GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

LAND COVER VS. LAND USE

BY

ANTONIO DI GREGORIO

TECHNICAL SUPERVISOR

FAO – GLCN (GLOBAL LAND COVER NETWORK)

digregorio@iao.florence.it

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

Land use/cover categories, classifications and standardization efforts an historical overview:

- **The origin of the concept of systematic classification of vegetation can be traced in the mid-18 century in Sweden (Camilus Limnaeus)**
- **Development of *'modern'* Land Cover classification systems start with the use of aerial photographs at the beginning of 20 century (1920 Can.)**
- **Real introduction of land cover and land use classification concepts, (*based on A.P.*) , occurs in 1950's and 1960's with terrain classification systems.**
- **In the later half of the past century many public agencies, researches and private organization had recognized that accurate information on land use are essential to monitor changes in the environment.**

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

- In the next 20 years progresses were done, if not on harmonization of LCLU terms at least in the harmonization of the interpretation results, through the introduction of photointerpretation keys.
- *Launch of the first civilian Earth observation satellite ERTS-1 n 1972 started a new satellite imagery-based era for LULC Class.*
- *During the 1970's the term Land Cover started to intermix with the previosely dominant Land Use terms.*
- *The efforts for harmonization started in the 90s in parallel with the increased use of GIS and spatial analyses*
- *An important step toward standardization had ben the efforts of FAO-UNEP. In 1994 they started a joint 'Initative on Standardization of L.C. and L.U. Classification Terminology'. One of the main out put of the initiative was a strong recommendation to separate Land Cover from Land Cover classifications.*

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

Present situation:

- *Despite the many recommendations to separate the two terms there is still an unfortunate mix of LULC terms in terminology, taxonomy and data sources.*
- *This problem is just a component of a bigger problem on semantic interoperability of geographical information.*

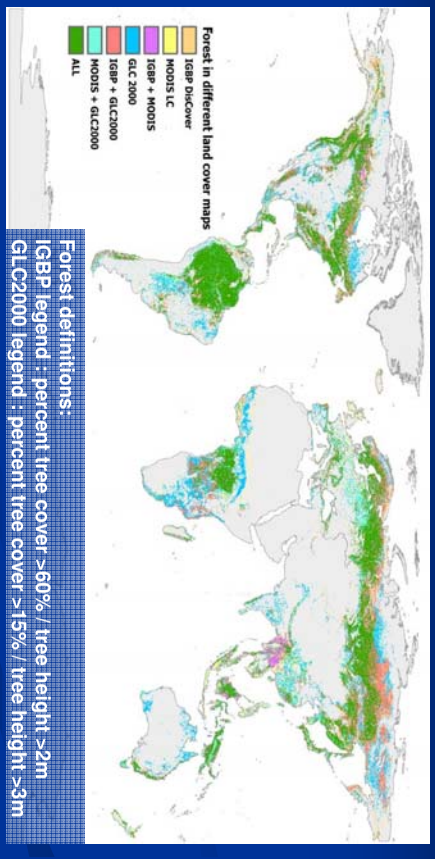
GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

Countries	Definition type	Area	Crown Cover (%)	Tree Height (m)	Strip width (m)	Notes
Costa Rica	Cover	2	70			Includes land with more than 70 trees per ha and with dbh 15 cm
Cuba	Use			5		
Denmark	Use	0.5	30-50	6	20-30	
Eritrea	Cover		10			
Finland	Potential	0.25				Excluded land capable of producing less than 1m3 and ha stemwood
France	Cover	0.25	10	8	15	
Gambia	Cover		10	3		
Germany	Use	0.1	50		10	
Iran	Cover		4			
Italy	Use	0.2	20		20	

LAND COVER TOPIC CENTRE - GLCN



FOREST LAND IN DIFFERENT GLOBAL LAND COVER DATA SETS

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

MAIN FOREST LEGEND OVERVIEW IN ASIA

NEW ZEALAND LCDB 2 Classes	MYANMAR 2000-2005 Classes	INDIA 2003 Classes	CHINA 2000-2005 Classes	SRI LANKA 1992-1999 Classes	MONGOLIA 1975-2005 Classes	NEPAL Jafta 2000 Classes	S. KOREA 1999-2006 Classes
	1. Evergreen Forest			1. Lowland rain forest			1. Stocked forest
54 Broadleaved Indigenous Hardwoods	2. MUMD (Moist Upper Mixed Deciduous) Forest	1. Very Dense Forest (VDF)	1. Forest (arbor forest, mangrove forest, bamboo forest),	2. Moist monsoon Forest	1. natural forest	1. Sal (Shorea robusta)	
68 Deciduous Hardwoods	3. DUMD (Dry Upper Mixed Deciduous) Forest			3. Dry monsoon Forest		2. Tropical Mixed Hardwood	(RSS 1996)
69 Indigenous Forest	4. Deciduous Dipterocarp Fores			4. Montane forest		3. Upper and Lower Mixed Hardwood	1. Conifers
	11. Dry Forest	2. Moderately Dense Forest (MDF) ??		5. Sub Montane forest	4. forest area damaged by fire	4. Chir Pine	4. Alpine Conifers
	5. Pine forest			7. Riverine dry forest	5. forest damaged by insects	5. Blue Pine/ Cypress/Yew	2. Hardwood
	6. Hill forest					6. Fir/ Hemlock/ Spruce/ Cedar	3. Mixedwood
70 Mangrove	8. Mangrove Forest			9. Conifers	2. planted forest		5. Oaks
				10. Eucalypts			
				11. Teak			
	9. Evergreen Forest / Open			12. Mahogany			
	10. MUMD Forest / Open	3. Open Forest(OF)	2. Open forest land,	8. Sparse and open forest	7. open forest		
50 Fernland	12. Mangrove Open				8. area for reforestation		
51 Gorse / Broom				6. Mangroves			
52 Manuka and or Kanuka							
53 Matagouri	13. Scrub Land	4. Scrub	3. Shrub land,		3. shrubs	7. Shrub	
55 Sub Alpine Shrubland			4. Unestablished forest,		6. logging area		
56 Mixed Exotic Shrubland			5. Nursery land,		9. non forest area		
57 Grey Scrub	7. Bamboo Forest		6. Forest suitable land,				4. Denuded forest land ??
							3. Unstocked forest land
	14. Shifting Cultivation					8. Agri/Grass	2. Cultivated land on steep slopes
15 Alpine Grass-/Herbfield			7. Other land				
41 Low Producing Grassland						10. Water bodies	
43 Tall Tussock Grassland						11. Bare Land	5. Rocky Area
.....follow						12. Snow	

LAND COVER TOPIC CENTRE - GLCN

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

Overview of classification systems:

LEVEL I Mapping scale 1:250000	LEVEL II Mapping scale 1:1000000
URBAN OR BUILT UP LAND	Residential Commercial and service Industrial Transportation, communication utilities Industrial and commercial complexes Mixed urban or built up land Other urban or built up land
Agricultural land	Cropland and pasture Orchards, groves, vineyards, nurseries, etc. Confined feeding operations Other agriculture land
Rangeland	Herbaceous rangeland Srub and brush rangeland Mixed rangeland
Forest land	Decidous forest land Evergreen forest land Mixed forest land
Water	Streams and canals Lakes Reservoirs Bays and estuaries
Barren land	Dry salts flat Beaches Sandy areas other than beaches Bare exposed rocks Strip mines, quarries, and gravel pits Transitional areas Mixed baren land
Tundra	Shrub and brush tundra Herbaceous tundra Bare ground tundra Wet tundra Mixed tundra
Perennial snow or ce	Perennial snowfields Glaciers

The USGS Land Cover Classification System (Anderson e al. 1972/1976)

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

The EarthSat GeoCover L.C. Global Land Cover Legend

No.	Land Cover Class Name	Land Cover Class Definition
1	FOREST DECIDUOUS	Trees > 3m height, canopy closure > 35%
2	FOREST EVERGREEN	As above. Includes both broadleaf and needleleaf species
3	SHRUB/SCRUB	Woody vegetation < 3 m in height With at least 10% ground cover
4	GRASSLAND	Upland herbaceous grasses > 10% ground cover
5	BARREN	< 10% ground cover by other LC classes
6	URBAN/BUILT-UP	Includes residential, commercial and industrial, transportation, sport facilities
7	AGRICULTURAL LAND GENERAL	Cultivated and pasture land, except paddy agriculture
8	RICE/PADDY FIELDS	Irrigated or rainfed
9	*WETLAND, HERBACEOUS*	Water table near the surface for most of the growing season. Includes playas and salt
10	WETLAND, MANGROVES	Sheltered coastal (estuarine) tropical wetlands supporting woody species of mangroves
11	WATER BODIES	Permanent open water bodies
12	PERMANENT ICE OR SNOW	Includes glaciers and permanent snow fields on mountains
13	CLOUDS/CLOUD SHADOWS/ NO DATA	Areas where land cover interpretation was not possible

LAND COVER TOPIC CENTRE - GLCN

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

Inconsistency of definitions (Hearthsat GeoCover)

FOREST DECIDOUS

Woody vegetation > 3 meters (10 ft) in height that lose leaves periodically due to changing seasons or drought. Canopy closure must be >35% (<35% = Category 3). Also included in this category are areas commonly referenced as "swamp" or forested wetland if dominated by a deciduous canopy.

- **Gap between classes FOREST vs. SCRUB**
- **Overlap between classes GRASSLAND vs. HERB. WET.**

SCRUB

Woody vegetation less than 3 meters (10 ft) in height, with both closed and open canopies. Minimum ground cover is 10%; conversion to forest occurs at 35% canopy coverage provided the trees are > 3 m in height.

GRASSLAND

Category may include herbaceous wetlands if images are collected during dry season or periods of drought. Land cover types commonly referenced as savanna and open savanna are included in this category

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

SEMANTIC INTEROPERABILITY THE CORE OF THE PROBLEM:

- The semantic problems of data exchange have became apparent with the increase of data modelling commmunity
- Many classifications of geographic phenomena are often a black box to anyone outside the immediate group involved in the classification process.
- In the worst cases LULC information are treated as data by users who don't fully understand its semantics.
- The consequences are a miss use of data bases information, a situation few users are prepared to acknowledge and even more difficult to document.
- In geographic information truth as in a distinct, indubitable and accurate fact cannot exist.

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

A NEW PROSPECTIVE TO CLASSIFY LULC:

- A classification process deals with the structuring of a specific knowledge domain in order to create consistency and stability in communication between users.
- LULC classifications are today perceived by the end users as 'boundary objects' between different disciplines.
- Classification is however a dynamic process definitions can change over time and prevalence of other cultures
- It should be recognized that no classification system can reflect either the social or the natural world fully accurately
- There are and it will be always multiple ways to conceptualize and communicate knowledge thus inherent ambiguity in any categorization

New challenges and needs:

- *It is not enough to supply a term together with a description it is important to specify what goes into separating one term from another*
- *The boundary object interpretation of a classification implies that classes could be customized to user requirements but on the same time have also a common identity across users.*
- *Classifications needs to develop an open, transparent and dynamic syntax for the formalization of meaning as UML (Unified Modelling Language), mathematical language etc.*

GLOBAL LAND USE DATA – Workshop
Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

CONCLUSIONS:

- *Intermix in many classifications of LU and LC terms is contributing to problems of semantic interoperability of geographic information.*
- *This intermix is often an indicator of more severe problems on conceptual design of a classification and its ability at structuring a specialized knowledge domain.*
- *A clear separation of LU and LC terms is possible considering however that defining geographic information classes implies an arbitrary drawing of boundaries in a continuum.*

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

LAND COVER TOPIC CENTRE - GLCN

GLCN LAND COVER & LAND USE DEFINITIONS:

LAND COVER: is the observed (bio)physical cover on the earth's surface

LAND USE: is considered as the arrangments, activities and inputs people undertake in a certain land type to produce, change or maintain it

GLOBAL LAND USE DATA – Workshop

Vienna 22 – 23 May 2008

THE END

LAND COVER TOPIC CENTRE - GLCN