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**LADA Technical Report #16**

**Guidelines for the use of the LADA set of indicators to respond to the needs of UNCCD reporting as described in Decision 17/COP9**

**Version 1.0**

**April 2010**





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# 1. BACKGROUND AND PURPOSE

## 1.1 Background

Land degradation is recognized to be a severe and widespread environmental problem. It is pivotal to the United Nations Convention to Combat Desertification (UNCCD), the Convention on Biodiversity (UNCBD), and the Kyoto Protocol on Global Climatic Change of the UN Framework Convention on Climate Change (UNFCCC). However, as there is no authoritative measure of land degradation and countervailing land improvements due to their complexity; there is pressing need for an up-to-date, quantitative and reproducible assessment methodology to support policy development for food and water security, environmental integrity, international aid programs, and national strategies for economic development and resource conservation. Such a methodology would not only be of use to policy makers but to all actors concerned with LD and SLM, to inform the range of technical sectors, land users and programmes/ projects of the environmental, social and economic effects of their interventions.

At its ninth session the Conference of the Parties to the UNCCD (COP 9, Buenos Aires, November 2009), decided to provisionally accept a set of **impact** indicators as per its Decision 17. This set is composed of 11 indicators which were defined and proposed by a group of experts appointed by the UNCCD<sup>1</sup>. These 11 indicators are in turn linked to the 7 generic core indicators identified by a previous decision<sup>2</sup> in relation to the 3 strategic objectives of the Convention:

*Strategic objective 1: To improve the living conditions of affected populations*

**Indicator S-1:** Decrease in numbers of people negatively **impacted by** the processes of desertification/land degradation and drought.

**Indicator S-2:** Increase in the proportion of households living above the poverty line in **affected areas**.

**Indicator S-3:** Reduction in the proportion of the population below the minimum level of dietary energy consumption in **affected areas**.

*Strategic objective 2: To improve the condition of affected ecosystems*

**Indicator S-4:** Reduction in the total **area affected** by desertification/land degradation and drought.

**Indicator S-5:** Increase in net primary productivity in **affected areas**.

*Strategic objective 3: To generate global benefits through effective implementation of the UNCCD*

**Indicator S-6:** Increase in carbon stocks (soil and plant biomass) in **affected areas**.

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<sup>1</sup> Len Berry, Elena Abraham, Wafa Essahli. 2009. UNCCD Minimum set of Impact Indicators. UNCCD report. [www.unccd.int](http://www.unccd.int).

<sup>2</sup> UNCCD *10-year strategic plan and framework to enhance the implementation of the Convention (2008–2018)* - ICCD/COP(8)/16/Add.1.

**Indicator S-7:** Areas of forest, agricultural and aquaculture ecosystems under sustainable management.

When “*affected areas*” are mentioned, the words are in bold, to underline in which context the indicator is supposed to be implemented. In S1, the word “impacted” is in bold too, to suggest the analogy.

The 11 indicators are characterized by a greater degree of specificity and operability and are assigned spatial scales of reference.

Two of these (specified below) are highlighted as “mandatory” and the countries are requested to report on them by 2012.

However, some of the 11 proposed impact indicators are still generic and described by the group of experts as still being under development, as they need more precise technical definitions. These explicitly include some of the LADA indicators (project ongoing until end 2010). Others rely on data difficult to obtain or on complex methodologies.

In this context, there is a need to define criteria for the country Parties in order to enable them to consistently report according to the Decision.

In particular, in the framework of LADA, there is the need to ensure the completeness of the LADA database of indicators and to give guidelines for its most appropriate use in view of the UNCCD reporting needs.

## **1.2 Purpose**

The purpose of the present guidelines is to define criteria for appropriately aggregating LADA indicators at sub-national level in order to support the needs of LADA partner countries in reporting to the UNCCD according the minimum set of indicators. More specifically:

- To define how LADA sub-national indicators can be used to meet the new UNCCD requirements (11 indicators according to COP Decision 17)
- To provide criteria in order to define and identify the areas affected by land degradation in each country.
- To provide global data required for the UN-CCD global and national level evaluation based on GLADIS (Global Land Degradation Information System) developed by LADA.

These guidelines analyze and consider all the eleven indicators listed by the COP to the UNCCD in its Decision 17.

The LADA indicators will be selected from the wide DIS4LADA database and from the GLADIS information system, in accordance with the LADA methodology.

## 2. UNCCD REPORTING NEEDS AS DEFINED IN DECISION 17/COP9

The following *minimum set of impact* indicators has been provisionally accepted by COP-9/UNCCD in its Decision 17:

- I. Water availability per capita in **affected areas**.
- II. Change in land use
- III. Proportion of the population in **affected areas** above the poverty line
- IV. Childhood malnutrition and/or food consumption/caloric intake per capita in **affected areas**.
- V. Human Development Index as defined by UNDP (HDI)
- VI. Level of land degradation (including salinization, water and wind erosion, etc)
- VII. Plant and animal biodiversity
- VIII. Aridity index
- IX. Land cover status
- X. Carbon stocks above and below ground
- XI. Land under Sustainable Land Management (SLM)

“Affected areas” are mentioned, and highlighted in bold, as the implementation context for 3 of the 11 indicators.

This aspect raises 2 questions:

1. How the affected areas can be defined and spatially identified?
2. Are the other 8 indicators to be implemented in the whole countries territories, while the selected 3 in the affected areas only?

The first is an open question, because no common method exists at the global level to unequivocally define and map the areas affected by land degradation. However it must be noted that the above indicator number VI, “level of land degradation”, is actually defined, by the above mentioned minimum set report, as “*the amount of land affected by degradation and its proportion of national territory*”, as pointed out in chapter 3. So this indicator VI should be rather named “affected areas”. Furthermore, the definition and the methodological explanation given by the same report for the indicator VIII, Aridity index, suggests that also this indicator should contribute to the definition of the areas affected.

*The idea emerges that the affected areas per se should be identified by means of both indicators VI and VIII (“degraded drylands”, if taken altogether).*

The other 9 indicators should provide the additional information requested by the UNCCD.

The second question is also open to interpretation.

It appears that to implement each indicator in both affected and not affected areas would be the most useful solution. That would allow for a comparison of the two contexts.

The 11 indicators are linked to the 3 UNCCD strategic objectives and to the related 7 “core indicators” (Table 1). They are also linked to the relevant spatial scales.

Concerning the linkage to the 7 UNCCD “core indicators”, it can be observed that 6 of the 11 members of the set of impact indicators (III, IV, VI, IX, X, XI) almost coincide with the corresponding ones in the core list.

Concerning the scale, all the impact indicators are to be considered at the national level, except indicator V, Human Development Index (global).

Five of them (I, III, V, IX, XI) are also to be applied at the global level. This distinction is not justified by the expert report.

*Since almost all the indicators are to be monitored at the national level, it seems that a global representation should be possible (and useful) for all of them, based on the national level datasets.*

What is to be intended as national level? *It seems reasonable that national reporting should be based on datasets aggregated at a sub-national level, as in the case of LADA..*

As an example, the highest level administrative units could be taken as basis for reporting (e.g., states in federal countries such as Mexico, regions or provinces in non federal countries such as China).

Table 1: Links between the 11 UNCCD indicators and the 3 UNCCD strategic objectives at different spatial scales.

	National Level	Global Level
<b>Objective 1: To improve living conditions of affected populations</b>		
<p><b>Core Indicator S1:</b> Decrease in the number of people negatively impacted by the process of desertification/land degradation and drought</p> <p><b>Core Indicator S-2:</b> Increase in the proportion of households living above the poverty line in affected areas.</p> <p><b>Core Indicator S-3:</b> Reduction in the proportion of the population below the minimum level of dietary energy consumption in affected areas.</p>	<ul style="list-style-type: none"> <li>• I. Water availability per capita in affected areas</li> <li>• II. Change in land use</li> <li>• <b>III. Proportion of the population in affected areas above the poverty line<sup>3</sup></b></li> <li>• IV. Childhood malnutrition and/or food consumption/caloric intake per capita in affected areas</li> </ul>	<ul style="list-style-type: none"> <li>• I. Water availability per capita in affected areas</li> <li>• III. Percentage of population in affected areas above poverty line</li> <li>• V. The Human Development Index as defined by UNDP (HDI)</li> </ul>
<b>Objective 2: To improve the conditions of the ecosystems</b>		
<p><b>Core Indicator S-4:</b> Reduction in the total area affected by desertification/land degradation and drought</p> <p><b>Core Indicator S-5:</b> Increase in net primary productivity in affected areas.</p>	<ul style="list-style-type: none"> <li>• II. Change in land use</li> <li>• VI. Level of land degradation (including salinization, water and wind erosion, etc)</li> <li>• VII. Plant and animal biodiversity</li> <li>• VIII. Aridity index</li> <li>• <b>IX. Land cover status</b></li> </ul>	<ul style="list-style-type: none"> <li>• IX. Land cover status</li> </ul>
<b>Objective 3: To generate global benefits through effective implementation of the UNCCD</b>		
<p><b>Core Indicator S-6:</b> Increase in carbon stocks (soil and plant biomass) in affected areas.</p> <p><b>Core Indicator S-7:</b> Areas of forest, agricultural and aquaculture ecosystems under sustainable management.</p>	<ul style="list-style-type: none"> <li>• VII. Plant and animal biodiversity</li> <li>• III. Proportion of the population in affected areas above poverty line</li> <li>• X. Carbon stocks above and below ground</li> <li>• XI. Land under Sustainable Land Management (SLM)</li> </ul>	<ul style="list-style-type: none"> <li>• III. Proportion of the population in affected areas above poverty line</li> <li>• XI. Land under Sustainable Land Management (SLM)</li> </ul>

A short technical definition of the 11 indicators is given below. Since the COP9 decision does not provide any extended technical definition for the selected indicators, the

<sup>3</sup> In **bold**: the two mandatory indicators, to be reported by **2012**.

information below is directly taken from the mentioned expert group document (here called the “Minimum Set Report”), which constituted the basis for the COP9 discussion. The two documents do not fully coincide, as highlighted by the footnotes.

#### I. Water availability per capita in affected areas

**Specifically mentioned indicator:** Population with water Stress (taken from UN “Sustainable Dev. Indicators”)

*Unit:* %

**Purpose:** To monitor the progress in the access of the population to improved water sources<sup>4</sup>.

#### II. Change in land use

**Specifically mentioned indicator:** FAO-LADA LUS change

*Unit:* Proportion of change of each category of land use to another land use per unit of time

**Purpose:** The purpose of this indicator is to highlight changes in the productive or protective uses of the land resource<sup>5</sup>.

#### III. Proportion of the population in affected areas above the poverty line

**Specifically mentioned indicator:** The percentage of the affected population with a standard of living above the poverty line

*Unit:* Percent - %

**Purpose:** To monitor poverty as the most important defining characteristic of underdevelopment. Poverty is considered a root cause, and at the same time a consequence, of land degradation and desertification.

#### IV. Childhood malnutrition and/or food consumption/caloric intake per capita in affected areas

**Specifically mentioned indicator:** Percentage of underweight (weight-for-age below -2 standard deviation (SD) of the WHO Child Growth Standards median) among children under five years of age; percentage of stunting (height-for-age below -2 SD of the WHO Child Growth Standards median) among children under five years of age; and percentage

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<sup>4</sup> Some confusion exists in the “Minimum set report” in relation to this indicator. The indicator name coincides with the one retained by the COP (available amount of water), while the indicator definition mentions the degree of access to improved water resources (% of population having access).

However, both indicators are currently available in the UN statistical records, and datasets are available, aggregated at country level.

<sup>5</sup> The “Minimum Set Report” explicitly suggests the adoption of the LADA LUS Land Use Systems concept and to generate and compare multi-temporal LUS map to quantify the changes in land use.

of overweight (weight-for-height above +2SD of the WHO Child Growth Standards median) among children under five years of age.

*Unit: Percent - %*

**Purpose:** The purpose of this indicator is to measure long term nutritional imbalance and malnutrition. Health and development are intimately interconnected. Nutritional status is the best global indicator of well-being in children and an indicator of the availability of ecosystem services.

#### V. Human Development Index as defined by UNDP (HDI)

**Specifically mentioned indicator:** HDI, based on 4 basic indicators: life expectancy at birth; adult literacy; combined gross enrolment in primary, secondary and tertiary level education; gross domestic product (GDP) per capita in Purchasing Power Parity US dollars (PPP US\$)

*Unit: parametric index*

**Purpose:** The HDI indicator is an attempt to measure the status and change in the well being of populations. Applied in affected areas it will be an effective surrogate for the impact of the efforts to combat desertification on the livelihood of peoples.

#### VI. Level of land degradation (including salinization, water and wind erosion, etc)

**Specifically mentioned indicator:** The amount of land affected by degradation and its proportion of national territory, according to LADA

*Unit: Area (Km<sup>2</sup>) and Percent (%) of land area affected*

**Purpose:** The indicator will measure the extent of land degradation at the national level. It also measures the impact of agreements and programs to address land degradation and to reclaim degraded lands<sup>6</sup>.

#### VII. Plant and animal biodiversity

**Specifically mentioned indicator:** Biodiversity intactness index (BII)

*Unit: Rate of change of BII in percentage (%)*

**Purpose:** to give an indication of the overall biodiversity condition of a region relative to a 'pristine' state. The current condition in protected areas is used as a surrogate measure of this pristine state<sup>7</sup>.

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<sup>6</sup> The "Minimum Set Report" explicitly suggests the adoption of the LADA methodology to define and map the affected areas; it also recognizes that LADA has not yet defined how LADA indicators could be processed in order to satisfy the request.

<sup>7</sup> The indicator is very demanding in terms of data, as it requires the number of species by ecosystem and land use type and this is to be related to the pristine ecosystem conditions.

## VIII. Aridity index

**Specifically mentioned indicator:** UNEP Aridity Index (Bioclimatic Index), defined as the ratio between mean annual precipitation (P) and mean annual evapotranspiration: (ETP)  $I_a = P_a / ET_o$ .

*Unit: Indicative value of the ratio  $P_a / ET_o$ .*

**Purpose:** To be used as a base indicator for characterizing sensitive and desertification-affected areas.

## IX. Land cover status

**Specifically mentioned indicator:** GLADA - Land cover status -in both cultivated and non-cultivated lands- based on NPP and RUE trends as obtained through long term series NDVI data.

*Unit: kgC ha-1 year-1% (NPP) and mm-1 (RUE)*

**Purpose:** to monitor land degradation in terms of long-term loss of ecosystem primary productivity and taking into account effects of rainfall on NPP<sup>8</sup>.

## X. Carbon stocks above and below ground

**Specifically mentioned indicator:** Indicator to be developed in conjunction with IPCC process

*Unit: tons/ha*

**Purpose:** To encourage countries to monitor their carbon stocks and to record changes in above and below ground stocks as a global benefit<sup>9</sup>.

## XI. Land under Sustainable Land Management (SLM)

**Specifically mentioned indicator:** Area of land under SLM<sup>10</sup>.

*Unit: ha*

**Purpose:** Land under Sustainable Land Management (SLM) is an important surrogate for a number of global benefits<sup>11</sup>.

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<sup>8</sup>

*The "Minimum Set Report" explicitly suggests the adoption of the GLADA methodology to define and map the land cover status, based on two GLADA indicators (NPP and RUE). However, it recognizes that guidelines are still needed to define how these indicators could be processed in order to satisfy the COP request.*

*Since the GLADA indicators are generated globally, a national mapping approach, as suggested by the COP9, is relatively less straightforward.*

<sup>9</sup> *The "Minimum Set Report" makes reference to different possible techniques, especially RS, to monitor this indicator, but it remains operationally undefined.*

<sup>10</sup> Sustainable Land Management: Challenges and Opportunities.  
worldbank.org/EXTARD/Resources/336681-1215724937571/PART1.pdf

### 3. A BRIEF ANALYSIS ON THE PRESENT OPERABILITY AND SPECIFICITY OF THE 11 UNCCD INDICATORS

Table 2. Rapid classification of the 11 UNCCD indicators in terms of specificity and operability.

	<b>Impact Indicator</b>	<b>Still need definition</b>	<b>Need greater specification<sup>1</sup></b>	<b>Operational<sup>2</sup></b>	<b>Datasets complete and available at sub-national level<sup>3</sup></b>
		(Y/N)	(Y/N)	(Y/N)	(Y/N)
1	Water availability per capita in affected areas	N	<b>Y</b>	Y	<b>N</b>
2	Change in land use	N	N	<b>N</b>	
3	Proportion of the population in affected areas above the poverty line	N	N	Y	<b>N</b>
4	Childhood malnutrition and/or food consumption/ caloric intake per capita in affected areas	N	N	Y	<b>Y/N</b>
5	Human Development Index as defined by UNDP (HDI)	N	N	Y	<b>N</b>
6	Level of land degradation (including salinization, water and wind erosion, etc)	<b>Y</b>	<b>Y</b>	<b>N</b>	
7	Plant and animal biodiversity	N	N	<b>N</b>	
8	Aridity index	N	N	Y	Y
9	Land cover status	N	<b>Y</b>	<b>N</b>	
10	Carbon stocks above and below ground	<b>Y</b>	<b>Y</b>	<b>N</b>	
11	Land under Sustainable Land Management (SLM)	<b>Y</b>	<b>Y</b>	<b>N</b>	

<sup>1</sup>See the considerations made above about the “affected area” concept. In principle all indicators making reference to the affected areas would need better specification.

<sup>2</sup>Operational = datasets are already collected (and updated) with standard and common formats at the global level.

<sup>3</sup>Only applies to “operational” indicators.

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<sup>11</sup> Both affected and not affected land may be managed in a sustainable way. In the first case, one can think that the pressure factors at the origin of past degradation are now mitigated and the land is (or not) recovering.

## 4. LADA CONTRIBUTION TO UNCCD REPORTING NEEDS

### 4.1. Linkages between LADA indicators (GLADIS and QM database ) and the 11 UNCCD minimum set indicators

#### 4.1.1 National and sub-national indicators.

Table 3. Potential contribution from the LADA (sub)National indicators to the implementation of the 11 UNCCD indicators.

F = Full: the LADA indicator(s) per se can fully satisfy the UNCCD requirements; P = Partial: the LADA indicator(s) could partially satisfy the UNCCD requirements (it conceptually covers only a part of the aspect dealt with); PF/A = Partial or Full /Aggregated: the LADA indicator(s) could have partial or full correspondence to the UNCCD ones, through aggregation of more than a LADA indicator. A = Alternative: the LADA indicator(s) could be used as proxies.

<b>QM – LADA National</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>LADA-N Wocat - Land Use Systems indicators</b>											
<b>LADA-N: Area trend of LUS</b>		<b>P</b>									<b>PF/A</b>
LADA-N: Intensity trend of LUS change											
<b>LADA-N Wocat - Soil erosion by water</b>											
LADA-N: Wc Coastal erosion											
<b>LADA-N: Wg Gully erosion / gulying</b>						<b>PF/A</b>					
<b>LADA-N: Wm Mass movements / landslides</b>						<b>PF/A</b>					
LADA-N: Wo Offsite degradation effects											
LADA-N: Wr Riverbank erosion											
<b>LADA-N: Wt Loss of topsoil / surface erosion</b>						<b>PF/A</b>					
<b>LADA-N Wocat - Soil erosion by wind</b>											
<b>LADA-N: Ed Deflation and deposition</b>						<b>PF/A</b>					
LADA-N: Eo Offsite degradation effects											
<b>LADA-N: Et Loss of topsoil</b>						<b>PF/A</b>					
<b>LADA-N Wocat - Chemical soil deterioration</b>											
<b>LADA-N: Ca Acidification</b>						<b>PF/A</b>					

<b>LADA-N: Cn Fertility decline and reduced organic matter content</b>						PF/A				PF/A	
<b>LADA-N: Cp Soil pollution</b>						PF/A					
<b>LADA-N: Cs Salinisation / alkalinisation</b>						PF/A					
<b>LADA-N Wocat - Physical Soil Deterioration</b>											
<b>LADA-N: Pc Compaction</b>						PF/A					
<b>LADA-N: Pk Sealing and crusting</b>						PF/A					
LADA-N: Ps Subsidence of organic soils settling of soil											
LADA-N: Pw Waterlogging											
<b>LADA-N: Pu Loss of bio-productive function due to other activities</b>						PF/A					
<b>LADA-N Wocat - Water degradation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>LADA-N: Ha Aridification</b>						PF/A					
<b>LADA-N: Hg Change in groundwater / aquifer level</b>	PF/A					PF/A					
<b>LADA-N: Hp Decline of surface water quality</b>	PF/A					PF/A					
<b>LADA-N: Hq Decline of groundwater quality</b>	PF/A					PF/A					
<b>LADA-N: Hs Change in quantity of surface water</b>	PF/A					PF/A					
LADA-N: Hw Reduction of the buffering capacity of wetland areas											
<b>LADA-N Wocat - Biological degradation</b>											
<b>LADA-N: Bc Reduction of vegetation cover</b>						PF/A			A	PF/A	
LADA-N: Bf Detrimental effects of fires											
<b>LADA-N: Bh Loss of habitats</b>						PF/A	P				
<b>LADA-N: BI Loss of soil life</b>						PF/A	P				
LADA-N: Bp Increase of pests / diseases loss of predators											
<b>LADA-N: Bq Quantity / biomass decline</b>						PF/A			A	PF/A	
<b>LADA-N: Bs Quality and species composition / diversity decline</b>						PF/A	A				

<b>LADA-N Wocat - Direct causes of land degradation (pressure indicators)</b>											
<b>LADA-N: c Crop management</b>											PF/A
<b>LADA-N: e Over-exploitation of vegetation for domestic use</b>											PF/A
<b>LADA-N: f Deforestation and removal of natural vegetation</b>											PF/A
<b>LADA-N: g Overgrazing</b>											PF/A
LADA-N: i Industrial activities and mining											
LADA-N: n Natural causes											
<b>LADA-N: o Over-abstraction / excessive withdrawal of water</b>											PF/A
LADA-N: p Discharges											
LADA-N: q Release of airborne pollutants from industrial activities and urbanisation											
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>LADA-N: s Soil management</b>											PF/A
LADA-N: u Urbanisation and infrastructure development											
<b>LADA-N: w Disturbance of the water cycle</b>											PF/A
<b>LADA-N Wocat - Indirect causes of land degradation (indirect drivers)</b>											
<b>LADA-N: e Education access to knowledge and support services</b>						PF/A					
LADA-N: g Governance / institutional											
<b>LADA-N: h Poverty / wealth</b>			A			PF/A					
LADA-N: l Labour Availability											
LADA-N: p Population Pressure											
LADA-N: r Inputs and infrastructure											
LADA-N: t Land Tenure											
LADA-N: w War and conflict											
<b>LADA-N Wocat - Impact on ecosystem services (Impact indicator)</b>											
LADA-N: P Productive Services											

LADA-N: E Ecological services (regul./support.)											
LADA-N: S Socio-cultural services and human well-being											
<b>LADA-N Wocat - Land conservation (Response indicators)</b>											
<b>LADA-N: Extent and trends of Land Conservation</b>											<b>PF/A</b>
<b>LADA-N: Effectiveness of Land Conservation</b>											<b>PF/A</b>

COMMENTS, per UNCCD indicator:

1. Water availability per capita in affected areas

As discussed above, this indicator needs clarifications.

If the UNCCD requires an estimate of per capita water availability, two LADA indicators (**LADA-N: Hg Change in groundwater / aquifer level; LADA-N: Hs Change in quantity of surface water**) could be aggregated and provide a corresponding estimate of the trend of this resource.

If the demand is related to the improved (drinking) water only, two other indicators (**LADA-N: Hp Decline of surface water quality; LADA-N: Hq Decline of groundwater quality**) could provide a partial, proxy estimate.

2. Change in land use

The corresponding LADA indicator (**LADA-N: Area trend of LUS**) is satisfactory.

3. Proportion of the population in affected areas above the poverty line

One LADA indicator (**LADA-N: h Poverty / wealth**) could be used as a proxy. However, the QM pressure indicators are recorded as “causal attributes” only, in relation to state factors. No semi-quantitative estimate is given.

4. Childhood malnutrition and/or food consumption/ caloric intake per capita in affected areas

This aspect is not considered by LADA (G/L).

5. Human Development Index as defined by UNDP (HDI)

Two LADA indicators (**LADA-N: e Education - access to knowledge and support services; and LADA-N: h Poverty / wealth**) could be used as a partial proxy. (Life expectancy, also considered by the UNCCD indicator, is not covered by LADA QM). The same consideration made above about the QM pressure indicators (n° 3) applies.

6. Level of land degradation (including salinization, water and wind erosion, etc)

This is the most complex (and the most basic and important) indicator for LADA. Potentially, several LADA indicators (in principle all QM State indicators) could contribute to define it. The following QM State indicators are likely the most relevant ones (some have been here discarded because related to off-site effects or to land degradation forms which

are often more localized than others, such as riverbank erosion or coastal erosion, or difficult to define/ quantify, such as loss of soil life<sup>12</sup>):

**LADA-N: Wg Gully erosion / gulying;**  
**LADA-N: Wt Loss of topsoil / surface erosion (by water);**  
**LADA-N: Ed Deflation and deposition;**  
**LADA-N: Et Loss of topsoil; (by wind)**  
**LADA-N: Ca Acidification;**  
**LADA-N: Cn Fertility decline and reduced organic matter content;**  
**LADA-N: Cp Soil pollution;**  
**LADA-N: Cs Salinisation / alkalinisation;**  
**LADA-N: Pc Compaction;**  
**LADA-N: Pk Sealing and crusting;**  
**LADA-N: Hg Change in groundwater / aquifer level;**  
**LADA-N: Hp Decline of surface water quality;**  
**LADA-N: Hq Decline of groundwater quality;**  
**LADA-N: Hs Change in quantity of surface water;**  
**LADA-N: Bc Reduction of vegetation cover;**  
**LADA-N: Bh Loss of habitats;**  
**LADA-N: Bq Quantity / biomass decline;**  
**LADA-N: Bs Quality and species composition / diversity decline.**

#### 7. Plant and animal biodiversity

One LADA indicator (**LADA-N: Bs Quality and species composition / diversity decline**) could be used as an alternative estimate (proxy). Two other LADA indicators (**LADA-N: Bh Loss of habitats; LADA-N: Bc Loss of soil life**) could provide only a partial estimate (also if aggregated, they only partially cover the issue, because they seem more specific than the first one).

#### 8. Aridity index

The corresponding G-LADA indicator (**LADA-G: ARIDITY TREND**) is satisfactory.

#### 9. Land cover status

Two LADA indicators (**LADA-G: NPP; LADA-G: RUE**) are explicitly mentioned by the UNCCD expert report. According to the report, if properly aggregated, the indicators could satisfy the requirements. Two other LADA indicators (**LADA-N: Bc Reduction of vegetation cover; LADA-N: Bq Quantity / biomass decline**) could be used as alternative independent proxies at the national scales, possibly aggregated.

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<sup>12</sup> A large part of soil biota is microbial, however, earthworms are visible to the naked eye and a key indicator species and hence proxy, and can be readily counted in a spade-extracted block of soil but they are not found everywhere even in non degraded conditions as they are not present in sandy soils and only their castes and burrows are visible in the topsoil in the dry season)

10. Carbon stocks above and below ground  
 Two LADA indicators (**LADA-N: Bc Reduction of vegetation cover; LADA-N: Bq Quantity / biomass decline; LADA-N: Cn Fertility decline and reduced organic matter content**) could provide an estimate (if aggregated, they potentially fully cover the issue). A fourth indicator (**LADA-N: Area trend of LUS**) could complement the estimate. The latter could also be used alone, by defining a look-up table relating LUS units and carbon stocks, an approach often adopted for carbon stock estimates at the global/regional level (where a traditional land cover map is generally used). Finally, **LADA-G: NPP** could contribute to the estimation of above ground stock.

11. Land under Sustainable Land Management (SLM)  
 As for indicator VI, this indicator is conceptually complex and, potentially, several LADA indicators could contribute to define it. LADA QM provides two different kinds of input related to sustainable land management. Primarily, the WOCAT response indicators (**LADA-N: Extent and trends of Land Conservation; LADA-N: Effectiveness of Land Conservation**) provide a direct, although maybe partial response, by estimating extent and effectiveness of conservation practices. Secondly, one can say that a well managed land is a land where anthropic pressure is limited or “sustainable”: so, even in case of an affected piece of land, if these factors are not highlighted as prominent among the QM direct causes, one can assume that management is not unsustainable. In this case the relevant LADA indicators would be, if we only consider rural areas, as these are not relevant urban areas: (**LADA-N: c Crop management; LADA-N: e Over-exploitation of vegetation for domestic use; LADA-N: f Deforestation and removal of natural vegetation; LADA-N: g Overgrazing; LADA-N: o Over-abstraction / excessive withdrawal of water; LADA-N: s Soil management; LADA-N: w Disturbance of the water cycle**) A combination of these indicators may better match the UNCCD requirement. Finally, a possible alternative is given at the global level (**LADA-G: MANAGEMENT (GAEZ)**).

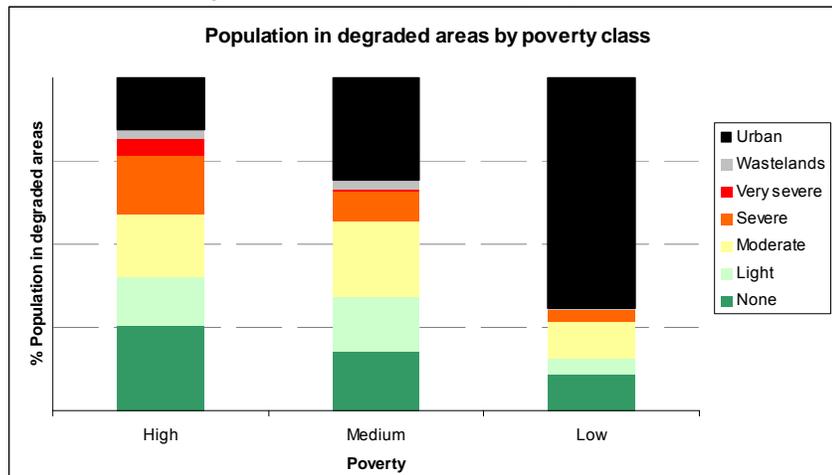
#### 4.1.2 GLADIS (LADA-G) indicators in support of UNCCD reporting.

In addition to the above approach a number of the indicators can be derived from the Global Land Degradation Information System (GLADIS) available at [http://www.fao.org/nr/lada/index.php?option=com\\_content&view=article&id=161&Itemid=113&lang=en](http://www.fao.org/nr/lada/index.php?option=com_content&view=article&id=161&Itemid=113&lang=en)

I. **Water availability per capita in the affected areas:** GLADIS provides national figures for available renewable water resources per country (from Aquastat) and an indicator for the pressure on water resources at national level. No sub-national data are available at this level.

II. **Land use change:** no information on land use changes can be derived from GLADIS.

**III. Percentage of population above poverty level in affected areas:** GLADIS provides geo-referenced estimates of areas presently affected by degradation and information on the present (degraded) status of the land. The system also provides information on poverty levels as derived from the stunted children database (also see indicator IV). This allows estimates of poverty levels within different types of lands as illustrated in Figure 1. These World figures are also available at (sub) national level



**Figure 1: World distribution of poverty according to type of lands.**

**IV Childhood malnutrition & food/calory intake per capita.** GLADIS provides no data on this factor but uses a health indicator for poverty estimates (see indicator III above)

**V. Human Development Index (HDI):** GLADIS provides as well the HDI status as its trends at national level. No sub-national data are available.

**VI Level of land degradation and types of land degradation:** GLADIS provides information at sub-national level both on degradation processes and on degraded status of the land. Most general types of land degradation are covered (soil erosion by water, salinization, compaction, nutrient decline, pollution, water, biomass and biodiversity decline).

**VII Plant and Animal biodiversity:** GLADIS provides geo-referenced estimates of biodiversity.

**VIII Aridity Index:** GLADIS provides the trends of the aridity index for various periods and the statistical significance levels of these trends.

**IX Land Cover status:** GLADA, GLADIS and FRA provide geo-referenced data and time series on the land cover status.

**X Carbon stocks above and below ground:** GLADIS provides geo-referenced data above and below ground of Carbon stored (Ton/ha). Below ground data are however collected over a number of years and are no good basis for monitoring.

Above ground Carbon data could be modeled/monitored based on NDVI techniques and land cover data as available from GLADA.

**XI Land under sustainable management:** GLADIS provides an estimate of the present land management level for agricultural cropped areas. This is a good first indicator but does require sub-national information for further development (See section 4.1.1.-11)

## 4.2. Thematic and spatial aggregation

In synthesis, **several** G-LADA (GLADIS) indicators and **34** National QM LADA indicators are potentially relevant. The G-LADA indicators do not need any kind of aggregation. They should only be cut to match the countries borders and to produce national maps, provided the level of detail and accuracy support this operation.

Concerning the QM indicators, for most of them, *assuming that the national assessments in LADA countries have been carried out at a common degree of detail and quality, the possibility to concretely use them to implement the UNCCD minimum set will depend on a suitable aggregation of the reported information.*

According to the QM manual, the assessment is to be fully performed (all QM indicators, whenever they are relevant to the local conditions) in each map unit. Map units are defined as the result of the spatial intersection of LUS units and sub-national administrative units.

For each map unit, a synthetic assessment report is to be made, as in the example below.

Mapping unit ID: 113 (= District: Lydenburg + LUS: Grassland)								
Land degradation (step 3)								
a) Type (state)			b)	c)	d)	e)	f)	g)
<i>i</i>	<i>ii</i>	<i>iii</i>	Extent	Degree	Rate	Direct cause	Indirect cause	Impact on Eco-system. Services
<i>Ha</i>	<i>Pt</i>		15%	2	1	<i>g1, e1, f4</i>	<i>p, h, t</i>	<i>P1-3, E2-2,</i>
<i>Bs</i>			10%	2	-3	<i>g1</i>	<i>g, w, t</i>	<i>P1-2, S3-1,</i>

*Starting from these tables, the relevant map unit information should be extracted and aggregated.*

Aggregation is to be thought, primarily, at a *thematic* level: how to merge/valorize the information brought by several indicators.

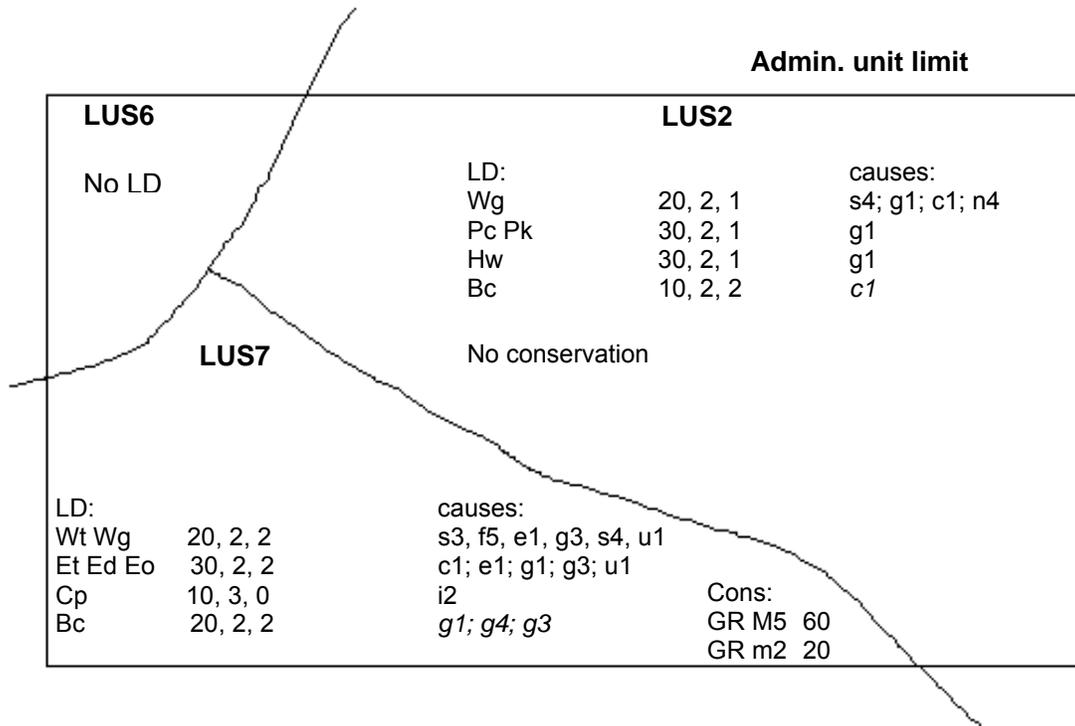
Secondly, *spatial* aggregation is needed to merge the information attached to the QM map unit to produce an output at the (administrative) sub-national level (scaled-up).

A possible, general aggregation strategy is proposed below.

*The practical possibility to apply this aggregation strategy to the single indicators (or to groups of indicators), according to the suggestions given in the above paragraph, will*

depend on the degree of reliability and accuracy of the various national assessments. That means that it will be probably different case by case and from country to country.

The figure below is an example of QM form filled in for 3 map (LUS) units included in a fictive administrative unit (a rectangle, to simplify the representation).



Three LUS units are represented (LUS2, LUS 6 and LUS7). This synthetic representation reports degradation (State) factors and their direct causes (Pressure factors), the former are semi-quantitative, the latter qualitative. All factors names are codified according to the QM (as indicated in Table 3 above). State factors are followed by an estimate of their extent, degree and rate. Pressure factors are simply named and associated to the different kinds of degradation. In addition, in the case of LUS7, existing conservation measures are mentioned.

As an example, for LUS2, *Pc Pk* (30, 2, 1); *g1* means that 30% of the unit is affected by both soil compaction and soil crusting/sealing, at a moderate degree, slowly increasing compared to the past, as a consequence of diffuse grazing.

The extents of the different LD forms are not overlapping (the total is  $\leq 100$ ).

This description is the outcome of a QM workshop and as such is based on *consensual perception*. This should have been supported by hard information and data, but often that is not the case in the practice.

These pieces of information can be aggregated back (or scaled-up) from the map units to the administrative unit.

### 4.2.1. Thematic aggregation

By considering the thematic information (presence of LD, degree and rate), three general considerations can be made:

1. Thresholds can be set to define whether a unit is *affected* by degradation or improvement or not.

As an example, it can be decided that the unit is affected if at least X% of it is characterized by a specific form or forms of LD at whatever degree or rate.

As an alternative, a minimum degree (e.g., 2) could be taken as reference in addition to the extent requirement.

The two thresholds (extent and degree) could be constant or different according to the factor considered. As an example, soil degradation could be given a greater weight (maybe due to a higher reliability of the assessment) and taken even if the degree is 1.

In such a case, the definition of the weights should be consensual.

2. Single LD forms or groups of factors could be aggregated to satisfy specific requirements, e.g., specific UNCCD indicators.

The approach can be the same as for point 1, but limited to one or more LD forms. It should be thus defined case by case.

The calculation would be more direct when single LD forms are mentioned by the QM tables, but can be done as well when the LD forms are grouped together.

However, in this case, if one is looking for water erosion, as an example, it may be useful (or not) to report whether this LD form is associated with any other.

3. LD rates, along with causal factors, could be considered to distinguish between inherited and present LD and to evaluate the sustainability of the land use.

A positive rate, indicating a worsening situation, can be interpreted as indicator of on-going degradation processes. In addition, the presence of recognized causal factors, although only qualitatively associated to the observed LD forms, can be an indicator of unsustainability.

The concomitant evidence of conservation measures in place could suggest that traditional or modern knowledge has been applied already to sustain the production, although this does not necessarily means that degradation was ongoing and recognized.

Furthermore, the spatial linkage of that information to a specific LD form recorded for the map unit may be not defined.

In the following section, operational proposals are formulated in relation to the **UNCCD indicators II, VI, VII, XI**, which will be implemented based on the dataset generated by the LADA Cuba team (the outcome of this exercise is described in chapter 5).

UNCCD indicator II - Change in land use

The LADA indicator AREA TREND OF THE LUS can be assigned the following values:

- 2:** area coverage is rapidly increasing in size; i.e. > 10% of the LUS area/10 years
- 1:** area coverage is slowly increasing in size, i.e. < 10% of the LUS area/10 years
- 0:** area coverage remains stable
- 1:** area coverage is slowly decreasing in size, i.e. < 10% of the LUS area/10 years
- 2:** area coverage is rapidly decreasing in size, i.e. > 10% of that specific LUS area/10 years

Suggestion. To take into consideration the possibly limited confidence associated to the observation of small area changes (below 10 % in absolute value).

*A map highlighting the “relevant changes” (above 10 %, either negative or positive) should be produced, such as “land use change hot spots”.*

Land use intensity trend indicator could be less reliable, due to the intrinsic higher difficulty of the guess.

However, the LUS classes structure allows for putting into evidence changes which are more sensitive (based on either general or country by country criteria), such as:

- Decrease of protected areas (forest, wetland, etc....)
- Decrease of forest areas

These could be marked by a different colour in the legend.

For other changes, they could be given different interpretations according to the direction of the change (for example we do not know what other class is decreasing when, as an example pastoralism area is increasing). A GIS based proximity analysis to discover it would be not supported by the limited quality of the semi-quantitative data available.

Proposed legend structure:

<b>1</b>	<i>Relevant positive changes (above 10 %)</i>
<b>1a</b>	<i>.....if any</i>
<b>2</b>	<i>Relevant negative changes (above 10 %)</i>
<b>2a</b>	<i>Relevant negative change of protected areas</i>
<b>2b</b>	<i>Relevant negative change of forest areas</i>
<b>2c</b>	<i>.....if any</i>

UNCCD indicator VI - Level of land degradation

Out of the potentially relevant indicators already listed in chapter 4.1, it is suggested to discard the two indicators selected to produce UNCCD indicator VII (below) and to retain the following list:

- LADA-N: Wg Gully erosion / gullying;
- LADA-N: Wt Loss of topsoil / surface erosion (by water);
- LADA-N: Ed Deflation and deposition;
- LADA-N: Et Loss of topsoil (by wind);
  
- LADA-N: Ca Acidification;
- LADA-N: Cn Fertility decline and reduced organic matter content;
- LADA-N: Cp Soil pollution;
- LADA-N: Cs Salinisation / alkalinisation;
- LADA-N: Pc Compaction;
- LADA-N: Pk Sealing and crusting;
  
- LADA-N: Hg Change in groundwater / aquifer level;
- LADA-N: Hp Decline of surface water quality;
- LADA-N: Hq Decline of groundwater quality;
- LADA-N: Hs Change in quantity of surface water;
  
- LADA-N: Bc Reduction of vegetation cover;
- LADA-N: Bq Quantity / biomass decline;

It is suggested to use the above indicators in 3 ways:

1. All together, to portray the general LD situation of the mapping unit;
  2. The 4 groups representing the main thematic components of LD (soil loss, soil quality degradation; water; vegetation);
  3. As single specific indicators;
1. The idea is to produce **1 map** and to consider as *affected by LD* a map unit characterised by a *moderate to extreme* degree of any form of LD. The *slight* degree is discarded, to have a more conservative evaluation and to take into consideration the possibly limited confidence associated with the observation of less intense LD processes.
- The total area affected is the sum of the extents of each LD form whose degree is included in that severity range. It is suggested to prudently filter out LD forms reported for small areas (e.g.: less than 20 %) of the map units. The limit of 20 % may be changed if the confidence level of the evaluation is thought to be high. Under these two conservative conditions, the simplified national LADA LD maps

should be safe enough from criticism.

In addition (facultative), if one single form (or combination of forms) of LD accounts for more than 50 % of the total affected area of the map unit, this may be highlighted by adding this information as an attribute, as the *dominant form* of LD reported. This can be given a different colour in the paper map legend, either remain a *clickable* attribute in the digital map version.

Proposed legend structure:

<b>3</b>	<i>Extent of LD (moderate to extreme degree) &gt; 80 % of the map unit area</i>	3(Wg): gully erosion dominant form (a mixed form, if it is the case)
<b>2</b>	<i>Extent of LD (moderate to extreme degree) &gt; 50 % of the map unit area</i>	idem
<b>1</b>	<i>Extent of LD (moderate to extreme degree) &gt;= 20 % of the map unit area</i>	idem

Example:

Wg            20, 2, 1  
Pc Pk        30, 1, 1  
Hg            35, 2, 1  
Bc            10, 2, 2

*Evaluation:*

65 % of the map unit is “affected by various forms of LD (moderate to extreme degree); Hg”. Class 2 (Hg).

- The idea is to produce **4 maps**: soil loss, soil quality degradation; water degradation; biological degradation, to follow the main categories defined by LADA-WOCAT for the State indicators. The approach suggested above should be applied group by group, always considering *moderate to extreme* degree and reporting the *dominant form* as an attribute. The same legend should be adapted and used, so at least 20 % of map unit area must be affected.

Example:

Wg            20, 2, 1  
Pc Pk        10, 3, 1  
Hg            35, 2, 1  
Bc            10, 2, 2

*Evaluation:*

20 % of the map unit is “affected by soil loss; Wg”. Class 1 (Wg).

35 % of the map unit is “affected by water degradation; Hg”. Class 1 (Hg).

A combination of forms of LD can be reported, whose extent is above 20 %.

In this case, if the combination includes factors belonging to different groups (e.g., a mix of soil loss and vegetation degradation) it is to be supposed that they co-exist in the map unit and occupy the same extent.

So, if they match the minimum requirements (at least moderate degree over 20 % extent), they will appear in the respective maps.

Example:

Wg Bc Bq 40, 3, 1

Pc Pk 10, 3, 1

Hg Bq 25, 2, 1

*Evaluation:*

40 % of the map unit is “affected by soil loss; Wg”. Class 1 (Wg).

65 % of the map unit is “affected by vegetation degradation; Bq”. Class 2 (Bq).

25 % of the map unit is “affected by water degradation; Hg”. Class 1 (Hg).

3. **Several maps** of single LD forms can be finally produced, with a similar approach.

Based on the last example proposed at point 2, the evaluation for the single indicators would be the following.

40 % of the map unit is “affected by gully erosion; Wg”. Class 1 (Wg).

40 % of the map unit is “affected by reduction of vegetation cover; Bc”. Class 1 (Bc).

65 % of the map unit is “affected by biomass decline; Bq”. Class 2 (Bq).

25 % of the map unit is “affected by groundwater depletion; Hg”. Class 1 (Hg).

### UNCCD indicator VII - Plant and animal biodiversity

Three LADA national indicators are potentially related:

LADA-N: Bs Quality and species composition / diversity decline

LADA-N: Bh Loss of habitats

LADA-N: Bl Loss of soil life

Suggestion. LADA-N: BI should not be considered here. It is more reliable when considered as a local indicator. Furthermore, information on soil fauna is typically rare and the domain of few specialists.

LADA-N: Bh and LADA-N: Bs should be both used.

The former, although based on an expert guess, is likely related to a clear awareness of the loss of valuable ecosystems at the national scale, and its *rate* should be mapped. The idea is to use the latter to reinforce the first one.

Proposed legend structure:

<b>3</b>	rapidly increasing degradation	<b>3a</b>	With reported moderate to extreme loss of species/diversity
<b>2</b>	moderately increasing degradation	<b>2a</b>	With reported moderate to extreme loss of species/diversity
<b>1</b>	slowly increasing degradation	<b>1a</b>	With reported moderate to extreme loss of species/diversity

UNCCD indicator XI - Land under Sustainable Land Management (SLM)

Several LADA national indicators are potentially related:

LADA-N: Extent and trends of Land Conservation

LADA-N: Effectiveness of Land Conservation

LADA-N: c Crop management

LADA-N: e Over-exploitation of vegetation for domestic use

LADA-N: f Deforestation and removal of natural vegetation

LADA-N: g Overgrazing

LADA-N: o Over-abstraction / excessive withdrawal of water

LADA-N: s Soil management

Suggestion. A combination of these indicators can satisfy the requirement.

The “*extent of LC at moderate to very high effectiveness*” should be the headline indicator, reinforced by a characterisation based on LD pressure factors.

The pressure factors listed above are related to the LD forms reported by QM LD tables.

The linkage between pressure factors and conservation measures if possible as far as also the conservation measures are related to LD forms. That means that the specific “f” field (“degradation addressed”) of the QM conservation table must be filled in.

If this condition is verified the two pieces of information can be aggregated as follows and provide even more information that requested by the UNCCD indicator.

Proposed legend structure:

<b>3</b>	<i>extent of LC at moderate to very high effectiveness &gt; 20 % of the map unit</i>	<b>3a:</b> sustainability threatened by Crop management <b>3b:</b> sustainability threatened by Overgrazing  etc.: 3c, 3d, 3e, 3f
<b>2</b>	<i>extent of LC at moderate to very high effectiveness &gt; 50 % of the map unit</i>	<b>2a:</b> idem 2b etc
<b>1</b>	<i>extent of LC at moderate to very high effectiveness &gt; 80 % of the map unit</i>	<b>1a:</b> idem 1b etc

### 4.2.1. Spatial aggregation

From the spatial point of view, this should be done based on two data:

- the extent of each LD type;
- the extent of each map unit as a % of the administrative unit

Assuming that the three map units occupied the following % of the administrative unit: LUS2 60%, LUS6 10% and LUS7 30%.

Let us consider a first, simple case:

The Bc factor (reduction of vegetation cover) is present in both LUS2 (extent = 10) and LUS7 (extent = 20).

We can broadly calculate the extent of the administrative unit affected by Bc:

$$\text{Extent of Bc LD form (\%)} = 0.1 \times 60 + 0.2 \times 30 + 0 = 12\%$$

This simple calculation could be very easily done in a GIS environment.

In this case, the terms of the operation are completely homogeneous (same degree and rate), so the same attributes could be assigned to the new extent.

In a different more complex situation, e.g. with degree 2 in a map unit a degree 3 in the other, that would not be possible, unless a sort of weighted average is computed to account for the difference.

For the other factors, or combination of factors (potentially, a great number of combinations are possible), it would not be possible to combine (aggregate them). The only possible operation would be to scale them up to the administrative unit.

As an example for this second case, let us consider Cp (10% of LUS7):

$$\text{Extent of Cp LD form (\%)} = 0.1 \times 30 = 3\%$$

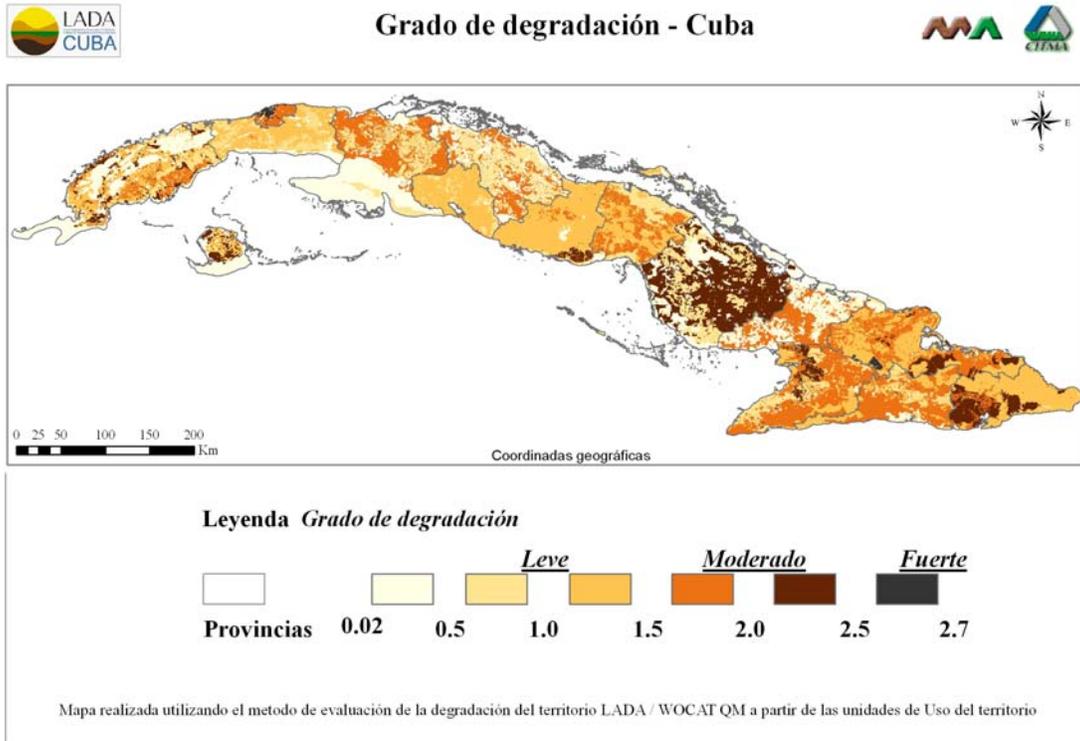
In this case, 3% is a small amount and could be filtered out by GIS processing, if an opportune threshold is defined (e.g., 5 or 10%).

All LD forms values could thus be scaled-up the same way, by assuming that all the extent estimates are equally reliable and accurate.

But the result could probably be difficult to manage.

A further, thematic aggregation should be made, to make the interpretation easier and to allow for the creation of a consistent (although simplified) map legend.

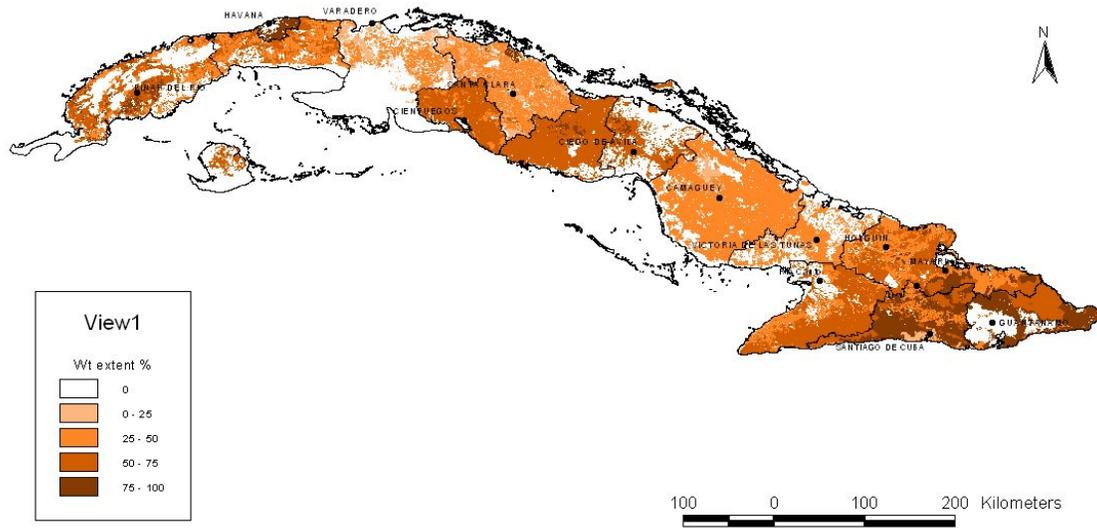
## 5. EXAMPLE IMPLEMENTATION



This map shows the average degree of degradation per map unit, including all the types of degradation and all degree levels.



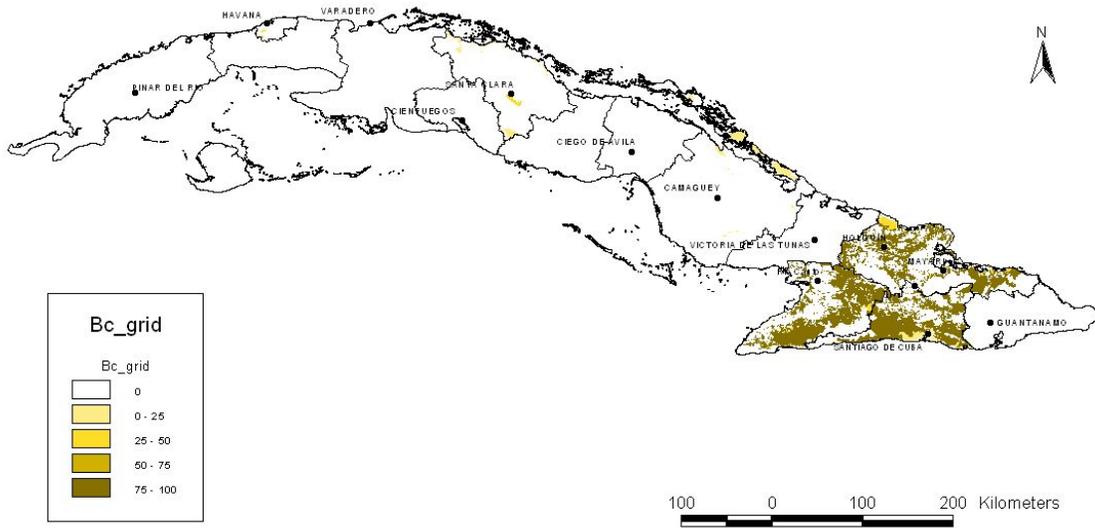
## Water erosion (Wt - % of area)



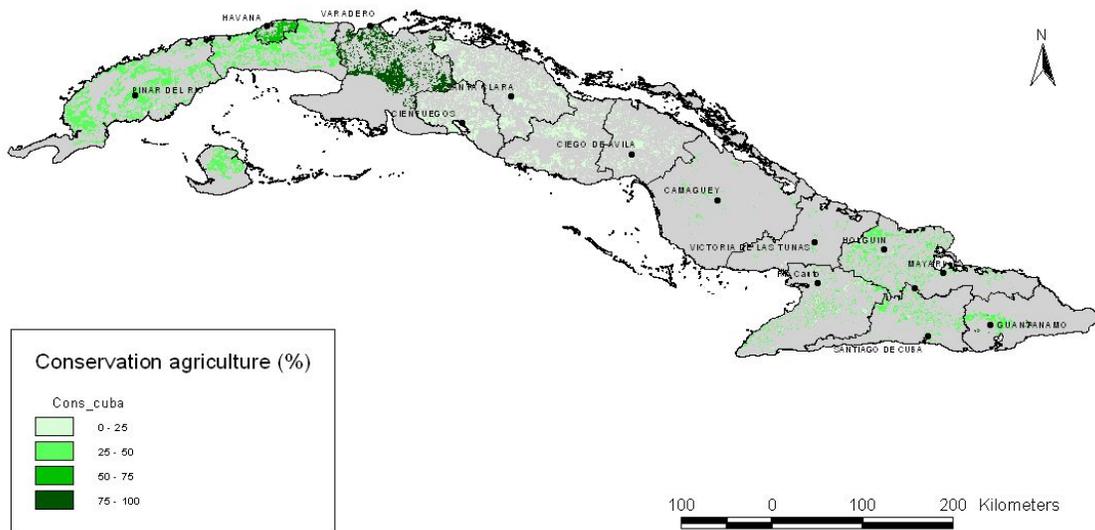
Extent of water erosion as percentage of the unit area.



## Reduction of vegetation cover (Bc - % of area)



## Conservation agriculture (% of area)



## 6. CONCLUSIONS

The UNCCD has promoted the international debate on desertification indicators since the late 1990s. Several *ad hoc* working groups have been established since then and a number of studies and research projects have explored the issue. The recent acceleration given to the process during COP8 and COP9 has urged the definition of a concrete and targeted minimum set of indicators.

Some recent or ongoing projects provided very relevant inputs but relatively limited in their scope. As an example DESERTLINKS explored desertification issues in the northern Mediterranean region only, while DeSurvey is developing advanced research products at different scales, but related to a set of specific issues and modeling approaches. LADA is the only project aiming at producing an integrated assessment at different scales, globally. So, it is not surprising that the UNCCD has increasing expectations from LADA.

During the last five years LADA had the possibility to adapt, in a flexible way, to try to satisfy the UNCCD demand. During COP9 this demand became more precise. Although some of the eleven UNCCD “indicators” discussed at the beginning of these guidelines are not fully defined, or not really feasible, they constitute now a clear demand for information.

The present guidelines show that some of these UNCCD indicators can be fully or partially satisfied by the LADA “products”, if adequately aggregated. Such a possibility was concretely demonstrated by using the national data produced so far by a LADA partner country (Cuba).

However, some considerations related to the comparability of these data from country to country should be done, as discussed below.

### 6.1. Lessons learnt from the Argentina national workshop

LADA can answer the UNCCD demand, provided it is able to establish a linkage between its own indicators and the UNCCD indicators. Such a linkage should not be just thematic (e.g., a sort of one-to-one or one-to-many relationship); it should possibly be quantitative and supported by an analysis of the real process carried out by the partner countries to produce the required information, its reliability and replicability.

This analysis was a major goal of the work carried out by the NRD during the national workshop in Argentina.

LADA is ongoing and the LD assessments made by the six countries are still in the process of being summarized and harmonized. LADA has been a learning process. The common methodology was set up by adapting to different local conditions and experts backgrounds through several iterations. That was an enrichment and an added value for the project. As confirmed by the Argentina workshop, although the LADA methods and tools are now consolidated, some of the information collected by countries in the course of the project may have different degrees of reliability and accuracy, due to several reasons.

Some of these reasons may be related to local expert choices or bias, or to heterogeneous availability of resources from one area to another inside a country, or to other very local

and unexpected factors. Others are linked to the need to further define the LADA-WOCAT national indicators and make them more operational.

As a consequence, the aggregated LD indicators suggested by the present guidelines are feasible, but the corresponding “products” (maps) obtained by the LADA partner may remain not fully comparable from country to country.

## 6.2. Recommendations

The LADA-WOCAT national indicators have a general and open definition and they should be considered as *descriptors*, instead of *indicators*.

Each descriptor should be linked to a more specific, operational and measurable indicator (either quantitative or semi-quantitative). This indicator can be in principle different from country to country. This process was already carried out, more or less implicitly, because each LADA national team was confronted with the need to translate the general descriptor into a real indicator, whenever they wanted to avoid to apply a merely expert judgment.

For this reason, it is recommended to ask the partner to produce meta-information about the local implementation of the national indicators, as done by the Argentina team after the workshop.

The LADA coordination should ease (and constrain) the choice of suitable indicators to implement the descriptors, by adding further guidelines to the WOCAT QM. This is not supposed to be a simple task and could be part of a *LADA II* task.

Also, common criteria should be defined for (semi-quantitative) self-assessment of the accuracy and reliability of the QM implementation in each country. These could be variable from an indicator to the other, as for the case of Argentina.

Based on these criteria, each LADA country should produce LD maps as indicated by the present guidelines only for the reliable products, and specific reader notes should be attached to the maps with synthetic meta-information on the national LADA process.

Finally, as already said, only some UNCCD indicators can be satisfied by the LADA “products”. The integration of suitable information to feed the others could be considered as another task for *LADA II*.