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Space-based Products to Enhance UNCCD Implementation

Prepared for the

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Presentation Outline

I. The Convention and its Challenges

II. Cause and Effects of Land Degradation and Desertification

III End users involved in the implementation of the Convention

IV. Information Needs and the Convention
The COP 9 Indicators

V. Conclusion
How can the space community help

Land Degradation and Drought

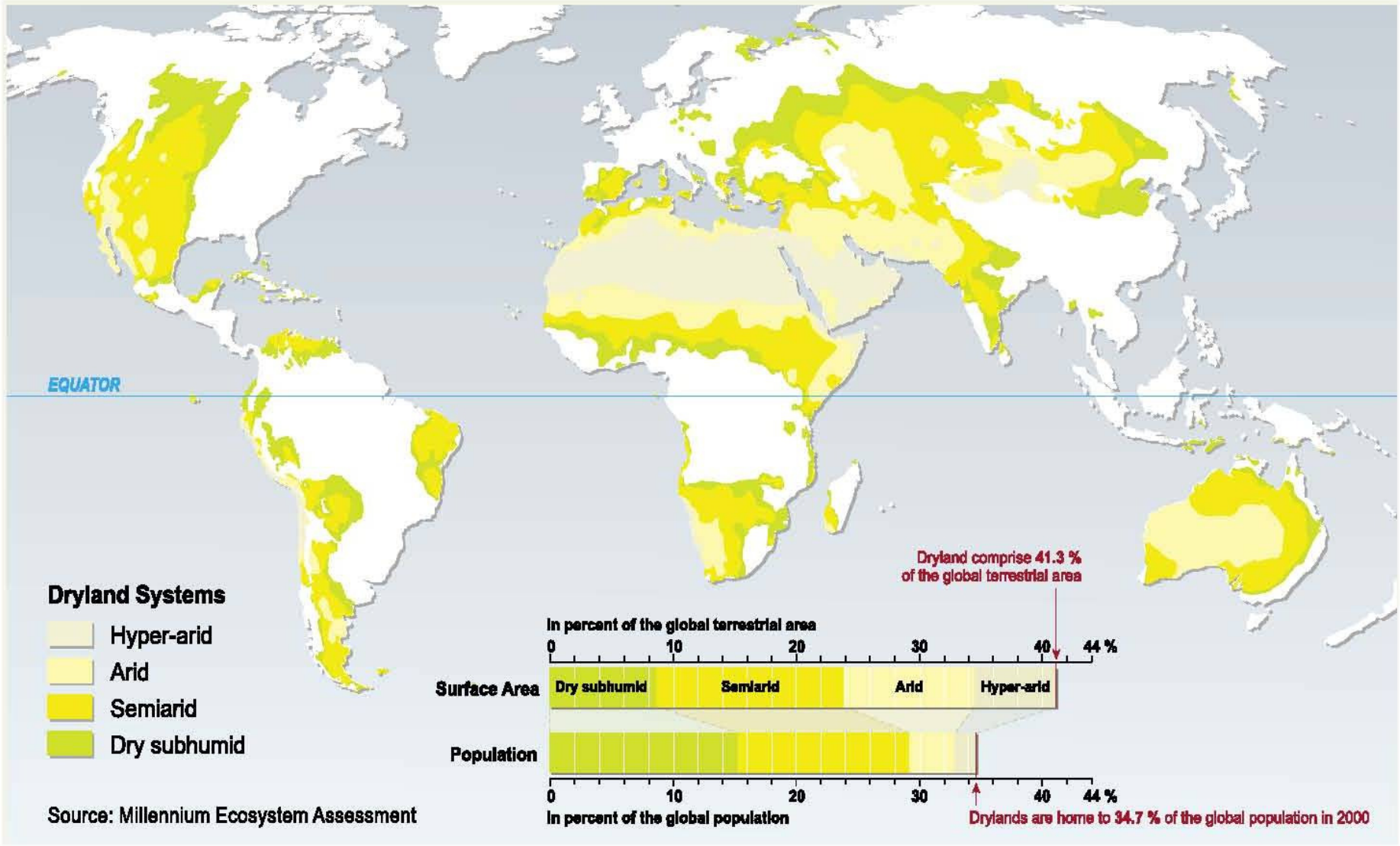
Desertification means drylands degradation.
Desertification was defined at the Rio Earth Summit as
"*land degradation in arid, semi-arid, and dry sub-humid areas resulting from climatic variations and human activities.*"

Drought is generally defined as a
"Temporary reduction in water and moisture availability significantly below the normal or expected amount for a specified period. "

Under the Convention, drought is defined as a
"naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems."

The Drylands

41.3% of the global terrestrial area – 34.7 % of the global population



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Beneficial Uses of Space-based Information

(i) To integrate and coordinate the collection, analysis and exchange of relevant short-term and long-term data and information

(ii) To establish and/or strengthen early warning systems

(iii) To survey and ensure systematic observation of the state of the environment

Causes and Effects of Desertification

Types of failures

(i) Unsustainable use of land and water resources, due to combined climatic and soil conditions and high human pressure on natural resources
(ii) Insufficient government attention to land degradation
(iii) Insufficient adaptation of recommendations to the larger agro-ecological variability
(iv) Deficient infrastructure
(v) Lack of economic incentives and marketing difficulties (market failures)
(vi) Inefficiencies arising from institutional weaknesses
(vii) Inadequate land tenure and land management systems
(viii) Agricultural and other economic incentives and disincentives
(ix) Loss of confidence in political and governance systems
(x) Breakdown of traditional leadership
(xi) Inappropriate development strategies

End Users for Spaced-based Products

Spatial level	End users	Examples
Global	International development and financing bodies	UN agencies such as UNDP, UNEP, FAO, WMO, etc. The World Bank GEF IFAD Bilateral aid agencies International NGOs (WWF-IUCN) Global early warning centers International research organization (CGIAR institutions, IUFRO, etc..)
Regional	International and regional bodies	Same as above African Development Bank Asian Development Bank Interamerican Development bank European Commission Regional early warning centers
Sub-regional	International, Regional and Sub-regional bodies	Same as above CILSS OSS UMA IGAD SADC
National	Responsible ministries and executing agencies UNCCD National coordination units Other line ministries and executing departments	Same as above Focal points of the Convention Decision-makers of line institutions National monitoring and assessment centers National early warning centers/systems Research Institutions, including remote sensing centers Universities
Sub-national	State, provincial, district, departmental institutions with strong functional links with national institutions	Decentralized government institutions Local NGOs
Local	Local extension organizations	Communities, farmers' associations, women with strong linkages with extension agents, researchers and NGOs

Information Requirements for Desertification Monitoring

Strategic Information	EO	Scale	Update frequency
Information on atmospheric conditions			
Atmospheric circulation	*	Global	Continuous
Radiation	*	Global	Continuous
Atmospheric gaseous trace constituents	*	Global	Continuous
Albedo	*	Global/National	Continuous
Surface-atmosphere interactions	*	Global	Continuous
Sea-surface temperature	*	Global	Continuous
Information on climatic conditions			
Mean and extreme data		National/Local	Continuous
Rainfall (seasonal variability)		National/Local	Continuous
Temperature (seasonal variability – land surface)	*	National/Local	Continuous
Cloud cover (seasonal variability)	*	National/Local	Continuous
Heat Fluxes (seasonal variability)		National/Local	Episodic
Seasonal occurrence, length and periodicity of drought		National/Local	Episodic
Net radiation (seasonal variability)		National/Local	Continuous
Wind speed, direction and frequency (seasonal variability)	*	National/Local	Continuous
Rain erosion potential (calculated)		Local	Annual
Sunlight duration (seasonal variability)	*	National/Local	Continuous
Potential evapotranspiration — PET (calculated)		Local	Annual
Sandstorm/dust storm (seasonal variability)	*	National/Local	Continuous
Information on soil and water			
Surface status (rockiness)	*	Local	Revision 5-year
Soil texture		Local	Revision 5-year
Soil fertility (organic matter)		Local	Revision 5-year
Soil structure		Local	Revision 5-year
Soil hydrology		Local	Revision 5-year
Aridification		National/Local	Revision 5-year
Soil moisture	*	Local	Continuous
Soil permeability		Local	Revision 5-year
Erosion potential (calculated)		National/Local	Revision 5-year
Alkalinization/Salinization	*	National/Local	Revision 5-year
Wind and water erosion	*	National/Local	Seasonal
Wind deposit (dune movement)	*	National/Local	Seasonal
Water sedimentation	*	National/Local	Seasonal
Inland water course and storage	*	National/Local	Revision 5-year
Information on Topography			
Slope	*	National/Local	One time
Land form	*	National/Local	One time
Information on Vegetation			
Land cover (area and vegetation types, fragmentation, biomass, use patterns and intensity, intake and performances, contribution to carbon balance)	*	National/Local	Annual
Agriculture and agro-forestry (outputs)		National/Local	Seasonal

Information Requirements for Desertification Monitoring cont.

Herbaceous/woody cover (forestry and range land outputs	*	National/Local	Annual
Biomass production (outputs)		National/Local	Annual
Canopy cover of herbaceous and woody plants (%)	*	National/Local	Annual
Plant composition and desirable or key species		National/Local	Annual
Potential herbaceous production (calculated)		National/Local	Annual
Irrigation	*	National/Local	Seasonal
Vegetation period		National/Local	Seasonal
Range land carrying capacity		Local	Seasonal
Information on animals			
Animal population estimates and distribution		National/Local	Seasonal
Herd composition		National/Local	Seasonal
Herbaceous consumption (calculated)		National/Local	Seasonal
Information on natural hazards			
Forest fires	*	National/Local	Episodic
Landslides	*	National/Local	Episodic
Flooding	*	National/Local	Episodic
Agricultural pest and diseases	*	National/Local	Episodic
Information on land and water uses			
Land use (annual variability)	*	National/Local	Annual
Fuel wood consumption (annual variability)		National/Local	Annual
Water availability and requirements (annual variability)		National/Local	Annual
Information on socioeconomic conditions			
Settlements	*	National/Local	Revision 5-year
Markets		National/Local	Revision 5-year
Roads	*	National/Local	Revision 5-year
Communications		National/Local	Revision 5-year
Population and growth rate		National/Local	Revision 5-year
Habitat structure	*	National/Local	Revision 5-year
Measures of nutritional status		National/Local	Seasonal
Availability of land		National/Local	Annual
Availability of water		National/Local	Annual
Availability of food		National/Local	Seasonal
Land tenure		National/Local	Annual
Land management system	*	National/Local	Annual
Nutritional habits		National/Local	Annual
Transhumance		National/Local	Seasonal
Environmental perceptions		National/Local	Annual
Conflicts		National/Local	Episodic
Migration		National/Local	Annual
Wrong incentives (policies, prices/subsidies, trade)		National/Local	Annual
Poverty level		National/Local	Seasonal
Unemployment rate		National/Local	Seasonal

COP 9 Endorsed Indicators – October 2009

Two indicators should be seen in the context of strategic objectives (SOs) 1, 2 and 3 of the 10-year strategic plan and framework to enhance the implementation of the Convention (2008–2018).

SO1. To improve the living conditions of affected populations
SO2. To improve the condition of affected ecosystems
SO3. To generate global benefits through effective implementation of the UNCCD

Indicator – Land cover status – rated in terms of changes to net primary productivity (a measure of vegetation levels).

Indicator – Proportion of the population in affected areas living above the poverty line – chosen because land degradation can be both a cause and effect of high poverty levels

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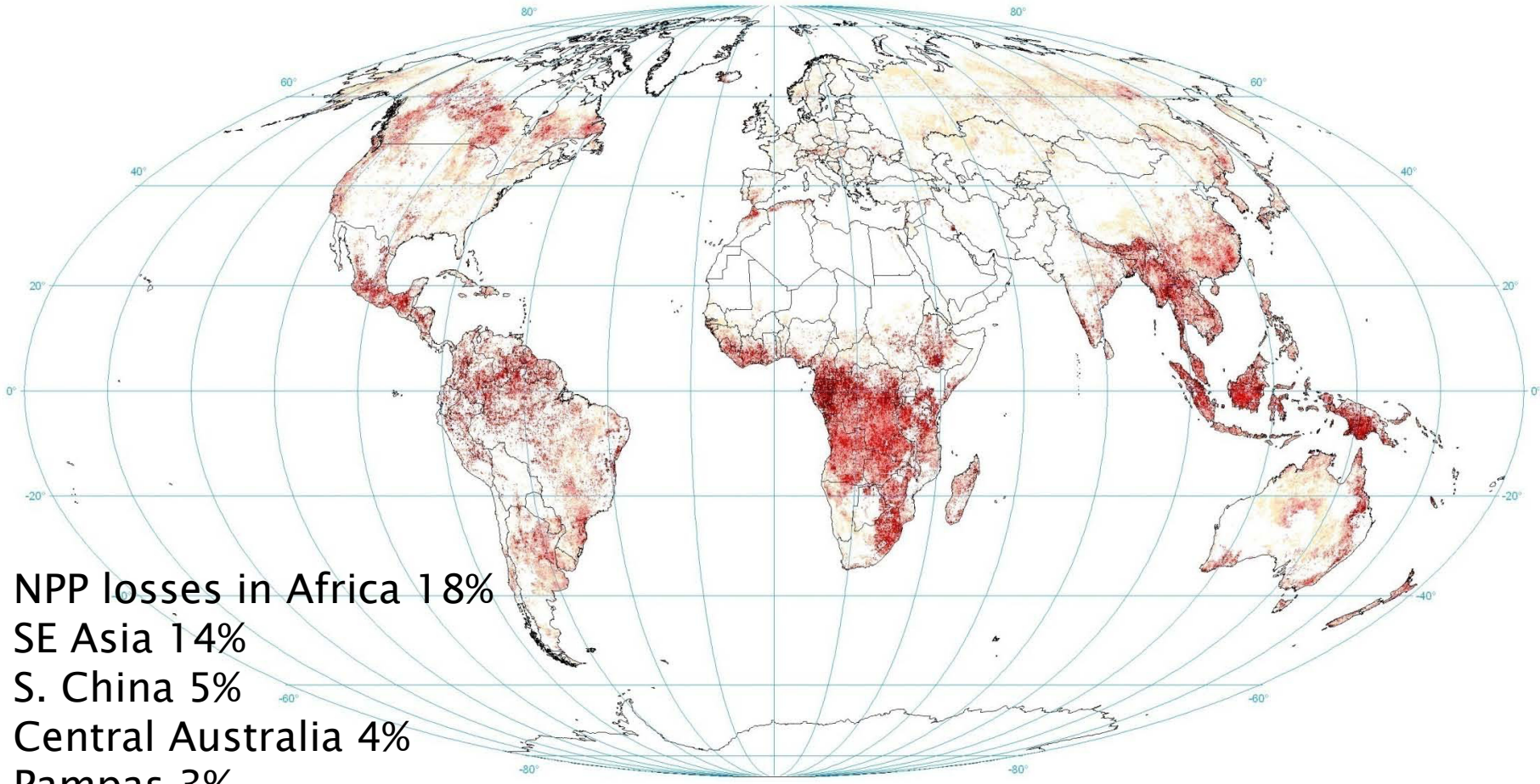
Global Loss of Net Primary productivity 1981-2006 ISRIC World Soil DB
Degraded Areas - 24% of land 1.5 billion people affected



NPP losses in Africa 18%
SE Asia 14%
S. China 5%
Central Australia 4%
Pampas 3%

NPP loss (kgC/ha/year)

0 - 5 | 5 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | > 50 | NA

Source: ISRIC - World Soil Information
Mollweide Projection
Central Meridian: 0.00

ISRIC World Soil Information

Greening of the Sahel – time series of NDVI amplitude (top) and NDVI seasonal integral (bottom) of NOAA AVHRR NDVI-data from 1982 to 1999.

40 climate observation stations, showing percent change between the periods 1982-1990 and 1991-1999, have been superimposed on the top figure.

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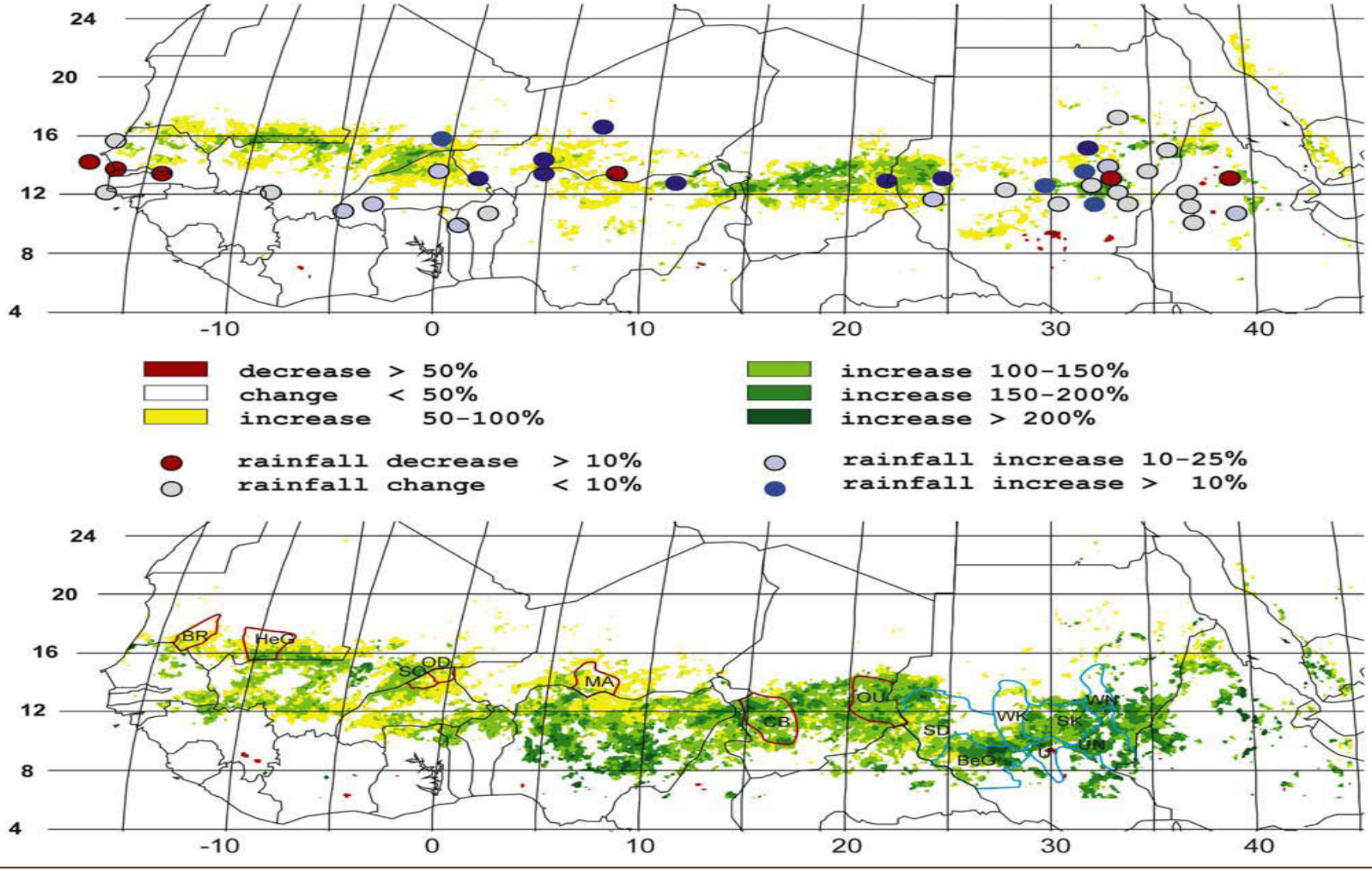

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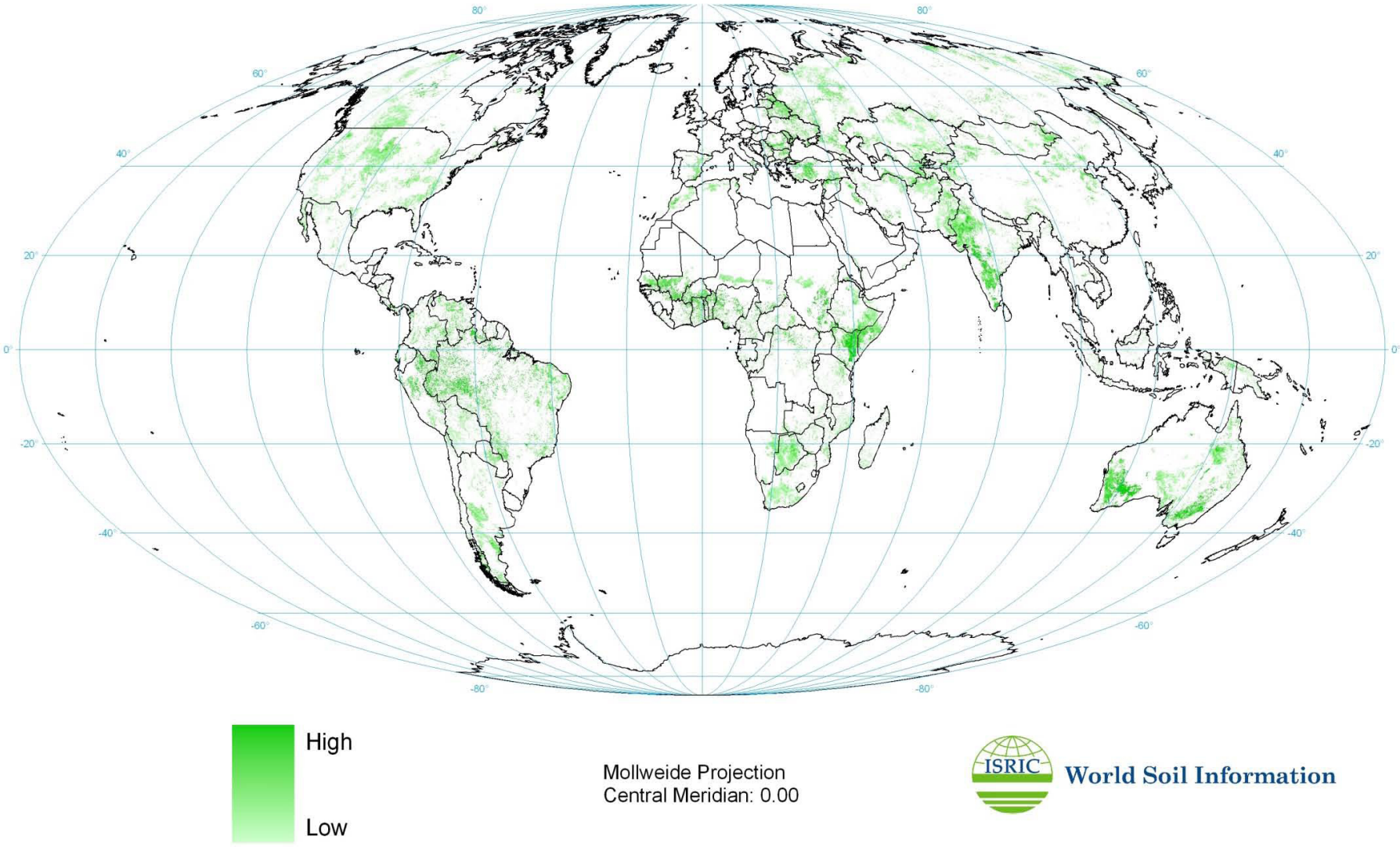
Global Land Improvement 1981–2006



Land Cover Indicator
Space-based Information Opportunities

Land cover map, whose thematic classes depend on the area of interest

Land surface changes maps (time t0 to tn)

Land displacements

Temporal land cover changes

Qualitative vegetation and soil changes

Quantitative vegetation and soil changes

Quantitative balance of surface water resources

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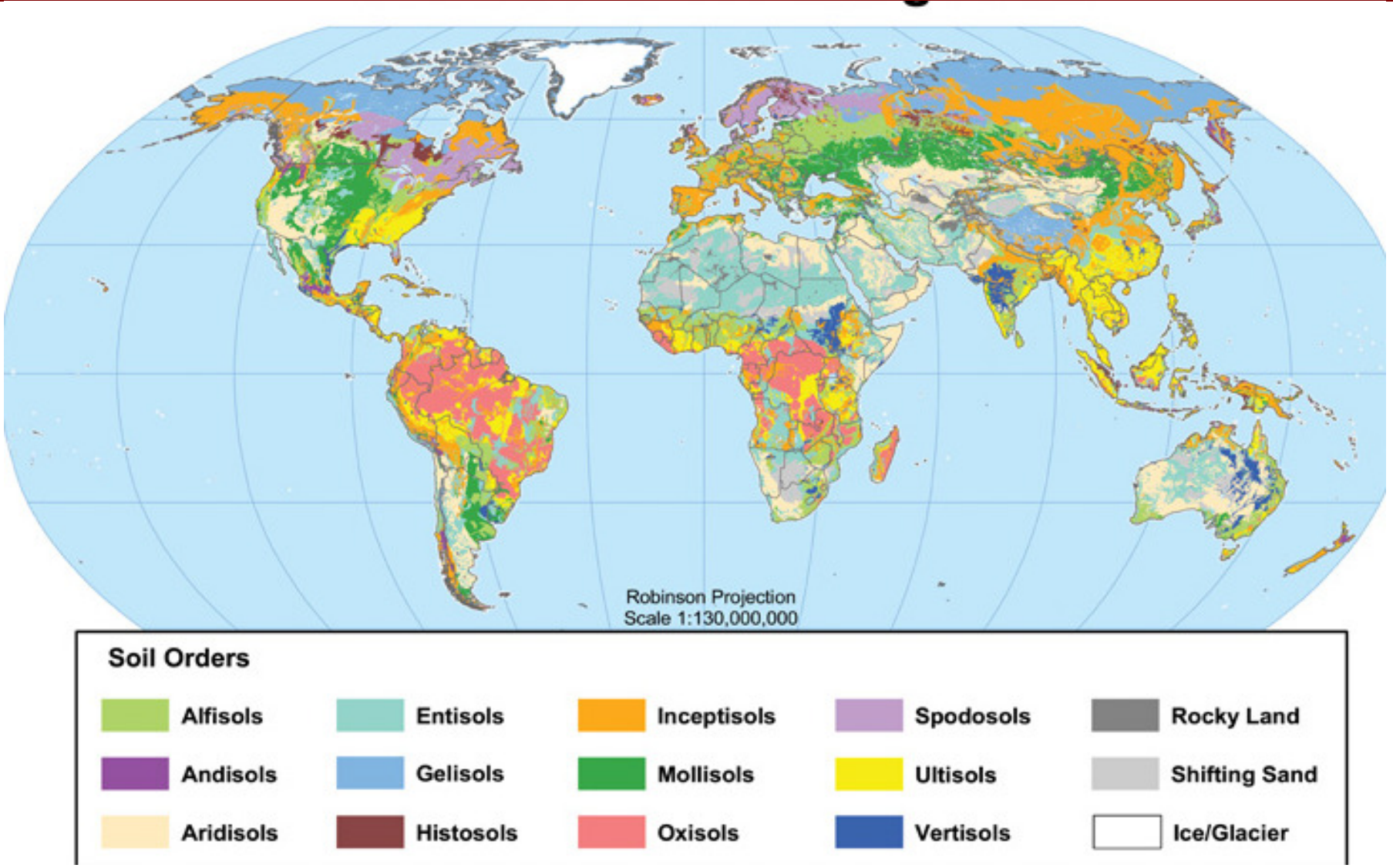
Land Cover Characteristics – possible end user requirements

Product	*Extent*[14]	*Scale*	*Temporal resolution*	*End User*
Topography	l, n	1 : 25,000 – 250,000	NA	All
Land cover/use	l, n	1 : 25,000 – 250,000	month or season	All
Aridity	l, n, r, g	1 : 25,000 – 2,000,000	month or season	CIDE
Land subsidence	l, n	1 : 25,000 – 250,000	year	OSS, CSE
Physical degradation[15]	l, n	1 : 25,000 – 250,000	month or season	CIDE, CSE, OSS
Salinised area	l, n	1 : 25,000 – 250,000	month or season	CIDE, CSE, OSS
Vegetation cover[16]	l, n, r ,g	1 : 25,000 – 2,000,000	month or season	All
Above ground biomass[17]	l, n, r, g	1 : 25,000 – 2,000,000	season	All
Chemical degradation[18]	l, n	1 : 25,000 – 250,000	month or season	CIDE
Vegetation greenness[19]	l, n, r, g	1 : 25,000 – 2,000,000	month or season	CIDE
Forest burned areas	n	1 : 100,000 – 250,000	month or season	CIDE
Deforestation	n	1 : 100,000 – 250,000	month or season	CIDE
Soil type	l, n r, g	1 : 25,000 – 2,000,000	month or season	CIDE
Soil moisture	l, n	1 : 25,000 – 250,000	month or season	CIDE, GORS, CSE, OSS
Surface water	l, n	1 : 25,000 – 250,000	month or season	CIDE, GORS, CSE, OSS

Global soil regions



Poverty Level Indicator

Depending on the availability of socio-economic data, two alternatives are envisaged

The indices of poverty or food security are known

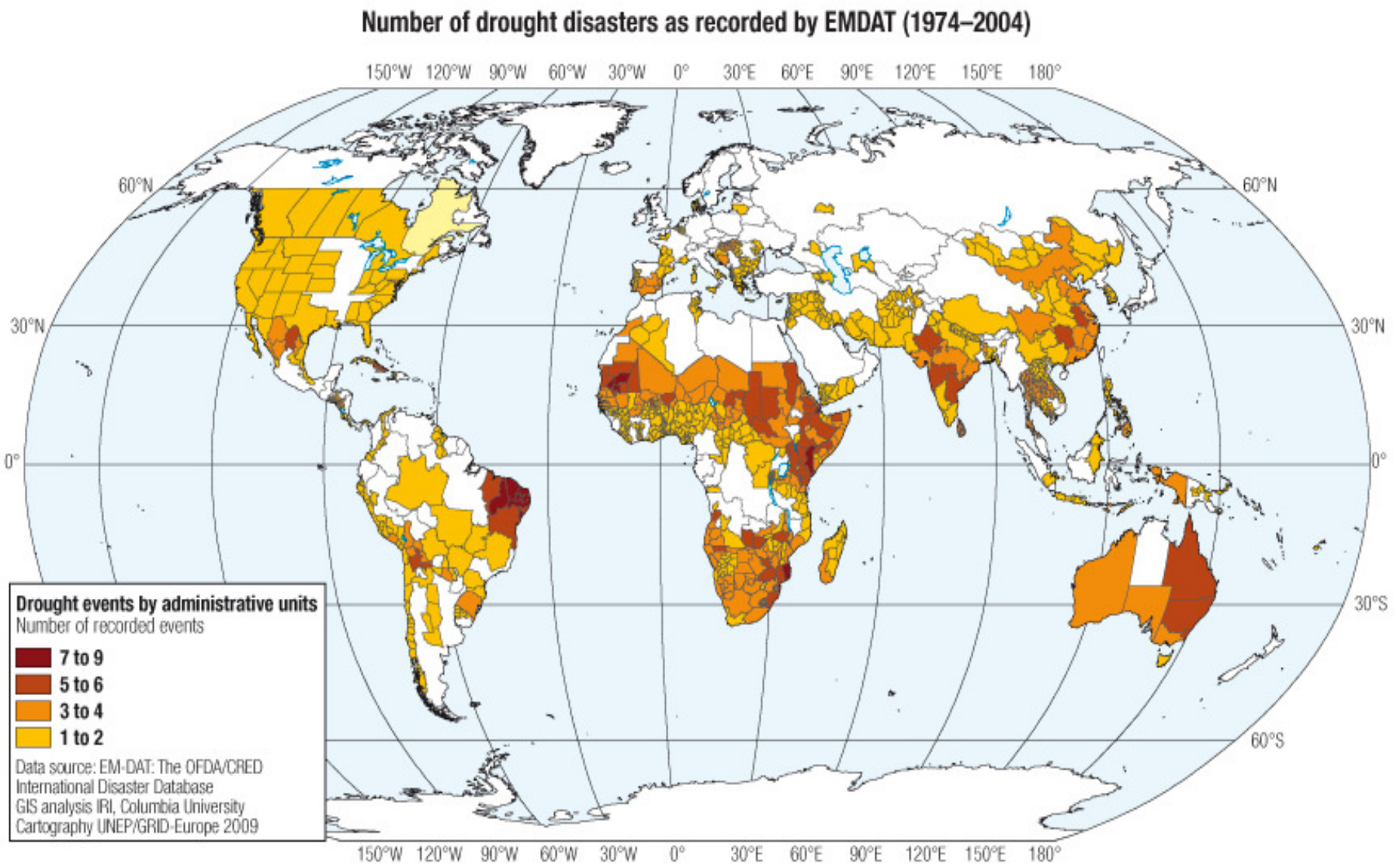
1. Extreme poverty, migration.
2. Clearing factors of production; abandonment of the production strategy. Sale of production means, tools, and lands.
3. Modifications of the production strategy, sale of the permanent assets, reduction in the livestock (large ruminants) loss of the reproducers, sale of labour force in yielding period.
4. Factors of production affected, marked tendency to decapitalization, but the usual production strategy is maintained. Sale of the short-term assets: seasonal labour force, sale of small animals, agricultural products (seasonal debt), diversification of the income generating activities, change of the food uses and practices.
5. The capital and the production strategy of households are preserved.

The indices of poverty or food safety are unknown

In this case, we assume that at least national statistics such as

- Demographic data
- Subsistence rainfed crop production
- Animal production
- Cash-crop production
- Agricultural dynamic on the basis of monitoring of surface and yield in time
- The cereal needs evaluated according to the national standards are available in spatial and temporal terms.

Number of Drought Disasters



Needs – How the Space Community can help

We should aim at contributing to:

- The creation of standard and comparable space-based information products from country to country about the status and trends in desertification.
- The creation of a common basic infrastructure as a base for further developments where space based information plays a key role.

Our end-users need accurate, timely and continuous information about:

- the status of the desertification processes affecting land cover in their territory,
- the driving factors for poverty at the origin of such processes; and
- the areas of risk where urgent measurements are required to be implemented.

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www.unccd.int