LOCAL IMPACT INDICATORS FOR PROJECTS TO COMBAT LAND DEGRADATION AND DESERTIFICATION

Summary of the report published within the framework of the CSFD/AFD Convention

Contract CSFD–Agropolis/RXC REL–DTO DAR/N°2009 09 161

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1. Introduction

Measuring the impact of development policies, programmes and projects is essential. In particular, it is a democratic requirement with respect to citizens and parliaments that fund them, and also necessary to enhance the efficiency and relevance of initiatives undertaken, so as to be able to reorient them and ensure their sustainability through capitalization of the achievements and empowerment of stakeholders. This measure is complex, i.e. policies, programs and projects, individual and collective initiatives, market forces and climatic constraints interfere and it is hard to distinguish between the effects of the different decisions that have been made.

Top international organizations are concerned about assessing their initiatives. Major environmental conventions are involved, especially those on climate change and biodiversity. The United Nations Convention to Combat Desertification (UNCCD) recommended that the scientific community address this issue and has already adopted some indicators to measure the impact of its strategy after 10 years. The French scientific community, particularly through the French Scientific Committee on Desertification (CSFD), has contributed to this effort.

France, through its key decision makers for its external activities (Ministry of Foreign Affairs, MAE, the French Development Agency, AFD, Treasury Department), has prioritized assessment of its development activities based on a combination of instruments:

- external project assessments;
- impact assessments through enhanced scientific approaches;
- comparative analysis of cooperation policies between contributing countries;
- and the development of composite indicators.

AFD has set a requirement for monitoring the fulfilment of its project objectives. It is obliged to account for its actions, while also addressing several questions:

- recurrent requests from its operational personnel and internal questions on the significance of its initiatives;
- the need to capitalize on its experience;
- the need to learn from good practices;
- the assurance that the objectives have been fulfilled, and if not, why;
- improving the quality, efficiency and performance of the Agency.

Several internal analyses and more scientific investigations have shown that assessments are hampered by major shortcomings. In particular, there is some confusion between the different project phases, specific and operational objectives to reach and the achieved results, and especially the absence and imprecision of the indicators used. Everyone agrees on the conclusion that proper monitoring of key intermediate and final results on the basis of qualitative and quantitative indicators is an ambitious project to put together. That being said, there is also agreement on the fact that there is no universal method to do this, that data are generally not available, that the monitoring-assessment stakeholders are not committed, and that the costs are unknown. Finally, although the *ex post* financial assessments are not problematic, it is clear that the long-term impacts of any development initiative have to be measured.

CSFD's work involves finding 'good indicators' to assess these impacts. The study scope only covers initiatives concerning sustainable land management, restoration and rehabilitation of degraded areas, prevention of land degradation, combating desertification, particularly in dryland, arid, semiarid and subhumid areas.

CSFD also conducted a seminar in July 2011 on issues concerning the assessment of policies, programmes and projects. All of these studies on impact and assessment indicators represent a French contribution to the future scientific conference to be held within the framework of the UNCCD in early 2013.

A French initiative launched in 2008…

The objective of the study initiated by CSFD in 2008 under the initial UNCCD request was to measure/monitor the strategic objectives of the strategy at the 10 year anniversary of the Convention (supported by the French Ministry of Ecology, Sustainable Development and Energy/MAE/AFD). This work provided a basis for addressing an AFD request in 2009 (AFD-CSFD partnership agreement, 2009-2011) concerning summary documents on land degradation indicators and indicators to measure the impact of natural capital restoration and sustainable land management operations, etc.

…by an international multidisciplinary group

The CSFD Working Group on Indicators consists of 10 members from various specialties and various research and higher education institutions, as well as other French scientists and a science writer. Since 2009, this work has been carried out in collaboration with DesertNet International (DNI, formerly European DesertNet, EDN), which is an international scientific network that includes more than 300 scientists from around 50 countries. During the first year of the triennial agreement, CSFD also worked with the International Federation of Agricultural Producers (IFAP) network that was founded in 1946 but unfortunately disbanded in 2010. IFAP represented more than 600 million farm families grouped in 115 national organizations in 80 countries. Members of the Working Group on Desertification (GTD) were also involved in this process. Founded in 2001, GTD is a platform for French stakeholders involved in combating desertification (CD), which is hosted by the Center for International Action and Achievements (CARI), i.e. an association dealing with development issues in developed and developing countries.

The objectives and methods of the CSFD Working Group on Indicators

The CSFD Working Group on Indicators has been striving to develop a minimum set of indicators to enable:

1. decision makers to assess implementation of the UNCCD strategy after 10 years and the progress achieved on meeting its objectives (year 1);
2. multiscale assessment of land degradation and desertification trends, progress achieved through local projects, and the impact of public policies, etc. (years 2 & 3).

After several steps, a list of indicators on the impact of operations to combat desertification and land degradation at the local level was drawn up (objective 2):

1. *Extraction of existing potentially usable indicators as well as useful related information*: an in-depth literature review was conducted (several hundred references, particularly from the work of the AFD and FGEF). PhD theses were also reviewed. Many websites (statistical yearbooks) were visited. A questionnaire was sent to the IFAP network in 2009. The responses of professionals from developing countries focused on the main indicators used to assess the effects of measures that have been taken. Meetings of the CSFD Working Group on Indicators have been held each year to foster discussions between experts and to refine/supplement the selection of indicators.

2. *Classification of indicators listed* by: topics (biophysical, socioeconomic, etc.), spatial scales (local to global), direct or indirect indicators, qualitative or quantitative indicators, data acquisition methods (field, remote sensing, statistical/database), etc. All of these indicators are posted in an Excel database along with information for each indicator: name and unit of measurement, definition, rationale for use, methodology, etc.

3. *Launching of an email query to DNI*: lists of indicators were sent to DNI members for comment in 2009. An analysis of the responses helped to refine the listed indicators, to complete the list of indicators proposed by DNI members, and to identify the most relevant indicators to address AFD's initial question.

4. *Selection of a first list of indicators of local impacts of CD operations*: a first list of a hundred local indicators was drawn up, but only the final selected indicators were characterized in the following step.

5. *Selection and characterization of indicators of local impacts of CD operations*: indicators were selected based on their relevance, 'measurability' (feasibility, availability of primary data, cost, etc.) and reliability. Each indicator was characterized on a fact sheet: name, short description, method and limitations (spatial, temporal, etc.) so as to provide in-depth information necessary for its evaluation. This also highlights how the indicator helps determine the local impacts of CD operations.

CSFD indicator assessment output

Reports

CSFD, 2010. *Indicateurs de la dégradation et de la désertification*. Report published within the framework of the CSFD/AFD Convention. Contract CSFD–Agropolis/RXC REL–DTO DAR/ N°2009 09 161. Montpellier, February 2010.

CSFD, 2010. *Rapport d'étape de la convention AFD/CSFD/AGROPOLIS RXC REL–DTO DAR N° 2009 09 161*. Year 2010- First semester. June 2010. CSFD, Montpellier, France.

CSFD, 2010. *Indicateurs de la dégradation et de la désertification*. Progress report for the convention AFD/CSFD/AGROPOLIS RXC REL–DTO DAR N° 2009 09 161. Year 2010–Second semester. December 2010. CSFD, Montpellier, France.

CSFD, 2011. Indicateurs de la dégradation et de la désertification. Progress report for the convention AFD/CSFD/AGROPOLIS RXC REL–DTO DAR N° 2009 09 161. Year 2011 – First semester. July 2011. CSFD, Montpellier, France.

CSFD, 2011. Research seminar 29-30 June 2011. *Politiques, programmes et projets de lutte contre la désertification : quelles évaluations ?* Summary. Institut Agronomique Méditerranéen Montpellier, French Scientific Committee on Desertification.

CSFD, 2012. Local impact indicators for projects to combat land degradation and desertification. Report published within the framework of the CSFD/AFD Convention. Contract CSFD–Agropolis/RXC REL–DTO DAR/N°2009 09 161. Volume 1: Summary. Volume 2: Descriptive fact sheets on selected local impact indicators. February 2012, Montpellier, France.

Leaflets

CSFD, 2009. Desertification and land degradation trend indicators. Leaflet published in English, French and Spanish. CSFD, Montpellier, France. (Published in three languages – English, French and Spanish - for COP9, Buenos Aires)

CSFD, 2012. Local impact indicators for projects to combat land degradation and desertification. CSFD, Montpellier, France. (Published in two languages – English and French).

Local, national and global indicator databases

National and global: 45 indicators for monitoring desertification and land degradation.
Local: 99 local indicators derived from the results of field surveys and specific to local situations, 70 of which were selected during the present work.

As well as:
Baseline national country characterization statistics available in statistical yearbooks
More complex indices concerning situations and trends and pooling several indicators (36 local, national and global indices)

CSFD website

Assessment of policies, programmes and projects on combating desertification
www.csf-desertification.org/index.php/activites-du-csfd/recherche-et-developpement/seminaire-2011-evaluation

Indicators of desertification and land degradation trends
www.csf-desertification.org/index.php/activites-du-csfd/recherche-et-developpement/indicateurs

Local impact indicators for projects to combat land degradation and desertification
www.csf-desertification.org/index.php/activites-du-csfd/recherche-et-developpement/les-indicateurs/indicateurs-impact

DesertNet International (ex-EDN) website
www.european-desertnet.eu/cop9_prep_eu.php

2. Terminology note

What is an assessment?

An assessment is conducted "to assess or determine the value or advantages of something" (IFAD, n.d.). This is a systematic (and as objective as possible) review of a planned, ongoing or completed project. It aims to answer specific questions, and decide on the overall operation, while gaining insight so as to be able to improve future initiatives, planning and decisions.

An assessment is typically carried out to determine the **relevance, consistency, effectiveness, efficiency, impact and sustainability** of project objectives (see box below). It should provide credible and useful information, and generate practical insight to help partners in making decisions.

Main assessment criteria

- *Relevance*: The nature of a project that meets the expectations of all or some of the concerned stakeholders.
- *Consistency*: The nature of a project with sufficient resources to meet the objectives and the different resources are compatible.
- *Effectiveness*: The nature of a project that achieves the expected effects.
- *Efficiency*: The nature of a project whose effects are proportionate to the resources used.
- *Impact*: All positive and negative, primary and secondary effects generated directly or indirectly, intentionally or unintentionally by the development initiative.
- *Sustainability or viability*: The nature of a project that generates activities or a structure that is able to 'live' and develop. This essentially involves assessing the ability of undertaken initiatives to last (survival following withdrawal of external intervention) and to independently expand (reproducibility).

From OECD *in*: MAE, 2007.

Why assess and for whom?

Project assessment is useful to (Neu, 2011):

- Verify the relevance and consistency of the initial objectives.
- Measure the effectiveness of an initiative, i.e. the extent to which the objectives have been fulfilled.

- Highlight the conduct and steering of CD initiatives and make various decisions: (i) 'short-term' decisions made by management or operational coordination bodies, and (ii) 'long-term' decisions made by steering or strategic orientation bodies.
- Assess the performance, results and effects of CD initiatives (and their relevance with respect to the objectives) beyond the direct stakeholders (donors, inhabitants, civil society organizations).
- Examine the sustainability of the observed effects (impact).
- Document the processes:
  - of learning for stakeholders directly involved in CD initiatives, especially technical and institutional (as part of decentralized assessments);
  - of capitalization in order to gain insight and make it accessible to others;
  - of information, communication or advocacy campaigns in order to convince financial partners and provide donors with economic (or other) arguments to encourage them to invest in CD.
- Explain/analyse a complex real situation (especially scientists).

An assessment is therefore useful for different types of user:

- *For international decision makers*: assessment methods help identify and characterize aggregated impact indicators at this scale. This raises the question of international harmonization. Normative work is needed to agree on a universally accepted assessment framework.
- *For national and international politicians*: an assessment is a instrument for mobilizing resources and can convince policy makers to invest in CD. The aim is to transform scientific results into political arguments. Moreover, an assessment may provide incentives for strategy change (or adjustment) in different areas at all levels (not only in affected countries).
- *For civil society*: a CD initiative impact assessment may have a learning effect on local stakeholders. It is a collective learning system and an essential element in decentralization of natural resource management situations.
- *For scientists*: assessments help detect, analyse and understand complex real situations. They can facilitate modelling and forecasting.

Advantages, users and spatiotemporal scales of assessments
Modified from Neu, 2011.

Assessment uses		**Users**	**Data type**	**Spatiotemporal scales**
Decision making	Operational	NGOs, field operators	Activities and results	Local Short term
	Choice of methods	Steering bodies	Activities and results Effects and reactions to the initiative External events and changing circumstances	Local Medium term
	Strategic choices	Political bodies	Analysis of effects, impacts and settings	Local to national Medium to long term
Understanding the processes		Scientists	Analysis of processes, results, effects and impacts	Medium to long term

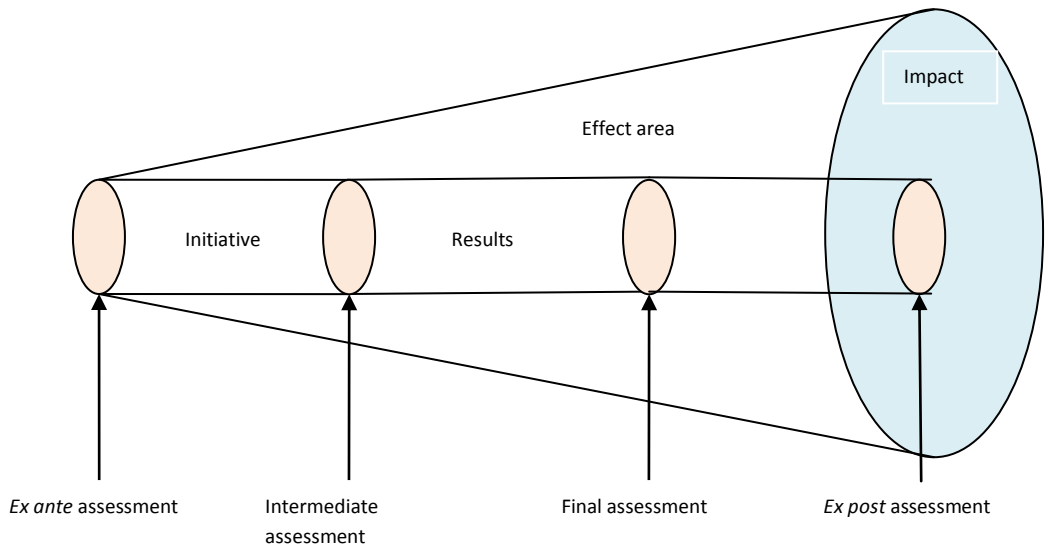
Achievements, outputs, outcomes and impacts: what should be assessed?

1. **Achievements** (**results** or outputs) are qualitative and quantitative changes produced directly by the initiative. They are planned and implemented on an annual basis and are directly related to the objectives of the initiative. An assessment of the outputs involves comparing the achieved results and those defined by the initial objectives of the initiative. They are measured by simple quantitative indicators (e.g. number of people trained in livestock production). **Monitoring** is used to measure them through regular information collection and analysis. This enlightens managers and stakeholders as to the progress achieved in meeting the objectives.
2. **Effects** (outcomes) describe early changes in the physical and human environment induced by these achievements (e.g. improving animal production techniques). These are short and medium term effects corresponding to what happens after the achievements.

The **impact of a project** is the new situation that arises as a result of all the effects. Impacts consist of all kinds of positive or negative, intended or unintended effects generated by CD initiatives. They do not necessarily correspond to the objectives identified at the outset. They may involve stakeholders not targeted by the initiatives and are often long term impacts. The impact of a project refers to its goal (e.g. poverty reduction). The impact concept can then be extended to a broad range of visible changes that contribute to this goal: considering the 'poverty reduction' example, this would involve an increase in agricultural production, an improvement in access to water, etc.

There are therefore different types of assessment depending on the assessment objectives, what is evaluated (results, effects, impacts, etc.) and when the assessment is conducted: *ex ante* assessment, intermediate assessment…

Different types of assessment according to the completion time
From F3E, CIEDEL, 1999.



3. Impact assessment is not a simple process

Problems common to many CD projects

Several general points emerged when reviewing CD project documents proposing the use of indicators:

- Ill-defined terminology and concepts: objectives, outputs and impacts.
- Inconsistent indicator formulations are sometimes due to unclear definitions of objectives. Indicators may be absent, somewhat irrelevant with respect to the objectives, or hard to apply. In addition, they do not systematically cover the different objectives, often at the expense of social or institutional components.
- Indicators (quantitative) are sometimes hard to measure or the required data are not readily available, so the information necessary for these indicators may necessitate complex data collection procedures.
- Project and programme monitoring and evaluation systems usually do not benefit from impact monitoring and are limited to monitoring activities and results.

These challenges closely coincide with the weaknesses underlined in project monitoring reports, including those of AFD (see box below).

AFD project monitoring systems

Some shortcomings resulting from an analysis of AFD project monitoring systems are:
• The lack of precision in formulating objectives in the Board notes, which makes it hard to design an appropriate monitoring system. The indicators focus on effects that are hard to attribute to the implemented activities and/or are not relevant with respect to the identified objectives.
• The monitoring systems proposed in some Board notes are unrealistic.
• The logical frameworks and monitoring systems presented in the Board notes generally are not mentioned in the funding agreements.
• Information on project results is unavailable, although the results are noted during the project implementation phase.
• Information on project results is unavailable because the results are actually not available during the project implementation phase. Consequently, monitoring is focused on the project achievements rather than the results. For these projects, the assessment results are derived from a decentralized evaluation, not from operational monitoring.

From Lefebvre *et al.*, 2010.

One of the main factors to explain this difficulty concerns—during the project design phase—the complexity of defining indicators that are relevant with respect to assessing the planned initiative, while also being sensitive and readily measurable over the considered period.

Difficulty in defining indicators to assess a project impact

An assessment of the success of a project or programme is based on different normative criteria, including effectiveness and impact. These two assessment criteria are appraised globally for often complex and multifaceted and collectively designed initiatives/projects/programmes. Each institutional stakeholder has a share of responsibility in the implementation process but also specific ways of assessing the phenomena, dynamics and transformations induced by the initiative. When planning interventions, it is thus necessary to jointly define **shared benchmarks** on the initial situation and on the situation sought through the proposed initiative. In some cases, these indicators may have value in contractual agreements and contracts between donors, the client and contractor. This is usually the case with output achievement indicators, and much less often with impact indicators.

A number of indicators are thus defined when the intervention rationale is being outlined (hierarchy of objectives in the logical framework). These indicators are used to assess the quantitative and qualitative achievement of objectives at different levels: implementation of planned activities, output achievement, fulfillment of the intervention objectives and the expected final contribution or end goal.

In this sense, the definition of indicators of activities and results is generally not problematic with respect to their identification and monitoring. However, the situation differs markedly for indicators designed to objectively assess direct and indirect changes induced by the combined outputs (first effects and impacts of initiatives).

The impact analysis is thus based on reading and interpretation of a number of indicators that are parameters set by agreement between the different stakeholders. They must be able to specifically describe (how, how many, when, who, where?) the state reached. They must make the objectives, results and activities verifiable as well as, in our case, the local impact of a project by clearly defining criteria for success. They can be based on a quantitative yardstick, while also being the focus of a qualitative description.

A note on indicators…

An indicator is a parameter or value obtained from a set of parameters, which provides information on or describes a phenomenon. An indicator is designed with a purpose and for a certain group of users. An indicator has two main functions, to:

- reduce the number of measurements and parameters normally required to accurately account for a situation;
- facilitate systematic and periodic information exchanges in favour of users.

Tailored impact assessment methods are required to deal with the broad range of CD projects

Desertification projects are extremely diversified (objectives, types, settings, stakeholders, etc.). Because of this diversity, it is not possible *a posteriori* and remotely to determine a specific assessment method, or a list of indicators applicable to all cases. Methods that claim to be applicable to a broad range of situations are necessarily systematic. They do not always facilitate assessment of specific features of a situation or specific issues concerning the

project. Excessively normative approaches generally result in overly extensive systems that are hard to implement and use (Neu, 2011).

Assessed natural and social systems are complex and variable

The desertification problem is complex and multidimensional:

- Ignorance of assessed natural and social systems and causality relationships between resource use practices and management practices (vegetation, soil, water, human capital, etc.).
- Complexity of concerned stakeholders (types, individual and collective rationales, behaviours, interrelationships, roles, interests, attitudes, etc.).
- Stakeholders involved and their strategic behaviours change over time. Centres of influence move, multiply and are contradictory. New stakeholders may emerge over time and hijack the process to their advantage. CD implies temporal changes in a set of heterogeneous stakeholders, interests and viewpoints.
- Difficulty in identifying relevant resources, especially those that are invisible (e.g. soil organic matter).
- Multiple types of impact: technical, social, economic, ecological and political, etc., directly or indirectly attributable to the project, expected or not...

The setting of desertification projects is constantly changing.

Projects often take place in unstable environments:

- Natural biological systems subject to constantly evolving environmental changes and anthropogenic pressures.
- Social changes that projects accompany progress at a hard to predict pace. Hence, they function iteratively—their intervention strategy changes with time. Insight is gained from their effects as they progress.
- Development is often synonymous with changes in social organization and local institutions, often even with the founding of new institutions and institutional arrangements.

Project impact assessments therefore cannot only involve ‘initial forecast/actual achievement’ types of comparison (Neu, 2011). The systems are continuously changing and the objectives of CD initiatives should thus be periodically reviewed. Because of the changing nature of assessments, they should be constantly adapted, and few studies have focused on this evolving cycle.

Spatiotemporal assessment scales are hard to define

Desertification is the result of complex and interactive processes and mechanisms driven by a combination of factors acting at different spatial levels and temporal scales. This causes major practical difficulties for assessing CD operations.

There is the problem of the time scale used for analysis and monitoring changes, including ecosystem dynamics and social changes, which often take place over long periods.

In the environmental field, for instance, setting up a system for monitoring wildlife evolution, vegetation dynamics, fisheries resource monitoring involve intervention times of some 10 years so as to be able to design an impact monitoring system, develop a learning method and a system for effective monitoring of the resource. This implies a long-term commitment that greatly exceeds donors' usual funding period. These are mainly German (and Italian) cooperation interventions that are part of a planning process of this type, generally with a seamless succession of 3-year phases over a period of a dozen years.

There is also a problem of spatial scale, or more precisely of scaling problems. What is observed in plots, such as restored plots, is not easily applicable throughout the catchment or physiographic or socioeconomic unit defined during the contextualization phase.

CD operations may also have impacts elsewhere (positive or negative externalities) and at different times. It is thus necessary to incorporate the 'ulterior or indirect' effects that go beyond the project benefits and are no longer a management responsibility. With time, causal links between the initiative and the changes may be harder to determine. Note that spatiotemporal aggregation, comparison and extrapolation cannot be readily done since the assessment is contextual. Indicators are often specific to the assessment scale.

Assessment results are sometimes hard to interpret

The significance of assessment results may differ depending on the analysis angle—an assessment focused on the implementation of technical standards or the evolution of natural resources could conclude that the project would fail (negative impacts), while an assessment focused on the economic impact could conclude on a success (positive impact). This raises the issue of multiple objectives for the same initiative—the same initiative could be effective or relevant with respect to one objective but not to another. This is not surprising and is even quite common in practice. This underlines the difficulties encountered with respect to obtaining clearcut overall results (Garrabé, 2011).

In addition, some impacts are not expected or sought, or are indirect. There is reference to positive or negative externalities (in the broad sense) of projects. An analysis of changes induced by an intervention completed or under way should distinguish changes that are actually attributable to the initiative.

Available required good quality data is hard to obtain

The absence of documented points of comparison is a common problem in the assessment of CD projects and highlights the importance of conducting an *ex ante* project assessment (initial situation) and, secondly, defining a baseline (a non-project situation) for comparison in order to appraise the changes and measure the impacts.

4. What can be done? Methodological elements…

Defining an initial situation and a benchmark situation

To evaluate changes and impacts, it is necessary to assess the change dynamics by comparison to a benchmark (or standard) (Bonnet *et al.*, 2004):

1. Compare the 'before project' situation to the 'after project' situation. In practice, this involves repeating, over time, comparable surveys before and after the CD project/operation.
2. Compare the 'without project' situation to the 'with project' situation at any given time. This requires an investigation on two samples of similar individuals or communities in the same area, with one having participated in the project (sample of beneficiaries) and the other not (control sample).

There is therefore an initial situation **AND** a benchmark situation:

- An 'initial situation' or 'starting situation' *(ex ante)* is a description of the different parameters (ecological, economic, social, etc.) upon which a project is to intervene in order to make changes. This initial situation is reconstructed with the aim of generating elements to measure the impact at the end of the project. This is often refined during the operation based on the indicators that are applied during the project to measure the achievement of its objectives. This involves quantitatively and qualitatively specifying the initial state of parameters necessary for a subsequent impact assessment.
- A 'benchmark' (*ex post* without project) does not describe the situation at the start of a project but rather the evolution of the initial situation in the absence of project interventions. Only the benchmark provides an objective basis for comparison to assess the effectiveness of a project. This requires modelling or developing hypotheses based on expert advice describing the likely evolution of the initial situation in the absence of any project intervention, or otherwise it requires an end of project analysis of the situation of a non-beneficiary 'control group' that experienced the same conditions as the beneficiary group prior to the project.

The after project situation (*ex post* with project) includes the effects of the project achievements.

In all cases, the choice of impact indicators, their initial value and the target values expected at the end of the initiative should be jointly defined in the *ex ante* evaluation, so that the methods and means needed to monitor these indicators, even establishing their initial value, are effectively defined and included in the planning.

Contextualization of the assessment

In order to achieve a meaningful assessment of programs and projects, it is essential to contextualize the situation in order to identify the real constraints hampering enhancement of the impact of CD initiatives. Moreover, the context influences the CD results, including their sustainability. This contextualization involves characterizing the area in which the project to assess is located. An assessment will therefore be more informative and relevant to stakeholders if it is placed in the actual context, including legal, political and institutional. Note that a contextualized assessment does not automatically enable spatiotemporal

aggregation, comparison and extrapolation since the context, including social and institutional, is constantly changing. A project context characterization step is thus required for each assessment.

Holistic, multidisciplinary, intersectoral and systemic approaches are used

The underlying causes of desertification are complex, overlapping, and often to be found in non-technical fields: poverty, land insecurity, inconsistency of sectoral policies, etc. A CD initiative should therefore be assessed with respect to its economic, cultural, environmental and even political aspects. In dryland areas, CD assessments require suitable methods and approaches involving different disciplines.

There are no universally applicable indicators (or methods), but they must be designed to integrate the different CD components: human, financial and economic, ecological, and finally the practices, techniques and methods used. CSFD has defined four overall groups of indicators that integrate these multiple components (see box page 15).

Assessments must include land and resource access aspects

Assessment results are related to the social, political and institutional situation and specifically to land rights. Property rights are human rights, and rights of access to resources influence their use. The inefficiency of certain CD operations can be understood by examining the effects of property rights on stakeholders' behavior (e.g. extensive clearing may be carried out to ensure land security). Deregulation of access to natural resources (NR) by social, economic and political changes leads to degradation practices and saturation.

The relevance of CD initiatives depends largely on the structure of NR access and usage rights and especially on the fact that they are already integrated in the design of CD projects. The ability to meet expectations in terms of equity between local stakeholders is a key to ensuring the success of a project (therefore with beneficial and sustainable impacts).

Assessments should account for the different CD stakeholders: choice of indicators, data collection and analysis

The literature review revealed the regular absence of local stakeholders in the process of defining and selecting indicators, as well as in data collection and analysis. A participatory assessment system is nevertheless essential and should involve all CD stakeholders, because:

- A project is a collective construction. Each institutional stakeholder has a share of responsibility in the project implementation and his/her own assessment of the phenomena, dynamics and transformations induced by the project. During the intervention planning, shared benchmarks must be jointly defined concerning the initial situation and the situation sought through the proposed initiative.
- The impact analysis is based on the reading and interpretation of a number of indicators, which are parameters set by agreement between the different stakeholders. They must be able to accurately describe (how, how many, when, who, where) an achieved state.
- The assessment of impacts attributed to an intervention must be solidly argued on the basis of an analysis of the different beneficiaries and stakeholders of the intervention. It must also be based on the independent observations of the appraisers.

- The assessment process helps clarify the role of stakeholders and their interests by linking the assessment with the decentralization process. Experiments have been conducted on impact monitoring systems in collaboration with and by the concerned groups, and these clearly represent a factor of appropriation and local management capacity building. More generally, decentralized assessment is a powerful self-training tool, while also strengthening local stakeholders' capacities to manage NR in their areas. In addition, assessments provide CD stakeholders with an opportunity to form their own opinions by providing solid evidence of impacts.

Assessment costs should be taken into account

The choice of assessment method and indicators, will depend, among other things, on the data availability, budget and timeframe. It is necessary to develop, in collaboration with local managers, simple and inexpensive tools and methods. If the indicators are developed by local stakeholders that inform them, their management will be more efficient. It is therefore necessary to rely on ***'expert opinions'*** from trained crop farmers and livestock farmers for some observations, municipal employees and technical services, or visiting scientists or engineers from consulting firms who have experience on the local situation. Sufficient funds are required and it is essential to develop the appropriate means and skills through local capacity building (farmers, herders, technicians, various organizations).

Impact monitoring methods that truly involve the beneficiaries and local managers of NR are not necessarily inexpensive. Suitable investment is thus required so that they will be sufficiently accurate and make sense from environmental, social and economic standpoints. Funds should also be available for regular monitoring, agglomerated data analysis, consultation costs that promote and allow data interpretation in collaboration with the concerned stakeholders…

Qualities of a 'good' assessment system

- Usefulness: the system meets users' needs.
- Feasibility: the methods, activities, resources, etc., are cost-effective.
- Accuracy: the information provided is appropriate.

Indicators will only give a partial view of the situation! They represent a simplification or approximation of a given situation. An indicator only highlights changes that are generally more complex.

Simplicity is essential: It is certainly crucial to identify indicators and have access to some information in order to gain insight into the situation. This is not, however, enough to understand the changing context, the operational process or new challenges and local impacts. The relevance of data should be considered before collecting numerous data. The common pitfall of gathering data of limited quality and not analyzing them should be avoided. Fewer data could generate more useful information. To conduct an effective assessment, it is also necessary to know what to measure, by whom, for whom and why.

The information requirements and indicators should be updated over time. A good assessment system evolves with time. The context changes in addition to the stakeholders and their interests, rationales, etc. The list of indicators used for the assessment is therefore not inflexible because it is sometimes necessary to review the information needs and therefore the

indicators during the assessment process. Information provided by some indicators may also turn out to be useless. It is therefore necessary to regularly review the list of information needs in order to remove anything that does not seem useful.

To explain the intended and unintended and positive and negative impacts of a project (i.e. not only measure the *quantitative* scope), it is also essential to keep informed about the environment in which the project is taking place. Areas to consider depend on the type of project: legislation, environment, macroeconomic (markets, prices), agricultural policies, price trends at different scales, demographic changes, etc.

Proposed typology for local impact indicators

1. Biophysical indicators are intended to qualify and quantify the state of natural capital: water, soil, vegetation. They usually consist of simple, sometimes complex, measures to characterize, as objectively as possible, parameters such as erodibility, salinity, plant cover rate, vegetation type, increases or decreases in biomass, carbon and the C/N ratio and land cover. Measures obtained over several years highlight the trends.

2. Quantitative production indicators are used to measure the results of project initiatives regarding agricultural production, forestry and livestock production. This involves measuring yields and their components, the number of hectares treated, fixed dunes, quickset hedges, methods used, the number of trees planted, parameters for improvement of livestock production and forestry products and non-timber forest products, etc.

3. Economic and financial indicators aim to measure investments, funding sources and rates of return. They must also measure the per-hectare cost of initiatives undertaken, the amount of wages paid, cost-benefit ratios, etc. Moreover, they are quantitative measures of household income and family budgets.

4. Institutional and societal indicators are intended to provide qualitative information on the nature and existence of local agreements and contracts between development stakeholders: farmers and herders, between the latter and technical services. They also generate quantitative and qualitative information on the organization of civil society and decentralization, and on poverty and wellbeing issues (education, health, etc.).

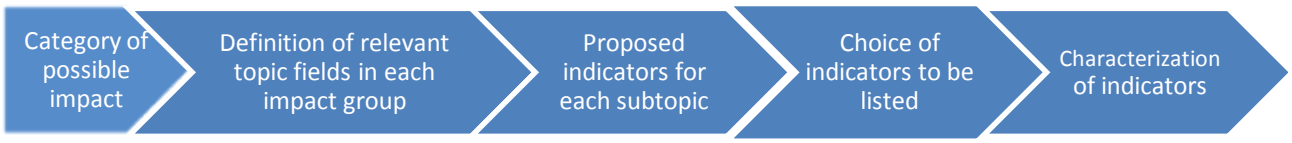
5. Selected local impact indicators

There is no list of universal local impact indicators (or assessment method), however it should be stressed that the list proposed by CSFD is indicative. The assumption is that a combination of a few simple indicators can help detect ***some*** changes in natural and human environments under the impact of CD projects. For each specific assessment, a minimum set of indicators is selected from this reference list of more or less widely applicable indicators.

These indicators can be very useful if the aim is to assess the natural, human and social capital of a considered area and the evolution in these sustainable development parameters. These different indicators are linked in order to analyse the dynamics under way, which must generate a sense (direction and significance), thus giving consistency to the multiple effects of the initiative.

The indicators were *deductively* selected in five phases:

1. From the concept to the dimensions: definition of the different types of potential impacts associated with most CD operations.
2. From the dimensions to the indicators: the impact represents all changes that may affect different topical fields ('subtopics') composing each impact group. The relevant fields had to be defined.
3. Proposal of indicators for each subtopic (as broad ranging as possible). This step helped make the screening and selection of indicators operational and to take all possible aspects of CD operations and their impacts into account.
4. Selection of impact indicators listed according to different empirical and pragmatic criteria.
5. Characterization of each selected indicator.



→→ Direction of indicator construction

CSFD tried to select a limited number of easily measured indicators. In addition, the selected indicators should be balanced with respect to their topical coverage and able to provide transparent evidence through their:

- **Relevance and reliability:** an indicator should be able to measure, as accurately as possible, variations in a component of a topic or subtopic due to implementation of the project (e.g. 'soil fertility' for the 'biophysical' group). This relevance may vary locally depending on the context and CD operational objectives. This of course will influence the choice of a particular indicator by the assessment users. The choice of relevant indicators that are general enough to be applied in a maximum number of different situations was one of the objectives of the CSFD Working Group.
- **Operationality:** this will influence whether the indicators are willingly used often (or not). This is why the choice of indicators is made from a list of existing and measured indicators having an already proven measurement methodology. This 'operationality' depends on the availability of primary data, as well as the data collection feasibility. The indicator measurement methods all have advantages and disadvantages in terms of cost, data reliability, necessary skills, ability to quantify results, and wealth of information produced. Some of the data required to calculate the value of an indicator may therefore already exist (e.g. national statistics). In addition, the complexity level (human and technical time and resources, their cost) required to measure (field, laboratory, satellite images, etc.) must be consider before the indicators are selected. This level should obviously be 'reasonable' and depend on the users' capabilities. The CSFD Working Group focused its choice on indicators that require, if the users' capabilities are insufficient, support that is easy to provide to strengthen the users' capacities.

Local indicators of CD project impacts are presented in the table below. Some are sometimes only temporary indicators of results and they become impact indicators when measured over several consecutive years to highlight the trends.

TYPES OF INDICATOR			
1. Biophysical	**2. Quantitative production**	**3. Economic and financial**	**4. Institutional and social**
INDICATORS			
1-1. Plant cover rate	2-1. Precipitation efficiency coefficient for production	3-1. Average income per family	4-1. Wellbeing indicator
1-2. Land cover	2-2. Crop yield	3-2. Income per worker	4-2. Schooling rate
1-3. Herbaceous phytomass	2-3. Total agricultural area per inhabitant	3-3. Income per inhabitant	4-3. Agricultural activity rate *(sensu lato)*
1-4. Total phytomass	2-4. Per-hectare fertilizer rate	3-4. Farm net income (current year)	4-4. Non-agricultural activity rate (business, craftwork, etc.)
1-5. Tree and shrub density	2-5. Number of seedlings planted	3-5. Farm needs fulfilment rate (agricultural, livestock production, general)	4-5. Overall activity rate
1-6. Vegetation type	2-6. Managed area according to initial objective (*zai*, compost, etc.)	3-6. Natural environment restoration investments	4-6. Agricultural product selfconsumption rate (agriculture, livestock production, general)
1-7. Soil water retention capacity	2-7. Number of hectares rehabilitated for cropping, grazing or woodland	3-7. Agricultural investments	4-7. Share of migrant worker income in household budget
1-8 Soil organic carbon content	2-8. Number of reforested hectares	3-8. Livestock production investments	4-8. Share of migrant worker income invested in agriculture
1-9. Soil N,P,K content	2-9. Woodland recovery rate after 3 years	3-9. Non-agricultural equipment rate (all services combined)	4-9. Land ownership and usage rights
1-10. Surface crusting rate	2-10. Dune fixation rate	3-10. Cost/benefit ratio of investments in the natural environment	4-10. Migratory flows
1-11. Sand encroachment rate	2-11. Watering place density	3-11. Cost/benefit ratio of agricultural investments	4-11. Temporary economic migratory flows
1-12. Indicator of soil surface changes (structure and texture) under wind erosion effects	2-12. Livestock productivity	3-12. Economic rate of return	4-12. Number of local agreements between development stakeholders (farmers, livestock farmers, technical services)
1-13. Runoff index Percentage runoff	2-13. Livestock density (domesticated livestock)	3-13. Farm size	4-13. Number of civil society organizations
1-14. Soil erosion rate: erodibility, erosivity	2-14. Carrying capacity	3-14. Land use	4-14. Decentralization rate
1-15. Soil salinity rate	2-15. Actual carrying capacity		4-15. Poverty rate
1-16. Water salinity rate	2-16. Herd composition per animal species		4-16. Percentage of total population with access to drinking water–Rural and urban areas
1-17. Soil fauna	2-17. Herd growth rate		4-17. Water availability (per capita)
1-18. Biodiversity integrity index	2-18. Fodder supplementation		4-18. Dynamic landscape index
1-19. Composite land degradation index			

Brief description of the selected indicators

1. BIOPHYSICAL	
Indicator name	**Description of the indicator**
1-1 Plant cover rate	Vertical projection of the above-ground parts of plant species.
1-2. Land cover	Overview of everything that is covering a land surface classified according to a specific nomenclature (bare ground, open water forest, grassland, artificial area, etc.).
1-3. Herbaceous phytomass	Weight of living or dead herbaceous plant material on the ground surface per unit area at a given time.
1-4. Total phytomass	Weight of total living or dead plant material on the ground surface per unit area at a given time.
1-5. Tree and shrub density	Number of trees and shrubs per hectare.
1-6. Vegetation type	Steppelands, savanna grasslands, savanna shrublands, wooded savannas, dry forests, etc.
1-7. Soil water retention capacity	Quantity of water that a soil holds *in situ.*
1-8. Soil organic carbon content	Carbon stock in the soil. Percentage of carbon whose quality, in terms of organic carbon in the soil, is maintained or enhanced. This indicator may optionally be substituted or supplemented by organic matter.
1-9. Soil N,P,K content	Nitrogen, phosphorus and potassium contents of a soil.
1-10. Surface crusting rate	Percentage of crusted soil in a given area, with the soil being crusted with a heavy and almost impermeable soil layer.
1-11. Sand encroachment rate	Percentage of the ground covered with sand in a given area.
1-12. Indicator of soil surface changes (structure and texture) under wind erosion effects	Sediment budget (BS- and BS+, the two poles of surface mechanisms: excess lost particles, excess deposits).
1-13. Runoff index; percentage runoff	Fraction of rainwater flowing on the soil surface
1-14. Soil erosion rate: erodibility, erosivity	Indicator based on the resistance of soils and their structure, on the intensity of the erosive power of water and wind and on the slope.
1-15. Soil salinity rate	Percentage of soluble salts in a soil.
1-16. Water salinity rate	Percentage of soluble salts in water.
1-17. Soil fauna	Abundance of animal species in soil.
1-18. Biodiversity integrity index	Degree of integrity of the original biodiversity per homogeneous unit area.
1-19. Composite land degradation index	Index consisting of the degree of degradation intensity and its extent.
2. QUANTITATIVE PRODUCTION	
Indicator name	**Description of the indicator**
2-1. Precipitation efficiency coefficient for production	Net primary production per millimeter of rain.
2-2. Crop yield	Ratio between harvested crop production in weight, volume and even number of plants and a specific unit area.
2-3. Total agricultural area per inhabitant	Area cultivated per inhabitant.
2-4. Per-hectare fertilizer rate	Quantity of organic and mineral fertilizers (N, P, K) applied per hectare and year.
2-5. Number of planted seedlings	Number of planted seedlings per hectare and year.
2-6. Managed area according to initial objective (*zai*, compost, etc.)	Number of hectares treated per year.

2-7. Number of hectares rehabilitated for cropping, grazing or woodland	Total number of hectares treated by the end of the project and patterns the following years.
2-8. Number of reforested hectares	Total number of hectares planted by the end of the project and patterns the following years.
2-9. Woodland recovery rate after 3 years	Number of vigorous plants relative to the total number of introduced plants in a given area and patterns the following years.
2-10. Dune fixation rate	Efficiency of dune fixation in a given area and patterns the following years.
2-11. Watering place density	Efficiency of watering places set up in a given area and patterns the following years.
2-12. Livestock productivity	Quantity produced (milk, meat, etc.) per unit area (or animal) and time unit.
2-13. Livestock density (domesticated livestock)	Number of head of livestock per surface in the considered area.
2-14. Carrying capacity	Maximum number of livestock that a rangeland is assumed to withstand without damage.
2-15. Actual carrying capacity	Number of animals grazing in a given area.
2-16. Herd composition per animal species	Herd composition per livestock species characterized by gender and age class.
2-17. Herd growth rate	Annual rate of increase in the number of animals in a herd.
2-18. Fodder supplementation	Proportion of fodder crops relative to the grazed rangelands, Type of supplement feeds and supplementation practices.
3. ECONOMIC AND FINANCIAL	
Indicator name	**Description of the indicator**
3-1. Average income per family	Annual cash income (excluding consumption).
3-2. Income per worker	Annual cash income for workers over 15 years old.
3-3. Income per inhabitant	Total income of the considered area divided by the number of inhabitants in the area.
3-4. Farm net income (current year)	Gross income from sales of agricultural products, minus depreciation and operating costs.
3-5. Farm needs fulfilment rate (agricultural, livestock production, general)	'Produced output/expected output' ratio.
3-6. Natural environment restoration investments	Input expenditures per farm.
3-7. Agricultural investments	Input expenditures for agricultural production.
3-8. Livestock production investments	Input expenditures for livestock production.
3-9. Non-agricultural equipment rate (all services combined)	Ratio between the number of farm units with specific equipment (TV, radio, cell phone, housing, etc.) and the total number of farm units.
3-10. Cost/benefit ratio of investments in the natural environment	Ratio between investment costs and benefits derived from investments in the natural environment.
3-11. Cost/benefit ratio of agricultural investments	Ratio between investment costs and benefits derived from agricultural investments.
3-12. Economic rate of return	Measurement of annual earnings generated by a project compared to the total amount of investments.
3-13. Farm size	Total agricultural area or number of livestock per farm.
3-14. Land use	General overview of land use in a given area according to a specific nomenclature: various crops, livestock production, forests, towns, infrastructures, etc.

4. INSTITUTIONAL AND SOCIETAL	
Indicator name	**Description of the indicator**
4-1. Wellbeing indicator	Composite index combining income, schooling, health, housing, employment, etc.
4-2. Schooling rate	'School student/total population' ratio.
4-3. Agricultural activity rate (*sensu lato*)	Ratio between the agricultural labour force and the total population.
4-4. Non-agricultural activity rate (business, craftwork, etc.)	Ratio between the non-agricultural labour force and the total population.
4-5. Overall activity rate	'Labour force/total population' ratio.
4-6. Agricultural product self-consumption rate (agriculture, livestock production, general)	Proportion of self-consumed products relative to the total production.
4-7. Share of migrant worker income in household budget	Percentage of money sent by migrants relative to the total household income.
4-8. Share of migrant worker income invested in agriculture	Percentage of money sent by migrants invested in agriculture relative to the total money sent by migrants.
4-9. Land ownership and usage rights	Type of land use rights (private property, common property, tenancy, sharecropping, etc.)
4-10. Migratory flows	Number of people emigrating for long periods relative to the total population (in a village or area)
4-11. Temporary economic migratory flows	Number of people emigrating for a few months relative to the total population (in a village or area)
4-12. Number of local agreements between development stakeholders (farmers, livestock farmers, technical services)	Number of written agreements on the management of water, rangelands, woodlands, etc.
4-13. Number of civil society organizations	Number of organizations of farmers, livestock producers, villagers, women, etc.
4-14. Decentralization rate	Percentage of rural municipalities delegated by the State to manage natural areas
4-15. Poverty rate	Percentage of the population living below the national poverty line or, by default, living on less than $US1 (or $US2) per day.
4-16. Percentage of total population with access to drinking water–Rural and urban areas	Ratio between the number of people using water network connections, public tapstands, boreholes with handpumps, covered wells, protected springs or collected rainwater and the total population.
4-17. Water availability (per capita)	Number of m^3 of water available per person per year.
4-18. Dynamic landscape index	Complex indicator combining the distribution of land-use types (cultivated/grassland/woodland/urban land ratios), the complexity of the spatial organization, opening or closing of the landscape (hedges, percentage woodland).

6. Descriptive fact sheets on the selected local impact indicators

Information that end users require on the selected indicators (see detailed fact sheets in volume 2 of the main report, CSFD, 2012), including:

- Indicator name
- Definition
- Measurement unit
- Justification for using the indicator
- Topic classification
- Measurement, calculation and methods
- Primary data availability
- Spatial and temporal applicability scale
- Other applicability limitations (e.g. agroclimatic zone, etc.)
- Thresholds, references and benchmarks
- Implementation costs
- References

7. Some prospects…

Beyond the extent of long-term impacts of SLM operations, the proposed indicators also allow assessment of the natural capital of a region, its components and patterns and evaluation of the human and social capital in order to show that the operations are required to:

- rehabilitate and restore supposedly marginal, or even lost, agroecosystems
- show that there is a return on investment in these operations
- enhance inhabitants' wellbeing, social stability and peace
- meet the Millennium Development Goals concerning food security and the environment.

Natural capital can be considered as a stock that may accumulate or depreciate according to the investment and work done. This stock produces flows of ecosystem goods and services: provisioning services (agricultural products, wood, water, etc.), regulation services (soil quality, water regulation, erosion, etc.) and cultural services. In arid, semiarid and subhumid environments, it is known that this natural capital is an important part of the wealth of the concerned countries and is the major resource for family farming in poor countries, especially in Africa. Degradation is particularly severe in terms of service delivery and secondly with respect to the economic and social levels of the inhabitants.

The proposed impact indicators should facilitate participation in natural capital measurement and monitoring. 'Production', 'economic and financial' and 'institutional and societal' group indicators could also enable assessment of other sustainable development, human, social and societal assets.

Stock and flow indicators

Sustainable development can be measured by the so-called 'adjusted net savings' indicator. It is the addition of four types of capital: physical capital, natural capital, human capital, social or societal capital.

By definition, capital is a stock that can accumulate or depreciate. This stock produces a flow of goods and services. Natural capital is an ecosystem that generates flows of ecosystem goods and services that are used by humans. An ecosystem can be defined by a range of physical, chemical and biological variables representing stocks. Their interaction provides goods and services, including: (i) provisioning services (food, fibre, timber, fresh water, medicines, etc.), (ii) regulation services (water and air quality, regulation of water, erosion, waste, noise, pollination, etc.) and (iii) cultural services (aesthetic, cultural and religious and recreational activity value).

We can distinguish nonrenewable natural capital (minerals, fossil fuels), renewable capital (water, soil, vegetation, etc.) and environmental services.

We then seek to develop indicators that can provide information on the status of stocks and others capable of measuring the flow of goods and services produced. This is relatively easy for market services, and harder for non-market services. The value of capital may be considered equal to the net present value of service flows generated by the use of capital.

From Giraud & Loyer 2006; AFD, 2009; Hamilton & Lemens, 1999; Olliver, 2009.

This global approach to sustainable development based on adjusted net savings seems particularly well suited to environments concerned by the combat against desertification. We also believe that, beyond the measurement of impacts of development operations, our tools could enable assessments of the healthiness of agroecosystems and social and economic systems.

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List of Abbreviations and Acronyms

AFD	French Development Agency / *Agence Française de Développement*
CARI	*Centre d'Action et de Réalisations Internationales*
CD	Combating desertification
CSFD	French Scientific Committee on Desertification / *Comité Scientifique Français de la Désertification*
DNI	DesertNet International
EDN	European DesertNet
FFEM	French Global Environment Facility / *Fonds français pour l'environnement mondial*
GTD	Working Group on Desertification / *Groupe de Travail Désertification*
IFAP	International Federation of Agricultural Producers / *Fédération Internationale des Producteurs Agricoles*
MAE	French Ministry of Foreign Affairs / *Ministère des Affaires étrangères*
NR	Natural resources
SLM	Sustainable land management
UNCCD	United Nations Convention to Combat Desertification