be done
- Volunteered Geographic Information (VGI)
- Citizen Science
  - Contributory, Collaborative, Co-created

Geo-Wiki

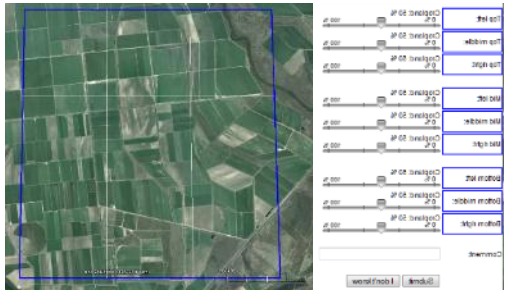
Visualization of Global Land Cover, Biomass, Photos, etc.

Crowdsourcing of Land Cover (Google Earth, Bing Maps)

Creation of Hybrid Land Cover Maps



Validation of Land Cover Maps

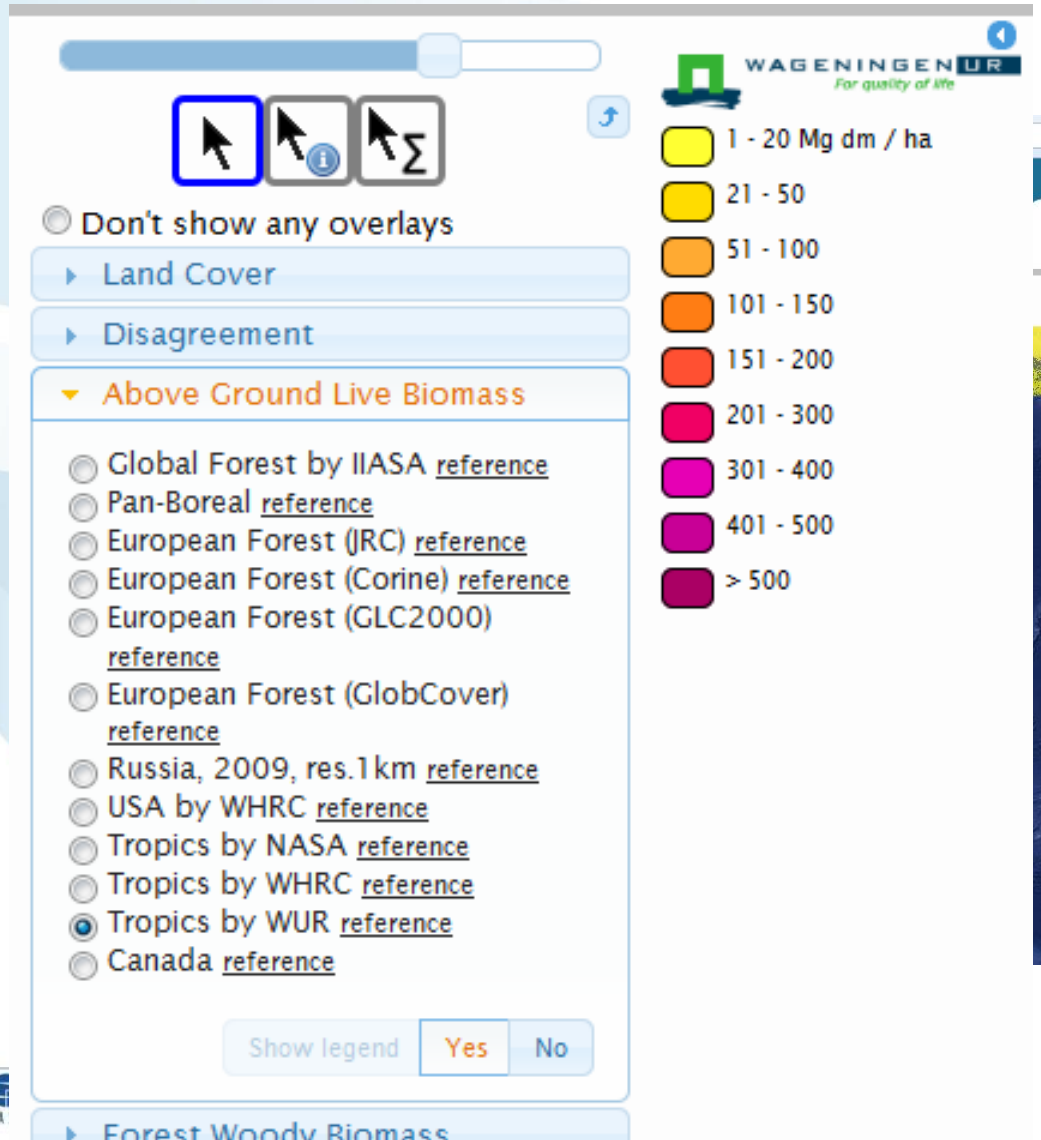


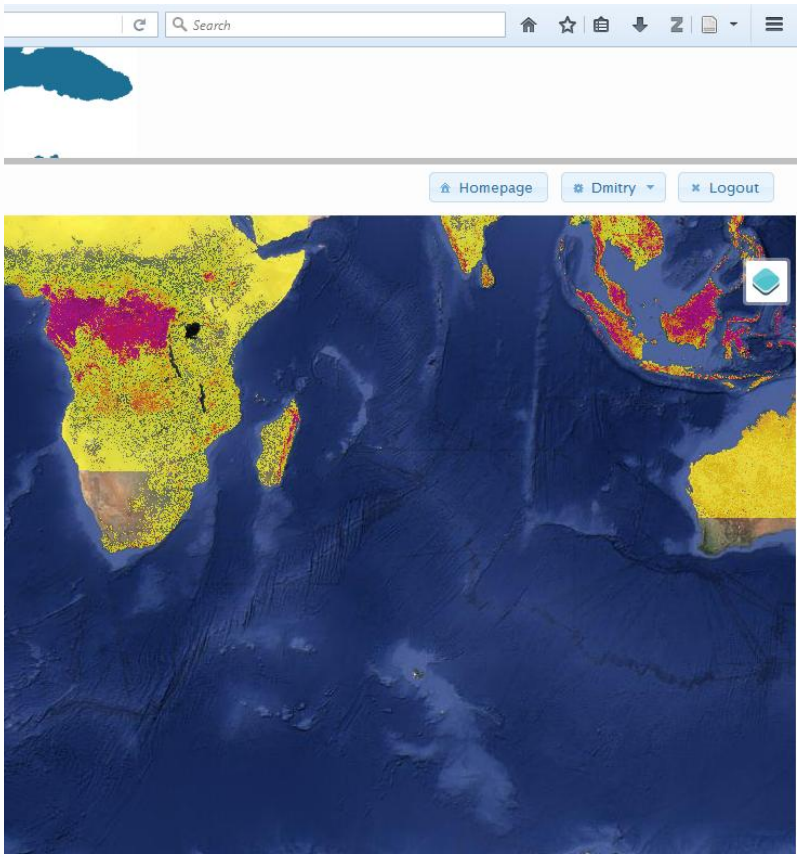
In-situ Data via Geo-Wiki Pictures app

Serious Games (Cropland Capture)

http://Geo-Wiki.org
Visualization, Crowdsourcing and Validation

Biomass.Geo-Wiki.org



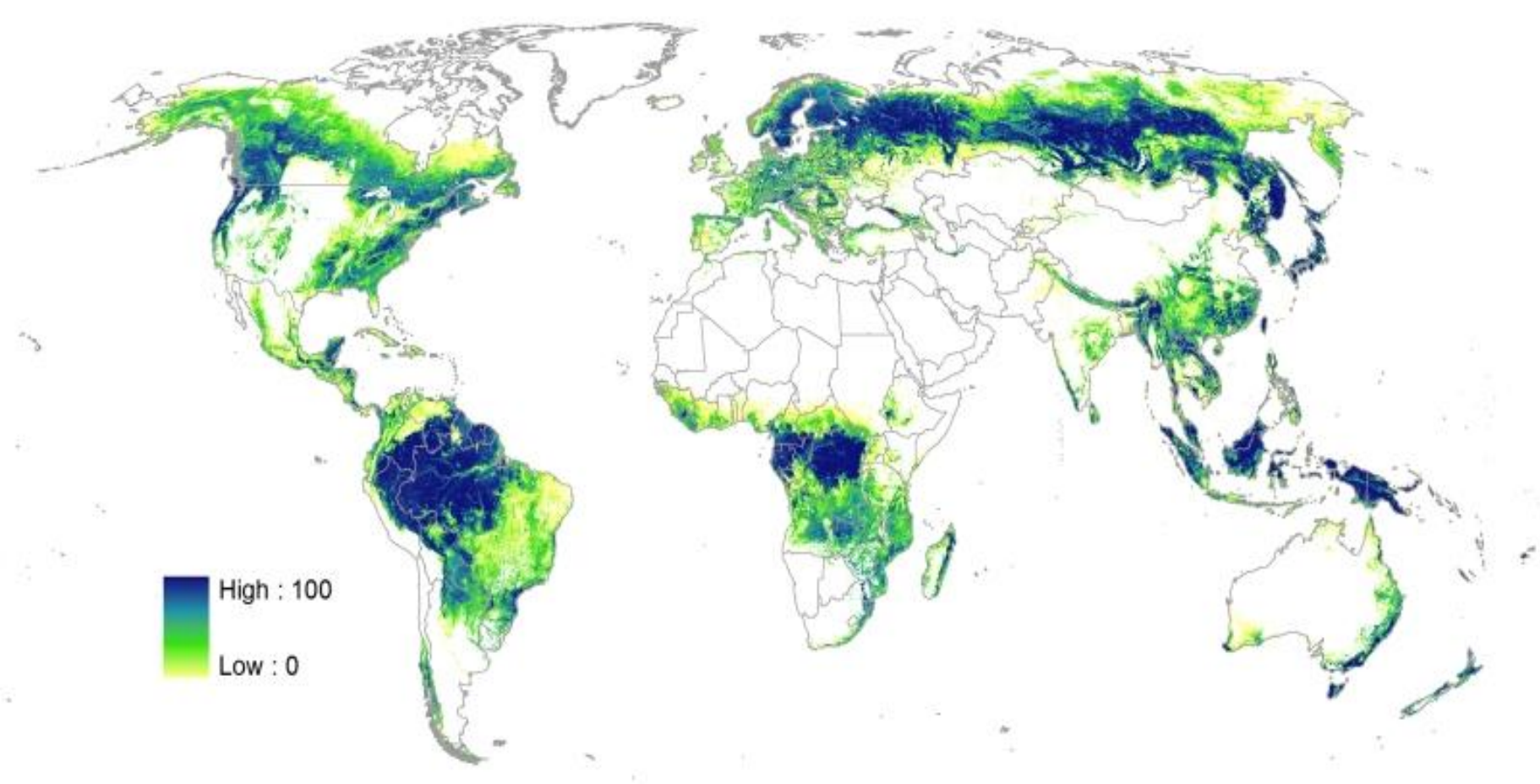


Mobile App: Geo-Wiki Pictures

Serious Game: Picture Pile

- More than 1.5 mil pics have already been sorted

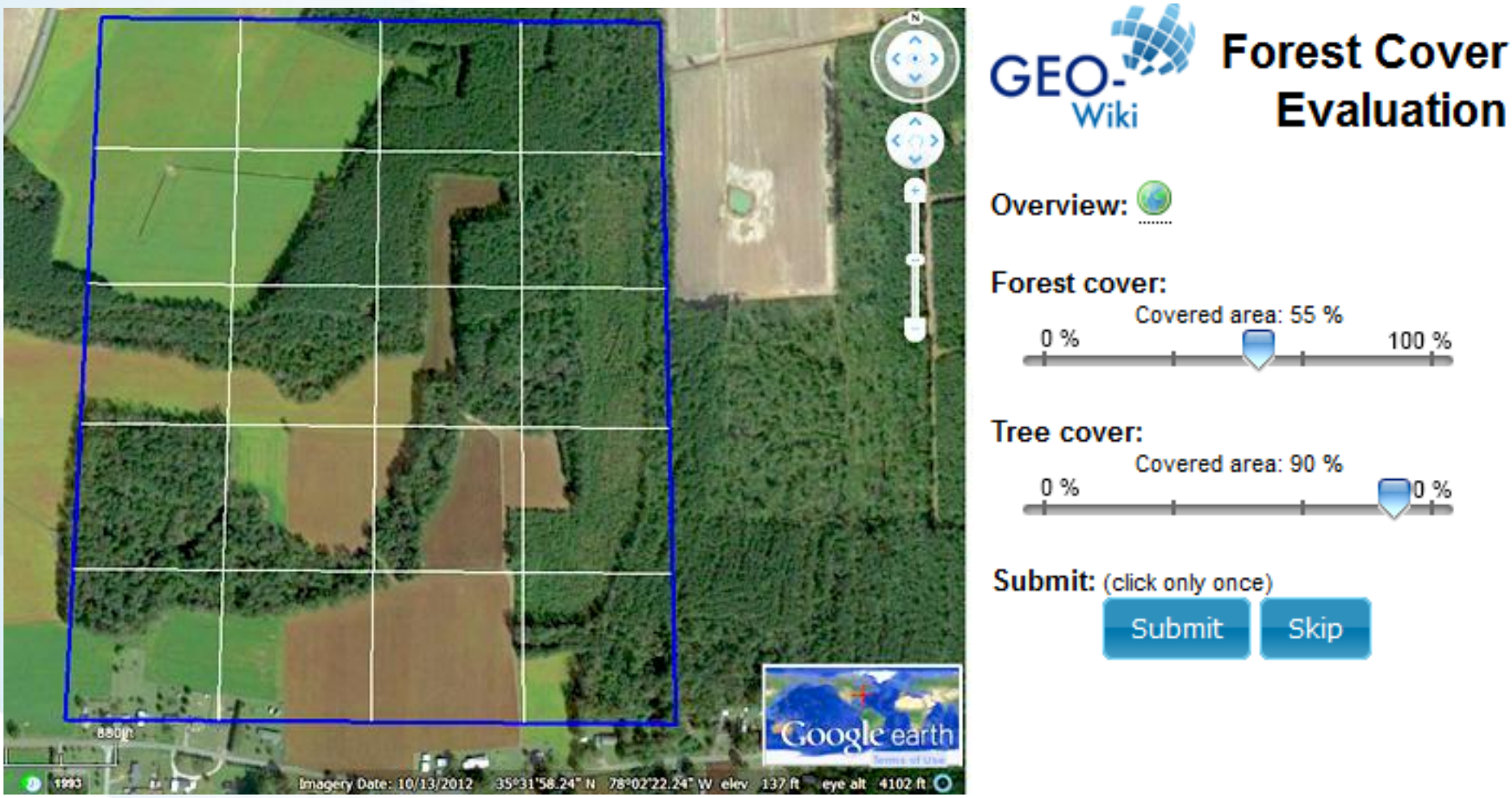
Global Hybrid Forest Cover Map



Schepaschenko et al. (2015) in Remote Sensing of Environment

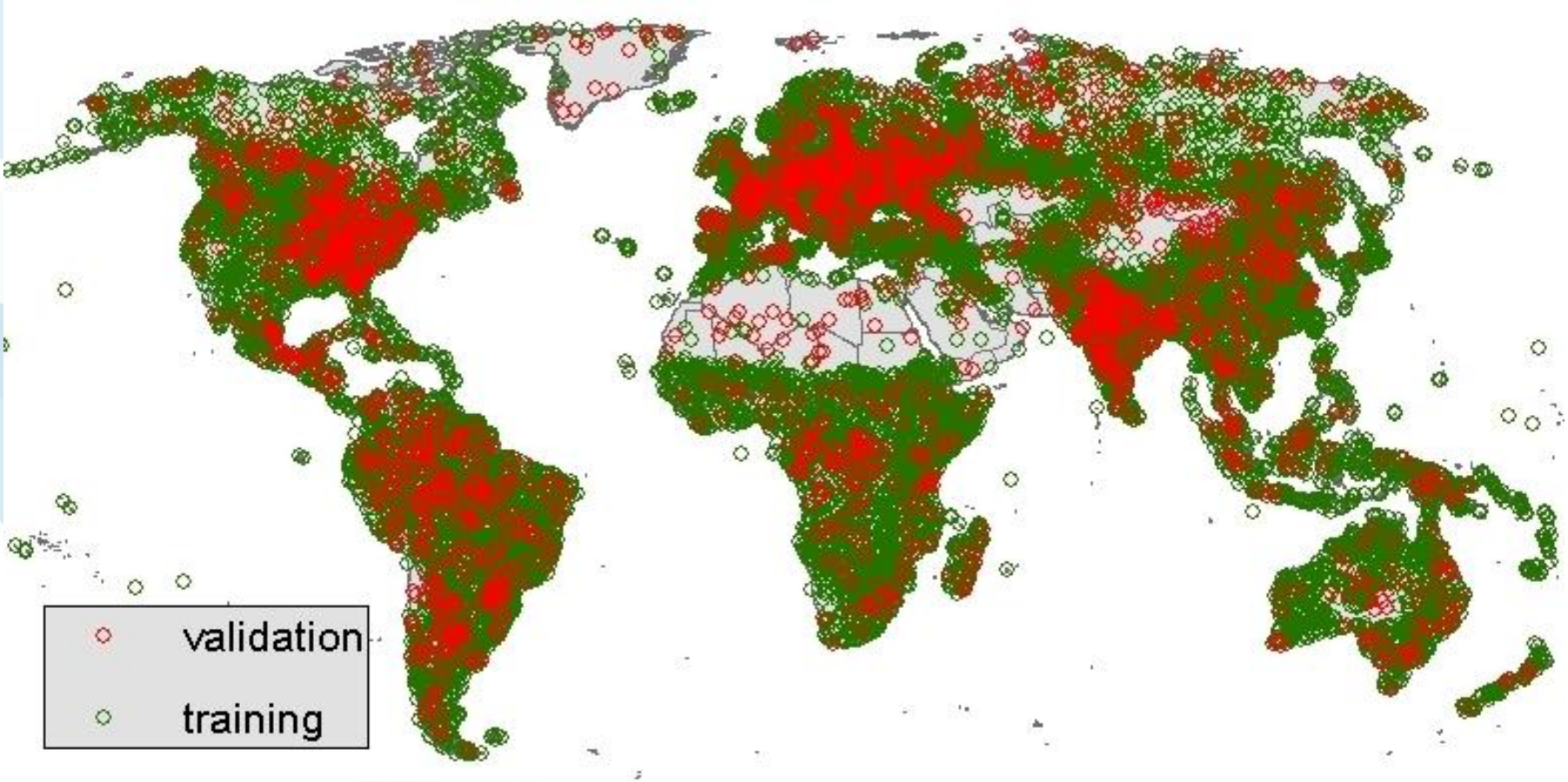
GlobBiomass project is acknowledged

Estimation of forest cover using Geo-Wiki and high resolution Google Earth imagery

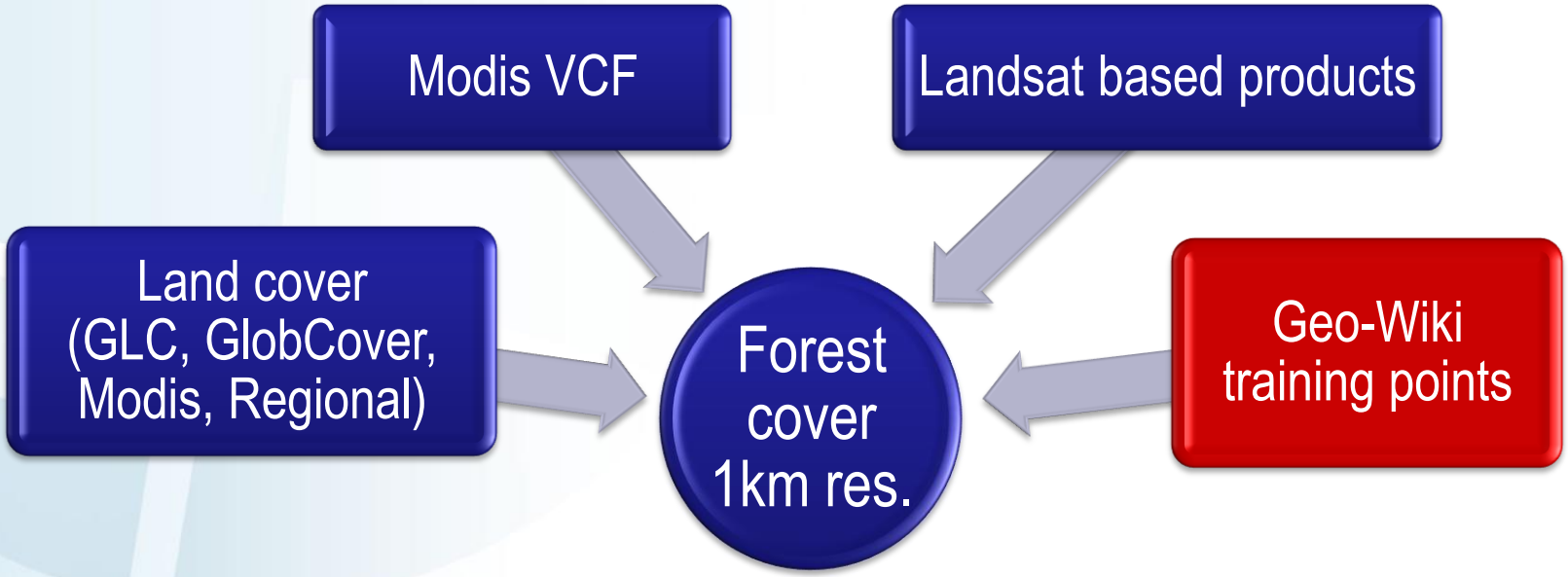


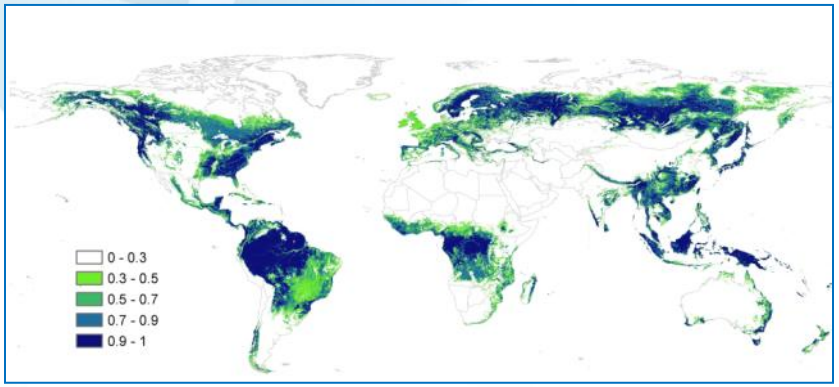
where 55% of 1km pixel area is estimated to be forest cover with tree cover of 90% stocking in this example.

Geo-Wiki training (~18K) and validation (~2K) points

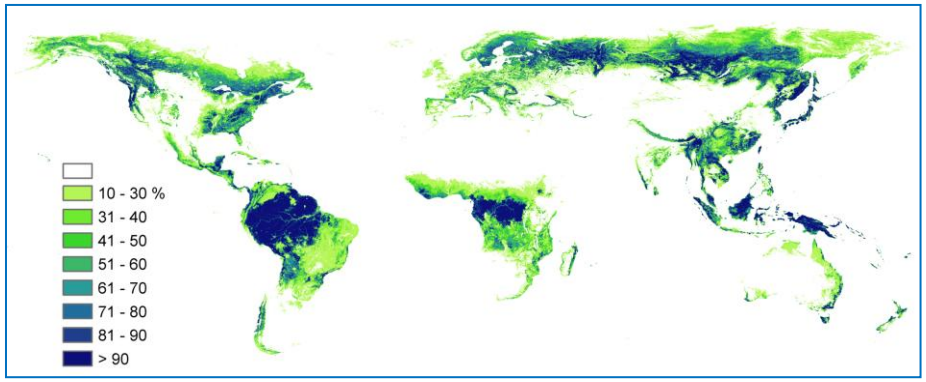


Global Forest Mask: synergy of remote sensing and crowd-sourcing



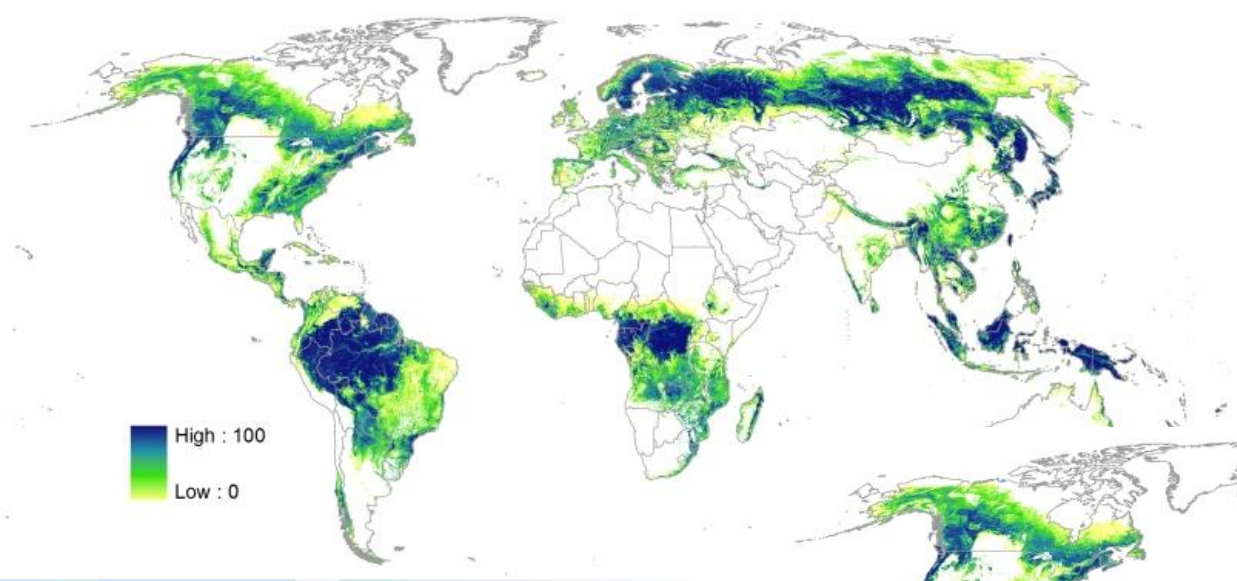


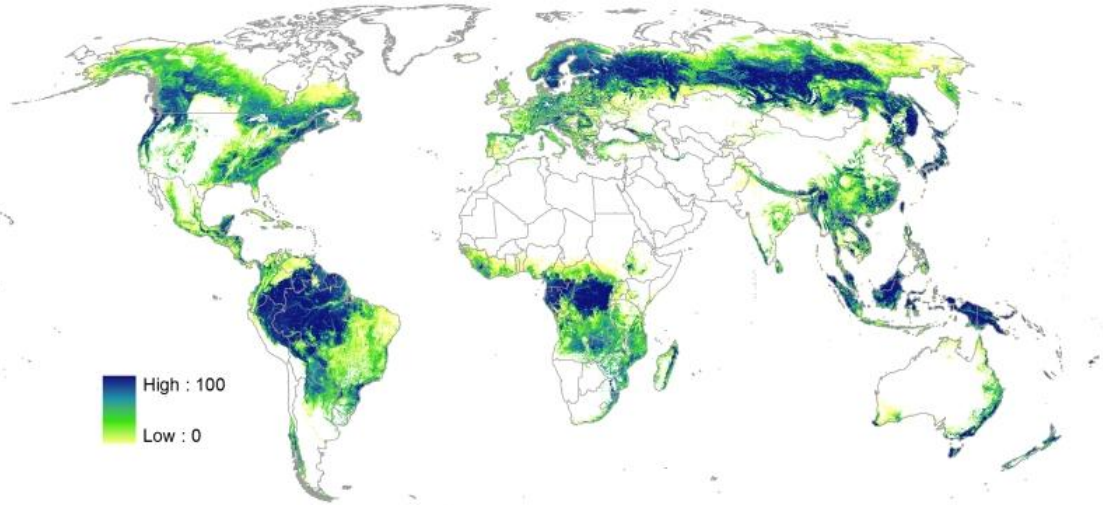
Forest probability



Forest cover, %

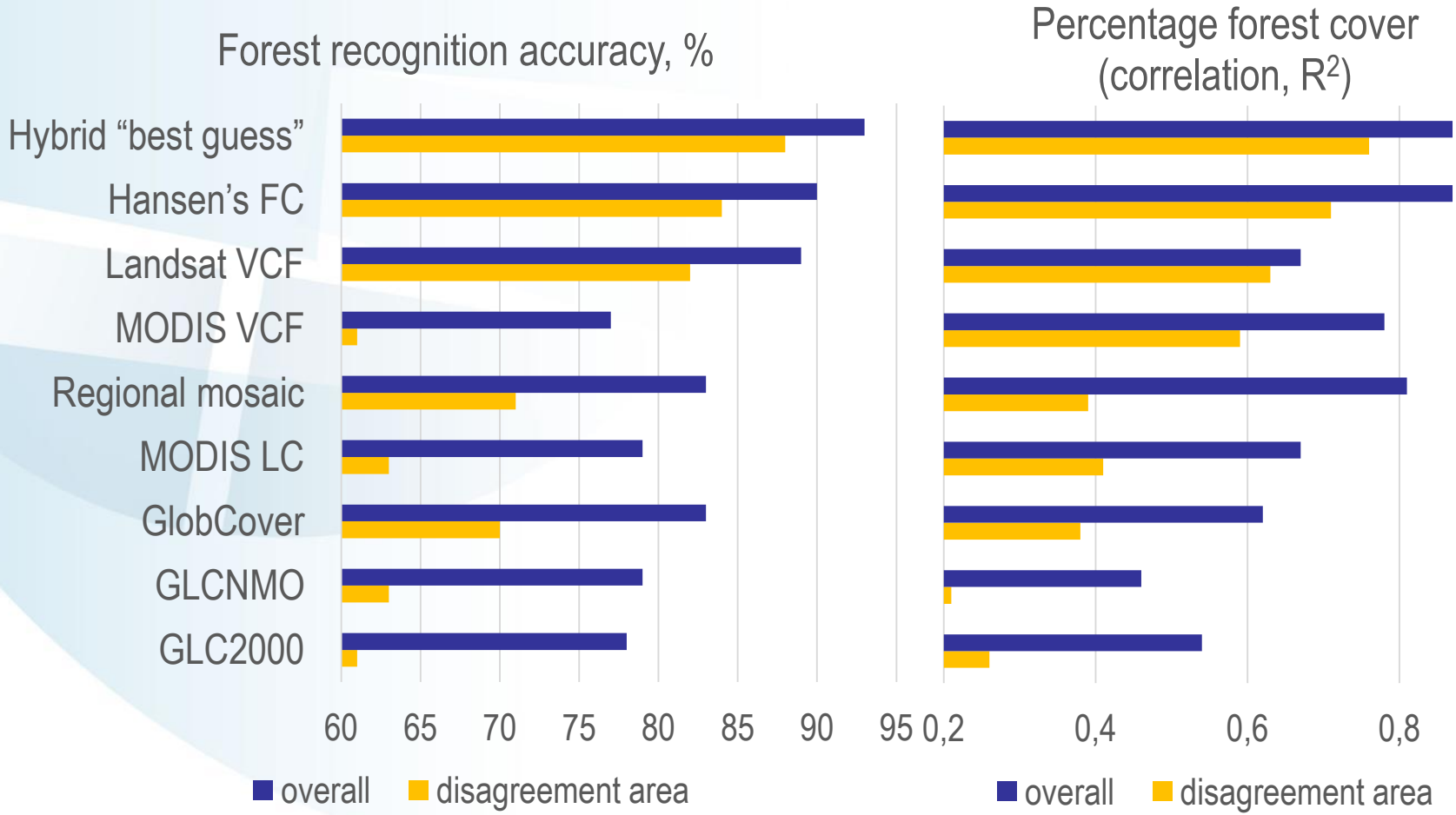
Hybrid forest cover maps
"Best guess" or calibrated to FAO FRA





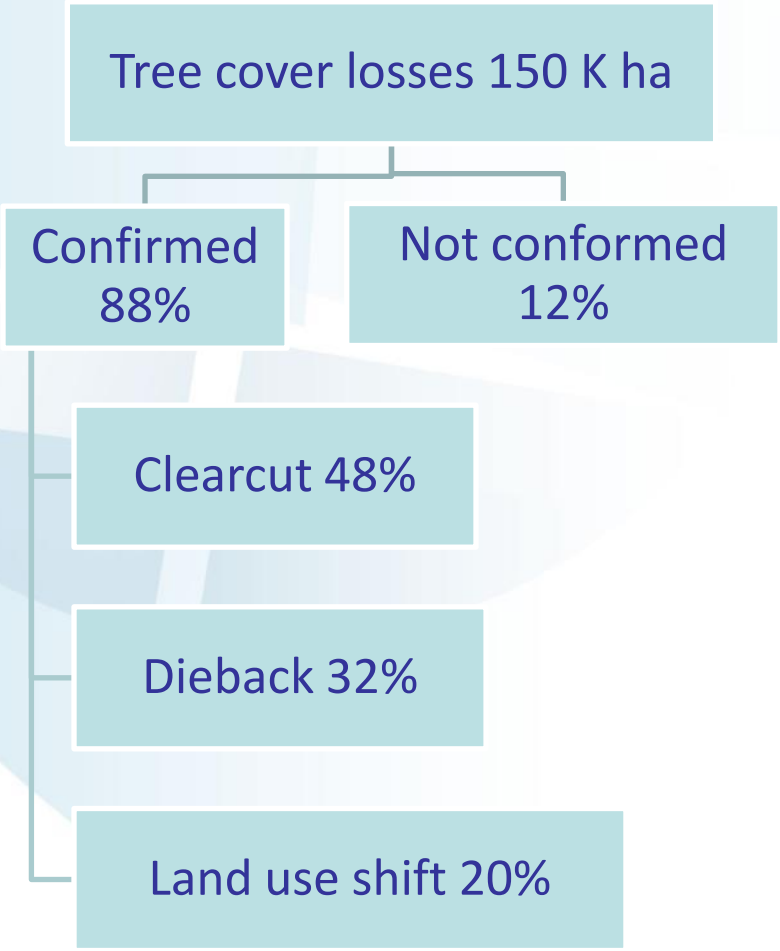
Available at http://forest.geo-wiki.org

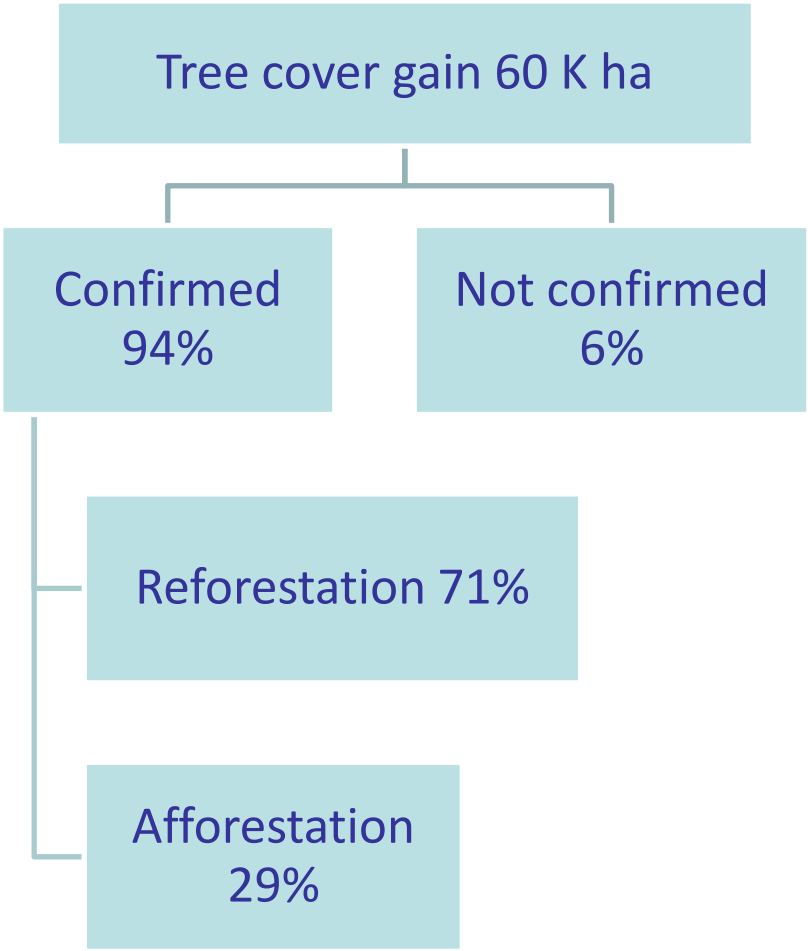
Validation of input datasets and final hybrid product



Tree cover change in Moscow region 2000-2013

Validation of tree cover change dataset by Hansen et al., 2014





http://Laco-Wiki.net

Laco-Wiki
The Land Cover Validation Platform

DRAFT

Welcome to Laco-Wiki

LACO-Wiki is a new web-based solution for validating land cover and land use maps. Using a variety of reference layers including satellite and aerial imagery from Google and Bing as well as OpenStreetMap, validation is a simple four-step process. After uploading your dataset, generate and validate the samples and create a report with the accuracy assessment.

Share your validated samples with us and you will help to build an open database that can be used to improve future land cover and land use maps.

Upload a dataset

You can upload your own maps for validation in either vector or raster format. Currently accepted formats are shape files and geoTIFFs in a WGS84 projection. Once uploaded you can design a customized legend for display. Additional datasets can also be uploaded to help you in the validation process.

Generate a validation sample

Once you have uploaded your map, you can create sets of validation samples using random, stratified or systematic sampling. You can specify the size of each sample or be guided by calculations of the minimum sample size needed based on the required confidence levels for your project.

Validate your map

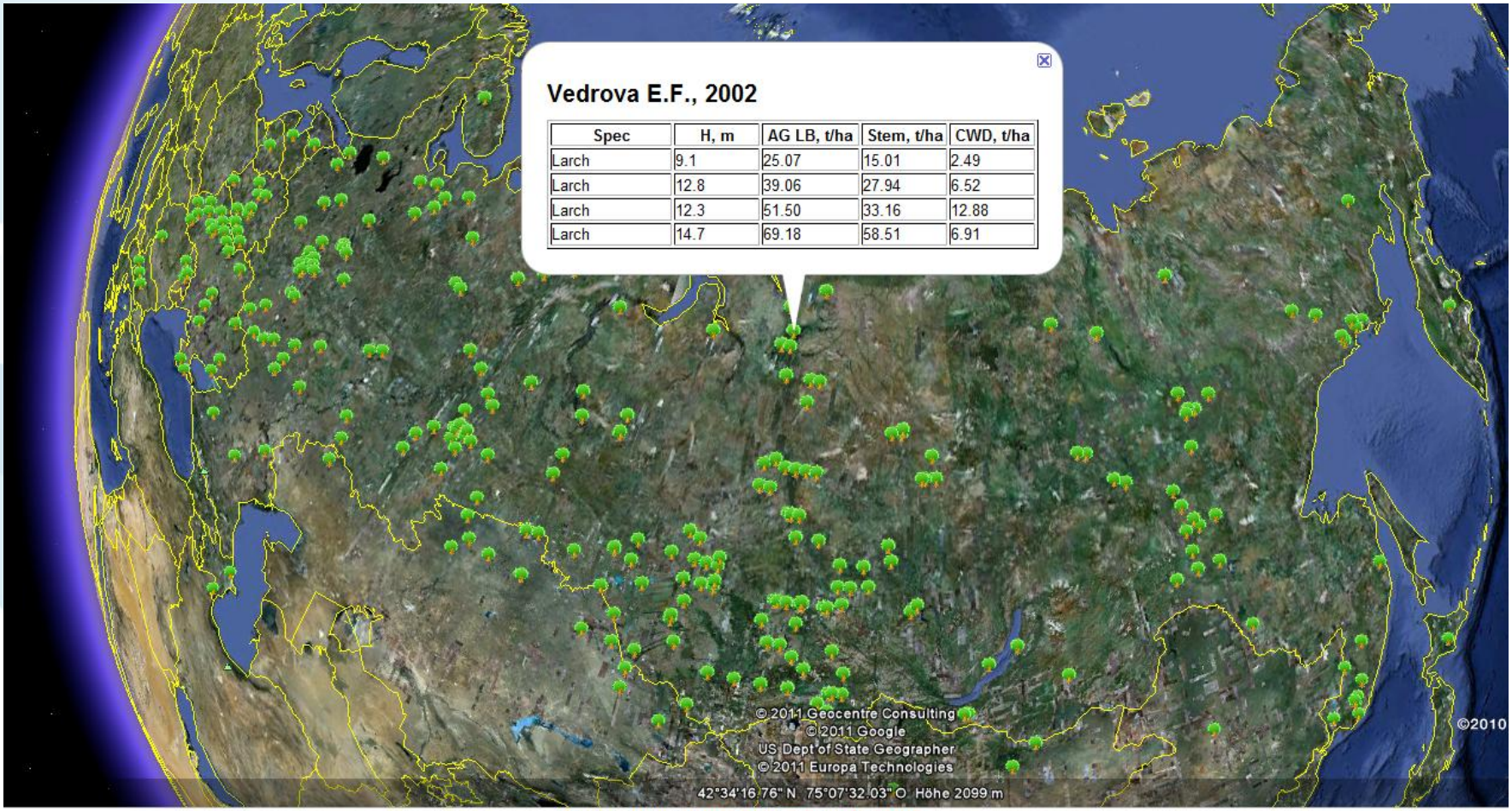
Using reference information such as satellite imagery, you can validate your sample using your own legend, either by selecting the class, confirming the class or correcting incorrectly classified ones. You can validate the samples by yourself or you can share any validation session to distribute the work.

Report on the accuracy

After validation you can download the raw data, the confusion matrix and generate a customized report on accuracy assessment, choosing from a set of different quality indicators including overall accuracy, omission and commission errors, kappa, average mutual information (AMI) and more.

IIASA

Database of field biomass measurements



Spec	H, m	AG LB, t/ha	Stem, t/ha	CWD, t/ha
Larch	9.1	25.07	15.01	2.49
Larch	12.8	39.06	27.94	6.52
Larch	12.3	51.50	33.16	12.88
Larch	14.7	69.18	58.51	6.91

This site is operated by IIASA, FH Wiener Neustadt and FELIS.

Forest Observation System: Towards Global Biomass *in situ* Data Repository

- Support Calibration/Validation of the ESA BIOMASS mission
- Elaborate a Live Biomass database accessible for the entire community
- Populate the database with the data from several multinational networks (RAINFOR, ArtiTRON, etc.)

Thank you for your attention

More information:
http://geo-wiki.org

http://www.iiasa.ac.at/web/home/research/modelsData/Geo-Wiki/Geo-Wiki.en.html

More readings:

Schepaschenko D, See L, Lesiv M, et al. (2015). Development of a global hybrid forest mask through the synergy of remote sensing, crowdsourcing and FAO statistics. *Remote Sensing of Environment*, 162:208-220.

See L, Fritz S, Perger C, Schill C, McCallum I, Schepaschenko D etc. (2015). Harnessing the power of volunteers, the internet and Google Earth to collect and validate global spatial information using Geo-Wiki. *Technological Forecasting and Social Change*

Fritz S, McCallum I, Schill C, Perger C, See L, Schepaschenko D, Kraxner F, Obersteiner M (2012). Geo-Wiki: An online platform for improving global land cover. *Environmental Modelling and Software*. V.31: 110-123 .