



Intermediary report - January 2003

**THE CLEAN DEVELOPMENT MECHANISM:
DESIGNING THE TOOLS AND
IMPLEMENTATION
CP-26**

IDD – AQUADEV

SPSD II



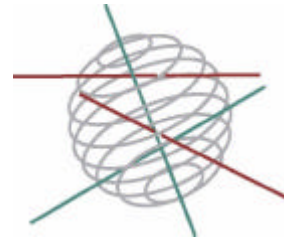
PART 1

SUSTAINABLE PRODUCTION AND CONSUMPTION PATTERNS

-  GENERAL ISSUES
-  AGRO-FOOD
-  ENERGY
-  TRANSPORT

**This research project is realised within the
framework of the Scientific support plan for a
sustainable development policy (SPSD II)**

**Part I “Sustainable production and consumption
patterns”**



The appendixes to this report are available at :
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Institut pour un Développement Durable

**SECOND MULTIANNUAL SCIENTIFIC SUPPORT PLAN FOR A
SUSTAINABLE DEVELOPMENT POLICY – SPSD II**

PART I - SUSTAINABLE PRODUCTION AND CONSUMPTION PATTERNS

Intermediary Report

January 31, 2003

**The Clean development Mechanism:
Tools conception and implementation**



AQUADEV
ONG internationale



**CENTRE FOR OPERATIONS RESEARCH AND
ECONOMETRICS**

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Acronyms and abbreviations

BAU	Business As Usual
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CoP	Conference of the Parties
EB	Executive Board
EU	European Union
GEF	Global Environment Facility
GHG	Green House Gas
IDD	Institut pour un Développement Durable
IPPC	Integrated Pollution Prevention and Control
JI	Joint Implementation
KP	Kyoto Protocol
NGO	Non Governmental Organisation
OE	Operational Entity
SIA	Sustainability Impact Assessment
UNFCCC	United Nations Frame Convention on Climate Change



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1 Project title

“The Clean Development mechanism: tools conception and implementation”

2 Introduction

2.1 Context and summary

In Conformity with Article 12 of the Kyoto Protocol, the Clean Development Mechanism (CDM) constitutes one of the instruments for the reduction of emissions of greenhouse gases available to the Annex I countries. The objective of this project is to provide Belgium with the tools allowing it to have recourse to the Clean Development Mechanism (CDM), both as an instrument of flexibility under the aegis of the Kyoto protocol, but also as an instrument contributing to sustainable development and to the reduction of the North / South inequalities. This dual objective necessitates not only an excellent understanding of the institutional framework (both at the Belgian level and at the level of the United Nations), but, also of the tools necessary to the implementation of CDM projects and the potentials for technological transfers.

The research project is motivated by the following twin observations: the uncertainties, both institutional and methodological, require from now on the preparation of the terrain for whatever CDM projects it might be possible to envisage, but as well as the investment in the methodologies of design, follow-up and assessment of CDM projects. On this account, the research is at one with the Opinion of the Federal Council for Sustainable Development (CFDD) when it encourages Belgium to “agree to build capacities in Belgium and to offer incentives to the candidate pilot enterprises” in order to have recourse to the instruments of flexibility.

Therefore, the whole procedural chain involved in a CDM project will be considered by the research, from questions that could be asked to Belgian stakeholders (both private and public) up to the actors involved in the beneficiary countries. The developing countries considered in the project are those of the sub-Saharan Region (Senegal, Mali, Burkina Faso and Niger). These are also the countries on which Belgium has decided to concentrate its development aid. Senegal will be taken as the pilot-country in order to assess rather more precisely the implications and repercussions of a CDM project.

In order to ensure better co-ordination between the various levels of power in Belgium, to spread and share information as best as possible, and this particularly from the viewpoint of

assistance in the political or policy decision and the strengthening of the Belgian participation in the process of European and international negotiation, the Users Committee of this project includes the Belgian and Senegalese Focal Points in charge of climatic policies and the various levels of power in Belgium, particularly a representative from the Advisers to the State Secretary for Development Cooperation.

2.2 Objectives

The objective of this research is to provide Belgium with the tools allowing it to have recourse to the Clean Development Mechanism, whether the legal, institutional, technological or economic tools. More precisely, the project seeks the following objectives:

1. Specify the institutional framework for the implementation of the CDM projects (at the various Belgian levels of competence/jurisdiction) and with regard to the rules defined or specified (or to be specified) by the international authorities (under the aegis of the United Nations Framework Convention on Climate Change), specify the role that could be played by the various actors, whether institutional or private.
2. Define the practical modalities for the implementation of CDM projects over the whole of the phases covered by any project (feasibility study, accreditation, financing, implementation, monitoring, evaluation, emission credits, etc.) and develop the tools necessary to such implementation (technological databases, methodologies for establishing reference forecasts, project follow-ups and the evaluation of their socio-economic impacts).
3. Evaluate the potential for the reduction of greenhouse gases realisable by CDM in the sub-Saharan zone, select a pilot project, carry out all the necessary procedures for its implementation and draw conclusions from same for the possible spreading of CDM over this zone.
4. Diffuse and enhance the value of the experience and knowledge from this research, both towards the beneficiary countries (countries in the sub-Saharan zone) and to the actors interested or affected by CDM in Belgium, particularly the institutional actors.

One part of these objectives (objectives 1 and 2) reposes on the analysis and the monitoring of the international negotiations undertaken under the UNFCCC. Other objectives could be fulfilled by exploiting the experience acquired with the jointly implemented projects by taking account of the Belgian institutional context (objectives 2 and 3). Finally, the project emphasizes the necessity of controlling the methodologies adapted to the conception and design, monitoring and the evaluation of the CDM projects, methodologies reproducible where required (objectives 2, 3 and 4). These methodologies could to a certain extent draw inspiration from the tools used in the industrialized countries, but they also sometimes require the recourse to specific evaluation tools, with regard in particular to the socio-economic impacts of the projects (semi-qualitative models). It is particularly necessary to note that the concept of the transfer of technology is ever-present within the "aiding decision-making" dimension. Thus the project targets the encouragement not only of the transfer of technologies frugal in emissions of greenhouse gases, but in addition, the deployment of capacity building simultaneously benefiting Belgium and the beneficiary countries via the CDM projects.

2.3 Expected outcomes

Working Papers will be published in order to give an account of the state of advance of the work. In particular, the monitoring of the international negotiations with respect to CDM will be the

subject of a regular briefing with the Users Committee in order to keep them informed of any developments noted and the potential implications for the organization of CDM projects.

A workshop will be organized in order to introduce the tools, developed in the framework of this research, intended to help the implementation of CDM projects. This workshop could be held approximately 18 months after the start of the project.

The final report will give an account of the knowledge acquired from the research, just as much within the technical dimension (description of the tools developed) as institutional (the state of advance of the international negotiations respecting CDM, the roles of the stakeholders, modalities in the organization of the CDM projects, etc.) or of evaluation (potential for a CDM eligible reduction in the sub-Saharan zone, lessons from the pilot project, etc.).

3 Detailed description of the scientific methodology

The project aims at evaluating the adequation and the operational character of the different methods proposed for:

1. Elaborating the manual of procedures of an CDM project;
2. Evaluating the savings of GHG attributable to a CDM project, which means, on one hand, the building of a baseline, and, on the other hand, the measure of emissions produced directly or indirectly by the project itself;
3. Assessing the contribution of the project to the sustainable development of the host country.

For what relates to the first point, there is, indeed, no specific methodology. The followed approach amounts to collate the different models of terms and conditions proposed on the « market », to compare them, evaluating their conformity with the prescriptions of the UNFCCC and underlying their respective strengths and weaknesses.

The approach followed for the second objective lies, equally, in the comparative analysis of the different methods proposed for establishing baselines, and taking into account the emissions attributable to the projects themselves. Nevertheless, this comparison leads here to the construction of a computer tool to help building baselines. The selected methodology is the one of simulation on the basis of a micro-economic and technical model (Cf. point 4.4).

As to the third objective, the SIA methods (Sustainability Impact Assessment) come under scrutiny, as far as methodology is concerned, particularly on the basis of their potential performances faced with 5 epistemological requirements inherent to the very notion of sustainable development:

1. Necessity of an interdisciplinary if not a transdisciplinary approach;
2. Acknowledgement and adequate treatment of the different sources of uncertainty;
3. Degree of openness to the intervention of the different stakeholders, and their participation to the process of evaluation;
4. Length of the time horizon contemplated, and the way the needs of the future generations are represented;
5. Taking into account the interactions between different institutional levels, social, political and geographical (local-global).

In the second phase of the project, the methodologies chosen on the basis of an *a priori* exam of their adequation and their operational character, shall then undergo the test of their adaptation to the institutional, economical, social and political framework of one or several pilot projects selected for the empirical testing of the instruments proposed (pilot projects, cf. point 5).

4 Detailed description of the intermediary results, preliminary conclusions and recommendations

4.1 Institutional framework analysis

4.1.1 International institutional framework analysis

The international institutional framework analysis consisted principally in following the results of the Conferences of the Parties (CoP) held in Marrakech (UNFCCC, 2001) and New Delhi (UNFCCC, 2002), and the executive board of the CDM works. Even if it is not an original contribution to the project, such a follow-up proved to be of the first importance because of the constant evolution of decisions and recommendations. Synthesis notes have been written and are available on the IDD web site.

With reference to the flexible mechanisms in general, the following issues seemed very important to us:

- Eligibility rules and implementation modalities have been defined. Especially, specific emission credits for each mechanism (CDM, JI, sinks) have been created;
- According to the fungibility principle, all these units are equivalent and can be exchanged or reserved for a later commitment period (except for credits derived from sinks which can not be reserved, but exchanged for whatever type of credits);
- The supplementarity principle which sets that the main part of the emission reduction has to be done domestically, has not been expressed in numbers;
- Despite its ratification by the European Union (EU) and its member states, the Kyoto Protocol (KP) has still not come into force. However, the EU recently adopted a directive setting a CO₂ European emission trading as from 2005 (European Union, 2002). This market will probably be connected to the Kyoto emission rights trading market in 2008.

For the CDM more specifically, the following issues have been considered of particular importance:

- A CDM functioning scheme has been defined in the Marrakech agreements. In this scheme, the Executive Board (EB) of the CDM issued from the CoP became responsible for the CDM implementation and for the definition of precise functioning modalities. Independent operational entities (OE) will be designated and accredited by the EB. Their task will be to evaluate CDM projects at different stages of implementation (validation, verification and certification steps);
- Each Party wishing to participate to the CDM will have to designate a national authority, the role of which will be to approve any CDM project in which said Party is involved. In particular, sustainable development contribution by the host country shall be evaluated by the country itself before the implementation of the project. The host country's national authority can refuse a project if it doesn't comply with national priorities;
- Unilateral, bilateral and multilateral schemes (Baumert & Kete, 2000) are all accepted by the Marrakech agreement. However, the way the criterion of participation of industrialized countries

will be taken into account is not clear in the case of unilateral or multilateral CDM, given the principle of fungibility.

- We distinguish three types of CDM projects: classic CDM, small-scale CDM projects and sinks. Small scale CDM has been defined very accurately by the EB, and the CoP7&8. For these small projects, implementation modalities and procedures are presently being adopted in order to reduce transaction costs. For sink projects, only afforestation and reforestation are allowed as CDM project for the first commitment period. CoP8 have precisely decided to create a particular emission reduction unit for sink projects under CDM, these units being suppressed at the end of each commitment period and cannot be kept in reserve. However, specific procedures for the implementation of that kind of projects will only be discussed at CoP9.

4.1.2 Belgian institutional framework

The objective of this point is to make an inventory, at Belgian level, of the main existing institutional actors in the area of climatic changes, in order to identify the persons in charge at executive (Governments), legislative (Commissions, Senate, Regional Parliaments, etc), and administrative (Ministries, administrative structures) and consultative levels (Consultative Bodies).

The information is summarised in tables 1 and 2 (cf. annexes).

Sustainable management of energy and prevention of climatic changes, which, indeed resort principally to Regions, have never been, until now, political priorities, and this was translated by insufficient actions materialized in a first Climate Plan realized in 1994, which ended in a failure¹. At Belgian level, the main representative for the respect of international treaties in the area of Greenhouse Gases (GHG) and objectives of emission reductions is the federal state.

A cooperation agreement between the federal State and the Regions, responsible for environmental policies, is indispensable to implementing climate national policy. Reaching such agreement is one of the priorities for Belgium one of the priorities as well as the setting-up of a National Climate² Commission.

If no measure is taken for reduction of GHG, Belgium will be emitting around 2012 some 165Mt of GHG emissions (National Climate Plan, 2002). The deficit to reach the targets of the Kyoto Protocol (KP) is of 34 MtCO₂ equivalent/year (3 gases) for the 2008-2012 commitment period. In the case of a scenario combining fiscal (11.5 Euro/t) and non-fiscal measures, a reduction of emissions of some 13.7Mt will be planned for 2010. This would mean that there would remain an excess of 20.6Mt of GHG emissions. The flexible mechanisms are supposed to make up this deficit. (National Climate Plan, quoting a study of the Bureau du Plan and Econotec, 2002).

The partisans of an energy/CO₂ tax argue that the studies realized for the European Environment Agency show that taxes on energy in Belgium are the lowest in Europe. According to this principle, the National Climate Plan will be established on big macro-economic tools such as the

¹ According to the commitments agreed in the Framework Convention of 1992, on climate changes, Belgium should have reduce their emissions by 5% in 2000, as compared with the 1990 level ; in reality the emissions have increased during this period.

² One of the attributions of this Commission will be to set in conformity the emissions inventories in order to satisfy the conditions of eligibility to the flexibility mechanisms.

CO₂ tax on energy, which would show fairer prices on economical and ecological level. The majority of companies do not share this opinion.

The flexibility mechanisms will complete GHG emissions reduction « domestic measures » taken by the federal and regional governments. From this point of view, the CFDD is using the method of distribution proposed by the environmental NGOs and development cooperation representatives, as well as representatives of the scientific world, i.e.: determination of a quantitative ceiling (90% of the reductions shall have to take place in the European domestic environment, 10% shall have to be realized through JI/CDM projects). The representatives of employers' organisations and energy producers are considering that such a quantity or quality distribution must not be made and that one must abide by internationally defined conditions. As for the quality limit, it supposes that resorting to flexibility mechanisms is more the result of an additional need to domestic measures than an inherent one (CFDD, 2002).

One must know that CFDD have expressed two opinions in 1999 and 2002, on the flexibility mechanisms concerning the following subjects:

- The importance to identify the criteria for the use of flexibility mechanisms, among which one can find environmental effectiveness and economic efficiency (CFDD, 1999);
- Harmonisation of political measures through the realization of an agreement for sharing competences;
- Institution of the National Climate Commission;
- Realizing an action concerning the setting in conformity of the GHG emissions inventories;
- Looking for a harmonization of the implementation of the flexibility mechanisms with the European level;
- Treating in a similar way the different actors in the three regions.

4.2 The Belgian federations' standpoint on flexibility mechanisms

Among the eight federations that are to sign the sector-based agreements, here are the six on which we have concentrated our attention in this analysis: Fedichem (chemistry), Febelcem (Cement manufacturers), FIV (Federation of glass industries), Cobelpa (paper), Fevia (federation of food industries), Agoria (non-ferrous industries). These 6 areas, grouping more than 150 industrial sites, represent more than 90% of Belgian industrial energy consumption. The two other federations are: Fedieux (extraction industry), and the Groupement de la sidérurgie (steel industry).

From our contacts with these federations, we have retained two main ideas:

- The marked preference for voluntary sector-based agreements as instruments of reduction of GHGs.
- The wish to see Belgian administrations supporting and controlling more the implementation of the flexibility mechanisms, essentially emission permits.

Analysing the environmental strategy of the 6 federations, we have been able to note some specificities, essentially contained in proposals, stands or concrete actions.

So, the chemical industry, through the Fedichem federation, have expressed the wish that the different administrations would take into account, when dividing costs among operators, the economic growth, basing themselves on the Dutch example, where sector-based agreements, including a « benchmarking » in terms of energy efficiency, are concluded between authorities and industry. The importance to resort to flexibility mechanisms, more particularly to negotiable permits, has been very clearly and strongly supported by this industry, through a number of notes and opinions expressed on the subject (Fedichem, 2000).

Among the measures of reduction of GHG emissions proposed by the cement industry, the Febelcem federation, one can mention: an increased use of substitution fuels, the use of flexibility mechanisms, as well as the participation in a system for marketing emission rights.

The glass industry, represented by the FIV federation, has made a contribution, among others, to redacting some articles taking stands on the IPPC directive, on climate changes in the framework of the Fédération des Entreprises de Belgique (FEB). Other opinions have been given, on request of the Union Wallonne des Entreprises (UWE), on flexibility mechanisms, on the project of decree about the environmental conventions that would determine the modalities of the future sector-based agreements as well as on the functioning of the consultative commissions. Still in the framework of this partnership with the UWE, FIV have taken a stand within the working groups on the economic aspects of the energy policy, as well as on the studies on the environmental consequences. Finally, the glass federation committed itself also in a common work within the Management Committee (working group) of the Flemish Economic Federation.

The Cobelpa federation, which groups the companies of the paper-maker industry, proposes that the specific objectives determined in the sector-based agreements be used as a reference for a free allotment of emission quotas on the base of real productions. An exchange of permits should be possible in order to complete an objective of an agreement not reached, or to encourage going beyond initially fixed objectives. (COBELPA Site). The federation equally supports the other two flexibility mechanisms, i.e. JI and CDM.

In the companies belonging to these different federations, the following ones have been taken into consideration: BASF and Solvay for FEDICHEM, CBR-Heidelberg Cement for Febelcem, Glaverbel and Saint-Gobain for FIV, SCA Packaging and Forest Products, and STORA ENSO (Ghent). The choice has been justified by the concrete actions undertaken in the area of climatic changes, of reduction of the emissions of GHG.

Some general observations may be added after the information gathered through the environmental reports and the contacts with persons in charge.

So, in order to reduce the GHG emissions, the companies are realizing a work of dialogue around the improvement of energetic efficiency of the different plants. In function of the results of these measures, the flexibility mechanisms shall be given a role. The companies have shown their intention to wait the publishing of the European Directive on the JI and CDM flexibility mechanisms, from 2005, to evaluate the application potential.

This way of reacting is characteristic about the current situation: the uncertainty on the enforcement rules and modalities of the flexibility mechanisms is a brake on economic analysis of the different instruments. The companies hence prefer using domestic measures for reduction of GHG emissions, still continuing to support the implementation of the market of tradable permits, for which a European Directive controlling the functioning has recently been adopted.

Flexibility mechanisms, CDM included, are included in the companies' environmental strategy but, as a matter for serious thoughts, any decision depending on international rules governs the

working of such mechanisms. Nevertheless, all these federations representing the companies agree to support the sector-based agreements instead of a CO₂ tax.

4.3 Manual of procedures for CDM projects

The objective of the manual of procedures is to give a promoter of a CDM project a clear vision of the different steps to follow, and the way to realize them. Hence, the conception of such a manual goes through the following steps:

- Identification of the different steps of a CDM project implementation;
- Brief description of the main issues rose during these steps (stakes, particular indications...).

Many similar manuals have already been written (DEA, 2002; IEPF, 2002; VROM, 2001; Pembina Institute, 2002). In general, they are based on the teachings of many projects of the pilot phase of the AJI projects and are, accordingly, rich in experiences and adequate practical advices. Our work, so, mainly consisted in a comparative study of these documents. Following is a description of the main teachings of this study.

One can distinguish in the different steps of a CDM project the stages planned by the UNFCCC (principally described in the Marrakech agreements) and the additional steps that a country or a financing organization (type carbon fund) imposes on the participants to the project. The main steps selected for the study in the scope of the project can be found in the outline below.

The Marrakech agreements have planned five major steps concerning the implementation of a CDM project:

1. Project validation by an Operational Entity (OE) on the basis of a project design document, going with a letter of approval of the Parties involved (and after consultation of the UNFCCC accredited NGOs);
2. Project registration by the CDM Executive Board (EB);
3. Project implementation and monitoring (monitoring plan detailed in the PDD);
4. Project verification by an OE and certification by the EB;
5. CER's issuance by the EB.

This plan is the base structure of any CDM project implementation, be it a small- scale project or a classic one (the particular methods of the « sink projects » remain without definition, but they probably will follow this basic outline). The specific methods of small-scale projects are mere simplifications of the requirements of the basic plan steps.

The project design document is particularly important, since it will be the basis for validation, public comments, monitoring during implementation and results verification. It shall include (UNFCCC, 2001):

- The project purpose, a technical description and a justified definition of the project boundaries;
- A proposed baseline methodology;

-
- Definition of the crediting period, i.e. the period during which the project will earn credits: 10 years (with no option of renewal) or 7 years (renewable twice), and its expected lifetime;
 - A proposed methodology for the emissions accounting, as well as a monitoring plan;
 - A description of the expected GHG emission reductions with regard to a BAU scenario;
 - Formulae and calculations used to evaluate emission credits;
 - The environmental impacts of the project: if the legislation of the host country provides for it, an environmental impact study will take place, but, in any case, the project design document shall include an assessment of its environmental effects;
 - An information on the sources of public funding from Parties in Annex 1, asserting that these funds do not come from official development aid;
 - Public comments, including a report on the way these comments have been taken into account.

The EB of the CDM have elaborated a project design document model (available on UNFCCC: www.unfccc.in/cdm) for classic CDM projects, as well as a document describing simplified methods for small-scale CDM ones.

The issues related to counting the emission credits and elaborating baselines have been studied more in detail in the scope of this research (see point 4.4). The manual of procedures will refer to the main conclusions of this study (for the leakage estimation, the choice of a baseline methodology and the definition of the project boundaries, principally).

All studied manuals of procedures, of course, refer to these steps. Their particularities mainly concern the definition of additional steps aiming at preparing negotiations with the concerned national authorities.

Danish or Dutch authorities, hence, recommend the projects participants to write a preliminary document describing briefly the main features of the project before elaborating the project design document (DEA, 2002; VROM, 2001). This report, more synthetic than the project design document, must allow:

- Possibly, to make an agreement with a financial intermediary ready to buy the credits earned by the project;
- To obtain a preliminary agreement of the national authority of the country mentioned in Annex 1;
- To get a preliminary agreement with the host country national authority.

These preliminary steps are, of course, specific to the organization set up by a country (or by a financial organization, for example the PCF asking to examine a project idea note before giving its agreement to continuing the project), and no such procedure has yet been adopted by Belgium. These steps are important because they make it possible to establish a dialogue framework between the participants to the project and Parties. This *ex ante* dialogue should, on one hand, reduce the risks of project non-acceptation by the Parties when evaluating the project design document and, on the other hand, allow taking into account the acceptability criteria of the Parties more completely. The Netherlands even go a step further by signing agreements on the priorities to give to CDM projects with developing countries.

Figure 1 shows the main steps identified as relevant for the manual of procedures.

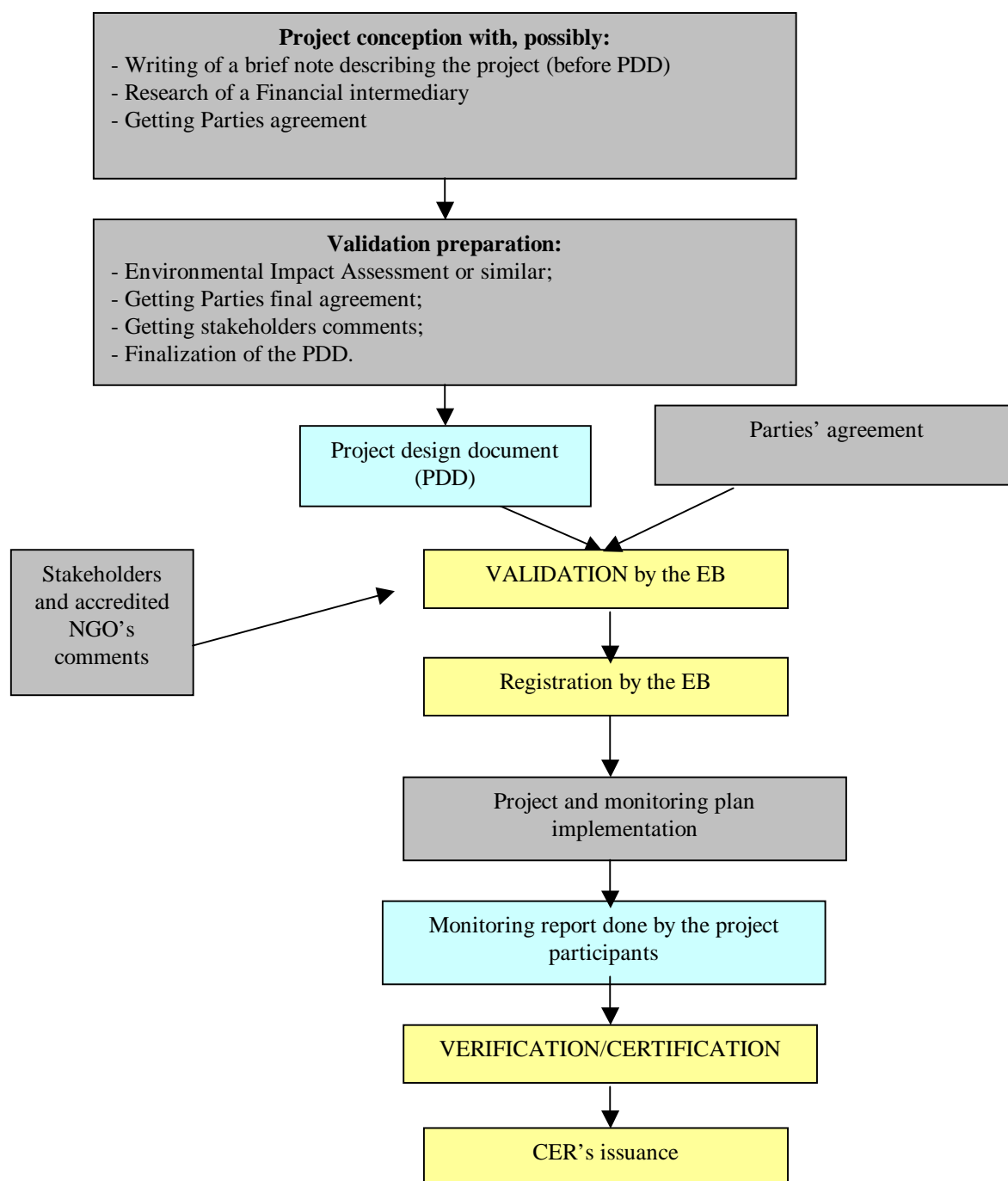


Figure 1 : Steps of a CDM project implementation identified for the manual of procedures

4.4 The baseline issue

A CDM project can be considered as additional only if it actually reduces GHG emissions that would occur in a BAU scenario. A baseline is the description of a situation that, by definition, shall never exist (excepted if the CDM project is not implemented). The counterfactual nature of the baseline which supposes that its construction is established on assumptions and hypotheses

impossible to ascertain (Begg et al., 2001) implies that its construction became the stumbling block of the additionality criterion.

Synthesis of the problem

Decision 17/CP.7 of the Marrakech agreements (UNFCCC, 2001) and their appendices have defined the main principles for the baseline elaboration. In particular, it is said that baselines are established project by project. Thus, multi-projects baselines are not allowed (except for small scale projects). Several uncertainties remain however. A synthesis and analysis of the baseline elaboration problems has been done by the IDD. This work deals with the following issues:

- A proposal of a methodological framework for the baseline construction in three steps: definition of scenarios that would occur in the absence of the project, selection of the most probable one and emissions estimation;
- Comparison of absolute and relative baselines (Laurikka, 2002) in the estimation of the emissions of the reference scenario;
- A proposal of an emission typology for CDM production projects (the main part of the projects with the exception of the sinks and transport projects) based on existing typologies (CERUPT, 2001). This typology made it possible to deal in a clear and systematic way with the problems related to the project boundaries and leakages.
- The discussion of uncertainties and problems related to the boundaries of a CDM project. The definition of the project boundaries is set by the Marrakech agreements. However, there is still room left for interpretation: inclusion or not of emission linked to the entire life cycle of a product, inclusion or not of emission related to a rebound effect, ...
- The synthesis of advances and uncertainties around the definition and estimation of leakages. No clear and commonly accepted methodology exists yet. However, several estimation methods have been advanced: theoretical methods (Lazarus et al., 2001; Chomitz, 2002) and more practical ones (Geres & Michaelowa, 2002).

A note summarizing these issues has been elaborated and is available on the IDD web site. These results will be used, on the one hand, for the definition of an analytical framework for the pilot project and, on the other hand, to expand the section devoted to the emission credits calculation in the manual of procedures.

Construction of a structural model for the emission credits calculation

An emission credits calculation model has been developed for production projects (production of a product, of energy or a service). This tool compares different emission calculation methods (for example: comparison of relative and absolute baseline) with regard to the environmental credibility and financial profitability. This model is based on different assumptions that concern:

- Substitution of local traditional production by the project production;
- Substitution of imports (productions from outside the project boundaries) by the project production;
- Project impact on demand (rebound or induce effect);
- Capacity constraints and technological evolution.

Figure 2 shows the model structure. It is composed of several modules: market balance and production process determination, baselines (absolute and relative) and project scenario emissions calculation, emission credits and financial indicators calculation.

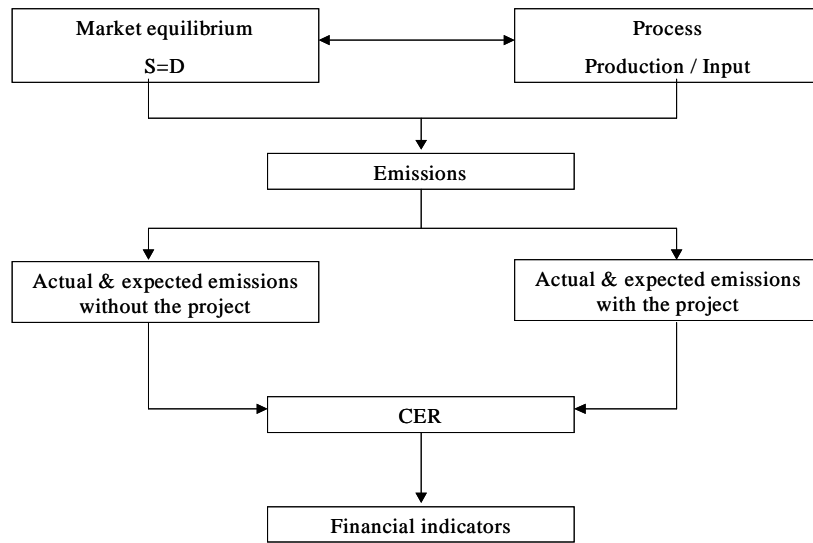


Figure 2 : model overview

In the first module, demand is split into a traditional demand (D_{it}^T and X_{it}^T) directed to a local traditional production (Q_{it}^T) and/or imports (M_{it}^T) and a demand for a similar good (X_{it}^P et D_{it}^P) but of a better quality directed towards the project (D_{it}^P) and/or external production (M_{it}^P). The structure of demand and supply will, of course, be different in the project scenario than in the reference scenario, and this because, on the one hand, the shift of part of the traditional demand for the demand of the project production and, on the other hand, creation of a supplementary demand induced by the project (demonstration of the product, bounce effect, ...). The equation below shows the supply-demand balance such as considered in the model:

$$\left(\sum Q_{it}^T + Q_{it}^P\right) + \left(\sum M_{it}^T + M_{it}^P\right) = \left(\sum D_{it}^T + D_{it}^P\right) + \left(\sum X_{it}^T + X_{it}^P\right)$$

Emissions are considered as being function of the quantities produced by each production mode to which are associated emission coefficients. The baseline is calculated taking into account the *ex-ante* activity level (absolute baseline) or the activity level observed in the project scenario (relative baseline). We also distinguish *ex-ante* and *ex-post* emission in the project scenario.

Emission credits are calculated as the difference between baseline and the project scenario emissions. Then an internal rate of return can be calculated depending on the price per CO₂ ton.

This model has been presented and discussed during the second users' committee meeting, the 3rd of December 2002.

This accountancy model will be tested with data available in design documents of existing CDM projects. It will be used as an analytical tool for the baseline elaboration in the study of the pilot project.

4.5 Economic analysis of CDM

The analysis of CDM is essentially based on the theory of investment at the micro level. Such an approach comes from the « engineer » dimension of the instrument, unlike tradable emission permits, which are an economic tool for reduction of pollution. Whereas the CDM is generally considered at the scale of the individual company, its interactions with other means of emission reductions, for a given company, have not been really explored. Furthermore, the consequences at market scale have not been any more evaluated. Finally, the CDM's macroeconomic assessments are currently based on rough hypotheses (accessibility rate of one third) that it should be necessary to improve in order to have a more specific idea of the reduction potential eligible for this instrument.

The works started by CORE are, hence, going in a threefold direction, according to the tasks defined in the contract's technical appendix:

- Making a theoretical analysis of the tool's properties, in relation with other instruments, particularly tradable permits;
- Evaluating the possible comparative advantage of CDM at a company level, in relation with other means of emissions reduction;
- Improving, on this basis, the way of apprehending the reduction potential eligible for CDM (macroeconomic analysis).

To this end, during this first year of research, we have concentrated our efforts on the constitution of a theoretical and coherent framework, making it possible to understand the CDM's logics, and this at the micro level as well as the macro one.

An analysis on the basis of the Turvey graphics (1960) which represents the marginal abatement cost curves of the emissions has been led in order to determine the interactions between CDM, domestic reduction and tradable permits acquisitions. The economic theory shows that when two countries are submitted to a quantitative constraint, but have the possibility to exchanging permits, they always have an interest in doing so. The seller as well as the buyer is gaining on the level of the global cost of respect of the constraint imposed to them (whether it is a company or a country).

The Gilles Grandjean note (CORE) « An economic analysis of the CDM » is summing up these analyses.

Confronting this mechanism with the possibility of reduction, through the CDM, in a third country not taking part in the emission trading shows that the proportion of the objective obtained through the CDM is endogenous for what relates to the price of permits, taking into account the respective marginal cost curves of the different geographical areas concerned.

Instead of setting an arbitrary rate of accessibility (generally 0.3), as it is made in the simulation models currently used (notably Markal), you can see here that this rate of accessibility is endogenous and varies in function of the price of the permit and the relative marginal costs between the countries of Appendix B and A.

This analysis shows also for what reasons the credits offered by the funds (for example the Prototype Carbon Fund of the World Bank) are, by definition, lower than the price of the permit on the international market, open exclusively to the countries of Appendix B. By breaking the market into segments, one maintains a relative advantage in favour of CDM, essentially through the funds, which explains why the prices offered today (in January 2003) are usually varying between 0 and 3

euros a CO₂-eq ton. The price of the permit expected within the European space in the framework of the trading guideline is currently ranging from 5 to 20 euros (when instituted in 2005). These results have been shown by Thierry Bréchet (CORE) and discussed during the second users' committee meeting, the 3d of December 2002.

A mathematical analysis has been made simultaneously (Marc Germain (CORE), « CDM and the investment theory »). Its object is to analyse the « godsend or windfall » effect and the determination of the selection of the baseline on the investment choice. The elaborated model is a microeconomic model of investment choice: it deals with a company, in partial balance and in comparative static. Under not very restrictive conditions, this model shows that the absolute baseline is more favourable to the environment, whereas the relative baseline is more favourable for development. This is relatively intuitive, but also remains true with or without free riding. The aim is now to complete this model in a generally balanced framework then, if it appears possible given the available data, use it to complete the structural model developed by Benoît Lussis (IDD) with microeconomic behaviours (see point 4.4).

4.6 Results of a mission to Senegal

During the mission realized early December, three categories of actors have brought a certain number of information about the CDM projects potential, i.e.: the private sector (SENELEC-Société Nationale d'Electricité et SAR-Société Africaine de Raffinage), the public sector (Ministry of Environment, Direction of Classified Institutions, focal point at the UNFCCC) as well as some sponsors (FEM-Funds for World Environment and the World Bank).

4.6.1 Examples of projects underway

Following the different interviews, the two following projects have been chosen as conclusive.

ENERBAT, CDM regional project

The Ministry of Environment provides the management of the ENERBAT project, financed by the UNDP/GEF for a 19 years period (2001-2002). This project aims at reducing GHG thanks to improvement of energetic efficiency of reduction and limitation of the electricity consumption in buildings. The main objective is the constitution of a national programme for reducing and limiting electricity consumptions in small and big buildings through national CDM projects.

Assessment of the project consists, among others, in the elaboration of:

- Relevant data on the performances of used technologies, recorded energy savings, costs of rehabilitation works and of the avoided CO₂ ton;
- Comparative data studies before and after rehabilitation and comparison with pre-established audits;
- Norms in relation with the Building, Housing authorities, and others (Ministry of the Environment, 2002).

As conclusions, the project shall proceed to the analysis of the following points: the electricity produced by fuels, average consumption of fuels per kWh, the methodology of calculation of GHG emissions per kWh produced, the emissions of GHG per kWh avoided, the potential GHG emissions avoided between 2001-2020, the calculation methodology of the emissions reduction unitary costs;

partial studies realized in industry in Senegal are showing unitary costs of reduction of the CO₂ ton ranging from 6 to 11\$.

CDM rehabilitation Project of the SENELEC plant of the Cap des Biches

This project aims in rehabilitating the three Cap des Biches plant, which account for 35% of the production capacity in the Dakar area, by improving the fuel burnt; estimation has been made and the results were 6.194 tons saved on an 18 years period. The reduction of the CO₂ emissions is estimated at 340 000 tons, i.e., 30 495 tons CO₂/fuel. These generators develop a 27.5 and 30MW power, and were set up in 1966, and the early 70's.

The reduction of CO₂ emissions can be operated through rehabilitating the boilers of the three generators; the estimated cost is 4 million US\$. Another possibility is offered by replacing heavy fuel and diesel by gas and renewable energy. One should know that, in 1993, an important gas field estimated at 5.000 Millions m³ was discovered in the Dakar area.

Among the expected results, one can find:

- Rehabilitating boilers, turbines and control/command systems, which will give rise to a reduction in the use of fuel, as well as GHG (the average fuel consumption of 310g/kWh in 2000 has been reduced to 280g/kWh);
- The increase of the plant expectancy by 10-15 years;
- The improvement of the plant profitability by 85% (SENELEC, 2001).

4.6.2 Conclusions

The mission realized early December 2002, showed that very few actions in terms of CDM projects have been undertaken, and that an increased awareness would be more than necessary, and could be reached through sustained information campaigns on the criteria of eligibility of the CDM projects, of the public as well as the private sector. This would enable to avoid considering as CDM projects which, in fact, could not be considered as such.

The companies' approach has been, on should say so, frustrating, because no statistic data on production, on the GHG emissions, e.g., has been disclosed. The only information with figures on which one can establish himself are the ones mentioned in the Communication Nationale du Sénégal realized for the UNFCCC.

The international sponsors' approach has introduced some summary information and principally in the area of climatic changes. So, the GEF have identified a series of areas for which a 50,000US\$ budgetary line per project has been released. Among the financing priorities, one can find the contribution to the climate change mitigation (wind and solar energy, biogas, energetic audits for building and strengthening capacities in order to use energy in a rational way), as well as projects struggling against soil degradation, desertification and deforestation. The GEF, as well as other sponsors, do not launch any appeal to project, but keep waiting for different CDM projects proposals, on the basis of a pre-established canvas.

The World Bank's strategy of assistance to Senegal 2003-2005 deals with the Productive Infrastructures and the Management of Natural Ressources. The steps identified by the Senegalese government and the World Bank in these areas are: diversification of energy sources and reduction of

the cost of electricity, development of the supply of « modern fuels » to the families, strengthening of rural electrification.

4.7 Interactions among the parties

One of the highly nevralgic dimensions of this research project is related with interconnecting the different parties (stakeholders) and the development of capacity building in implementing CDM project at the Belgian level as well as at the one of the chosen target area – sub-Saharan zone, and in particular Senegal.

To this aim, the project is giving particular importance to the communication with the users' committee and between the different partners of the network, these ones having been chosen for their strong complementarities in relation with the considered problems.

Within the network, this communication got organized around regular working seminars. Particularly, in order to train the young IDD and Aquadev researchers associated with the project, reading workshops have been held. In these gatherings, every participant was given the possibility to expose and discuss a scientific article of his choice. The complexity of the subject required such an important investment from these young researchers, all the more so that the matter to study appeared to be developing very quickly (conferences of Marrakech and New Delhi).

As regards the users' committee, particular attention was given to (i) communication, (ii) popularisation, and (iii) interaction. Two meetings have been held, in June and December 2002. Every time, the whole group of the users' committee attended (with the exception of the Senegalese members, of course), even if it was a particularly big and heterogeneous group. This shows that these members are looking for information and reflexion of scientific quality about CDM. During both meetings, a dialogue has been opened between researchers and the users' committee. This dialogue has been very positive for researchers and the users' committee, given the comments that followed these meetings.

4.8 Conclusions

The first task of the project research was to specify the institutional framework at the Belgian and at the international level. Such a follow-up was of the first importance because of the constant evolution of decisions and recommendations.

At international level, the Marrakech agreements have defined a general scheme for the CDM, and the CDM Executive Board progressively specifies the rules and modalities for implementing projects. Many methodological uncertainties remain, nevertheless, particularly for what relates to the elaboration of baselines.

One shall also note that debates on CDM at international level remain relatively technocratic and focused on the environmental integrity issue. This issue, however, tends mask the contribution to sustainable development of the host countries and the North-South technology transfer issues. So, the projects acceptability criteria defined by the UNFCCC are principally related to counting emission credits and environmental impacts. The contributions to sustainable development and technology transfer are little developed, and their assessment remains in the hands of the Parties.

In order to make the CDM equally a development tool, (and not only an efficient economical instrument for GHG emissions reduction), the main thought tracks that could be proposed at this stage of research concern the opportunity to developing a public-private-NGO's partnership, in order

to establish a link between development cooperation and private investments. In particular, part of the official funds to development could be used to create an environment favourable to the implementation of CDM projects and to the strengthening of local skills (Lussis (IDD), « Le transfert de technologie dans le MDP »). This could also imply that the parties be integrated in the conception of the projects, particularly by preliminary assessments at the validation stage provided for by the UNFCCC.

These thought tracks will be developed during the study on the contribution of the CDM to sustainable development in host countries.

In Belgium, one must acknowledge that the institutional actors have adopted a rather wait and see type approach as to flexibility mechanisms. Uncertainties burden sharing between the Regions, the amount of obligations of private actors, the priorities given to the different instruments (domestic reductions, emission trading, JI, CDM) and the administrative structures that will be put up, remain important for private actors. This is perhaps why, at least partly, the industrial sector has kept such a prudent attitude towards these mechanisms.

Next to the institutional framework analysis, our work has been to analyse the methods of implementation of the project as to the respect for environmental integrity (the baseline issue) and to the macro- and micro-economic consequences.

The construction of baselines is pointed as a stumbling block of the additionality of emissions reductions of the CDM projects. The methodological uncertainties remaining about this have been identified, and the different options for a proper accounting of emissions have been explored. Our works have led to the conception of a small modelling tool at the level of a project, which will make it possible to make the analysis of the different options as to the environment integrity and the profitability of the project.

A coherent theoretical framework integrating the interactions between the different tools (domestic measures, permits, CDM, JI) at the level of a company, as well as on the level of an economy, has been elaborated. These works, which will go on this year, have already enabled us to demonstrate that the proportion of the objective of emission reduction reached by the CDM will be function of the price of the emission permit on the international market and cannot, hence, be considered as an exogenous data.

5 Future prospects and future planning

Future prospects mainly concern the finalizations of the tools described above (handbook of procedures and baseline studying). This work will be followed by three major tasks: development of other tools necessary for the evaluation of CDM projects, evaluation of the potential for a reduction in greenhouse gases achievable by CDM in the sub-Saharan zone, identification and implementation of a fictive pilot project.

The other tools necessary for the different stages of the evaluation of a CDM project are:

- A technological database relating to the region under study (sub-Saharan region): this database will use the existing studies and databases on the subject (UNIDO, Enda TM, Riso, etc...) and take the criteria for eligibility set out by the Climate Convention into account.
- Fixed costs variables, variables costs, rates of greenhouse gas emissions per unit produced and technical conditions will be taken into consideration, as well as the dynamic dimension of the technologies (obsolescence, technical improvements, etc.). This database will be linked with the structural model of emission credits calculation.

The contribution of the CDM projects to the development will be considered. This means that additional criteria ought to be introduced inside the assessment process, such as population participation and the different stakeholders and the strengthening of institutional capacities (Lee, Georges, 2000). The impacts of CDM on the prospects for the future generations, the income distribution in the current generation (impact on poverty), the environmental systems (biodiversity, carrying capacity, resources...) and some target groups (women) will be considered.

The potential for a reduction in greenhouse gases achievable by CDM in the sub-Saharan zone will be evaluated on the basis of the technological database developed for this zone. This potential will be compared with the supply potential available in Belgium.

With the assistance of the Belgian and Senegalese Focal Points (members of the Users Committee), a pilot project will be selected. The choice will be made regarding to a comparison of potentials from the supply (technological supply from Belgium) and the demand (technological requirements identified in Senegal) perspective as well as the marginal relative costs of reduction. It will also be influenced by the priorities put forward by the authorities (the Focal Points in particular).

This project will be implemented, as an example, for the whole set of procedures: modalities of financing, feasibility study, emissions credit, evaluation of local or global development. Thus the tools developed in the project will all be involved in this exercise. An *ad hoc* group will be set up; it will gather not only the Users Committee members, but also other persons involved in the CDM project under consideration: local and other government services, manufacturers, NGOs...

A complete appraisal of the pilot study and an analysis of the potential for reducing the greenhouse gas emissions will be carried out, in cooperation with the Users Committee and the *ad hoc* group set up in order to monitor the pilot project.

A workshop will be organized in order to introduce the tools, developed in the framework of this research, intended to help the implementation of CDM projects.

6 Annexes

6.1 Reference

- IEPF (2002), "Guide pratique pour la formulation de projets dans le cadre du mécanisme pour un développement propre (MDP)", Institut de l'énergie et de l'environnement de la Francophonie, 81 p., mars.
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 - SENELEC (2001), « Projet de réhabilitation de la centrale Cap des Biches », Société Nationale d'Electricité du Sénégal.
 - UNFCCC (2001), "The Marrakech Accords & the Marrakech Declaration", United Nations Frame Convention on Climate Change, November.
 - UNFCCC (2002), « Draft report of the conference of the parties on its eighth session », United Nations Frame Convention on Climate Change, November.
 - VROM (2001), "Implementation of the clean development mechanism by the Netherlands", Ministry of Housing, Spatial Planning and the Environment of the Netherlands, 53 p., December.

6.2 Publications

All the following notes are available on the IDD web site <http://club.euronet.be/idd>.

- Lussis B. (2001) « Accords de Marrakech et mécanismes de flexibilité », Institut pour un Développement Durable, December.
- Lussis B. (2001) « Principe de fonctionnement des MDP définis à la CdP7 », Institut pour un Développement Durable, December.
- Lussis B. (2002) « Les niveaux de référence : méthodologies et cadre législatif », Institut pour un Développement Durable, March.
- Lussis B. (2002) « Le transfert de technologie dans le MDP », Institut pour un Développement Durable, Augustus.
- Lussis B. (2002) « La construction d'un niveau de référence », Institut pour un Développement Durable, November.

6.3 Detailed results

Table 1: Belgian operators, implicated in the area of climate changes and flexibility mechanisms

INSTITUTIONAL ACTORS/DECISION LEVEL	FEDERAL	FLEMISH REGION	WALLOON REGION	BRUSSELS REGION	CONCERTATION: Federal/regional Interregional
EXECUTIVE	<ul style="list-style-type: none"> - <u>Jef Tavernier</u>, Minister of Protection of Consumption, Public Health and Environment - <u>O. Deleuze</u>, Secretary of State in charge of Energy and Sustainable Development, deputy Minister of Mobility and Transports 	<ul style="list-style-type: none"> - <u>Vera Dierckx</u>, Minister of Environment And Agriculture 	<ul style="list-style-type: none"> - <u>M. Foret</u>, Minister of regional development, Urbanism and Environment 	<ul style="list-style-type: none"> - <u>D. Gosuin</u>, Minister of the Environment and the Policy of Water, Conservation of Nature, Public Cleanliness and Foreign Trade - <u>A. Hutchinson</u>, Secretary of State in charge of Housing and Energy 	<ul style="list-style-type: none"> - 16 CIE (federal/regional concertation)
LEGISLATIVE	-	- Commission for the Environment, Nature Preservation and Regional Development	-	-	-
ADMINISTRATIVE	<ul style="list-style-type: none"> - Federal Ministry of the Environment (focal point UNFCCC) - Federal Ministry of Economic Affairs, Directorate Energy - CREG shall manage the « Kyoto Fund » - Taskforce Sustainable Développement (SD) 	<ul style="list-style-type: none"> - ANRE - Aminal - Taskforce for climate policy 	Ministry of the Walloon Region – DGRNE	<ul style="list-style-type: none"> - Semi-regional Bodies of public interest: IBGE - IBGE as the Brussels energy administration - Brussels Energy Agency - IRGT 	<ul style="list-style-type: none"> - Interregional Concertation: CELINE I - Federal-regional Concertation: CELINE II
CONSULTATIVE	<ul style="list-style-type: none"> - CFDD - CIDD - AMPERE Commission 	<ul style="list-style-type: none"> - Working group ANRE and Aminal 	<ul style="list-style-type: none"> - CWEDD - CESRW - Working Group on permits tradable within the DGRNE 	<ul style="list-style-type: none"> - Environment Council of the Brussels-Capital city Region 	<ul style="list-style-type: none"> - In the CIE, interregional working groups under the CCPIE; among those working groups, one can find the Greenhouse Effect Coordination Group - ENOVER/CONCER concertation unit of the Federal Min. of Economic Affairs

Table 2: The main initiatives realized or under realization in the area or climatic changes and flexibility mechanisms

PASSED and UNDERWAY INITIATIVES/ DECISION LEVEL	FEDERAL	FLEMISH REGION	WALLOON REGION	BRUSSELS REGION	CONCERTATION
EXECUTIVE	<ul style="list-style-type: none"> - National Action Program, 1991 - National Climate Plan 2002-2012 - Plan for sustainable development, 2000 –2004 	<ul style="list-style-type: none"> - Annual Environment Programs - MiNa Plan, 2002-2006 (implementation of the CO₂ Plan, preparation of the CH₄ emissions reduction Plan, N₂O, HFCs and PCFs emissions control Plan) - Environment reports (MIRA) - Flemish Climate Plan - « CO₂-URE » Plan 	<ul style="list-style-type: none"> - «Air Plan (Action plan for the quality of air) - Plan for a sustainable control of energy - « Contract for the Future » - Environment plan for a sustainable development (PEDD) - Action plan for climate changes (2001) 	<ul style="list-style-type: none"> - Plan for struggling against air pollution, 2002-2010 - Regional Développement Plan 	<p>National action Program for limiting the CO₂ emissions, 1994</p>
LEGISLATIVE	-	<p>The decrees and orders relating to the organisation of the electricity market are imposing public services obligations, relative to URE and the promotion of renewable energies.</p>		-	-
ADMINISTRATIVE	<ul style="list-style-type: none"> - Federal report on sustainable development - Taskforce: evaluation reports on energy, transports, ozone, climate changes - “ Kyoto Fund» of 25 Mio €/year to finance climatic changes policy; it will be fed by a 0.03 €cents/kWh tax on energy transport (producers); earlier, said tax was managed by Intermunicipal authorities for RUE initiatives. Once the law concerning this fund is adopted by the Council of State, it shall be implemented early March (2.3 Mio € for 2003) 	<ul style="list-style-type: none"> - Signature of the benchmark agreements with the steel, chemical and paper industries; these agreements will lead to issuing environment permits. - Taskforce: evaluating the results of the « CO₂-RUE » Plan, preparing the Flemish Climate Plan, implementing the National Climate Plan, etc 	<ul style="list-style-type: none"> - Realisation of projects through the Clean Technologies Unit - Signature of voluntary agreements with the companies about the management of waste and the use of BAT technologies (Best Available Technologies) 	<ul style="list-style-type: none"> - IRIS Plan (« Transport ») - Issuing permits and environment certificates - 1993-'94, introduction of 20 natural gas buses 	<ul style="list-style-type: none"> - CELINE I: ecotaxes allocation, atmospheric emissions monitoring and data structuring - CELINE II: structuring of environmental data destined to the European Environment Agency
CONSULTATIVE	-		<p>Opinion of the CESRW on:</p> <ul style="list-style-type: none"> - the cooperation agreement for the realisation of the National Climate Plan, - the project of the plan for a sustainable control of energy - the action program for air quality 	<p>Publications on air, energy</p>	<p>CCPIE: production and spreading of working papers on transport, air, energy, the environment and the GHG.</p>

Acronyms and abbreviations for tables 1&2

AMINAL	Administratie Milieu, Natuur, Land en Waterbeheer (Administration for Environment, Nature and Water (Flanders))
AMPERE	Commission pour l'analyse des modes de production de l'électricité et le redéploiement des énergies (Commission for the Analysis of the Production Modes of Electricity and the Energy Development)
ANRE	Administratie Natuurlijke Rijdommen en Énergie (Administration of Natural resources and Energy)
CCPIE	Comité de Coordination de la Politique Internationale de l'Environnement (Coordination Board for the Interregional Environmental Policy)
CELINE	Cellule Interrégionale de l'environnement (Interregional Cell for the Environment)
CESRW	Conseil Economique et Social de la Région Wallonne (Economic and Social Council of the Walloon Region)
CFDD	Conseil Fédéral de Développement Durable (Federal Council for a Sustainable Development)
CIE	Conférences Interministérielles de l'Environnement (Interministerial Conferences on the Environment)
CREG	Commission de régulation de l'électricité et du gaz (Commission for the Regulation of Electricity and Gas)
CWEDD	Conseil Wallon de l'Environnement et du Développement Durable (Walloon Council for the Environment and the Sustainable Development)
DGRNE	Direction générale des ressources naturelles et de l' environnement (General Direction of the Natural Resources and the Environment (Walloon Region))
IBGE	Institut Bruxellois pour la Gestion de l'Environnement (Brussels Institute for the Environment Management)
IRGT	Institut royal pour la gestion durable des ressources naturelles et la promotion des technologies propres (Royal Institute for the Sustainable Management of the Natural Resources and the Promotion of Clean Technologies)
SD	Sustainable Development