THE EX ANTE CARBON-BALANCE TOOL

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ANALYTICAL TOOLS

EASYPol Module xxx

Main recommendations for the elaboration of the baseline scenario

Building the "without project" scenario within the EX-ACT tool

EASYPol

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Building the "without project" scenario within the EX-ACT tool

by

Martial Bernoux, FAO consultant, IRD, UMR Eco&Sols, Montpellier, France

Louis Bockel, Senior Agricultural Policy Support Officer, Policy Programme Development Support Division, FAO, Rome, Italy

Marianne Tinlot, **Ophélie Touchemoulin, Madeleine Jönsson,** FAO consultant, FAO, Rome, Italy

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ABBREVIATIONS

AFOLU:	Agriculture, Forest and Land Use
BAU:	Business As Usual
C:	Carbon
CDM:	Clean Development Mechanism
EB:	Executive Board
EX-ACT:	Ex-Ante Carbon balance Tool
GHG:	Green House Gas
IPCC:	Intergovernmental Panel on Climate Change
JI:	Joint Implementation
LULUCF:	Land Use, Land Use Change, Forestry
MoA, MoE, MoF:	Ministry of Agriculture / Environment / Forestry
NAMA:	Nationally Appropriate Mitigation Actions
NAPA:	National Adaptation Program of Actions to Climate Change
SLM:	Sustainable Land Management
SRES:	Special Report on Emission Scenarios
UNFCCC:	United Nations Framework Convention on Climate Change
VCS:	Voluntary Carbon Standard
VCU:	Voluntary Carbon Unit

1 Summary

EX-ACT, an excel-based tool developed by FAO, enables to estimate the GHG emissions of a situation "without project" and a situation "with project". The difference between the two situations' emissions gives the carbon balance of the project, i.e. the amount of GHG, expressed in CO2e that the project is able to avoid or stock. The construction of the "without project" scenario, also called baseline scenario, is as important as the construction of the "with project" scenario. Indeed, an over or under estimation of the emissions in a business as usual situation may lead to a false estimation of the actual mitigation potential of the project. Project boundaries, time frame, level of emissions, leakage, transparency and conservatism are important aspects of the baseline. Three main types of baseline scenarios can be built: a no change scenario or a scenario using either past trends or future trends to estimate the future situation. The choice between those, or combining the three, depends on the scale of the project and the indicators of future estimations. It is therefore recommended to conduct a sensitivity analysis by using different baseline scenarios.

2 Introduction

Objectives and target audience

The objective of this paper is to provide good practice guidance for the construction of the "without scenario", i.e. the baseline scenario or Business As Usual (BAU) scenario, in the EX-ACT tool.

The purpose is not to set a fixed method that will not allow considering the specificities of different contexts or countries. On the contrary, it is a general guideline provided to narrow down subjectivities and provide a common understanding of important aspects to be taken into account while establishing the baseline scenario within EX-ACT.

Required background

No specific technical background is required to use the information provided below. However it could be useful to have some background in agriculture mitigation and GHG inventory.

Readers can follow links included in the text to other EASYPol modules or references[1]. See also the list of EASYPol links included at the end of this module.

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[1] EASYPol hyperlinks are shown in blue, as follows:

a) training paths are shown in **underlined bold font**
b) other EASYPol modules or complementary EASYPol materials are in ***bold underlined italics***;
c) links to the glossary are in **bold**; and
d) external links are in *italics*.

3 THE NECESSITY TO CLARIFY THE ELABORATION OF THE BASELINE SCENARIO IN CARBON BALANCE APPRAISAL WITH THE EX-ACT TOOL

3.1 Background

3.1.1 Baseline methodologies

The construction of a baseline scenario is often required in analyses and prospective studies that aim at comparing different possible future situations. Many criteria have to be taken into account to build such scenarios, from socio-economical to environmental aspects. Each assessment builds its own baseline scenario, not really based on a strict common methodology but rather on similar key components to respect.

Nonetheless, within the framework of carbon markets, methodologies to calculate the amount of carbon credits that a specific project will be able to sell are developed and become mandatory. The UNFCCC, as part of Clean Development Mechanism (CDM) and Joint Implementation (JI), sets up baseline methodologies and monitoring methodologies, for different types of projects (biomass plants, afforestation/reforestation, hydroelectric power plants, biofuels, carbon capture and storage...). The CDM Executive Board (EB) is in charge of this activity. To facilitate project development, the EB has set out a process through which methodologies developed under one project can be used for other, similar activities. Thus, baseline methodologies should be developed generically; project specific elements should be excluded. Project developers have two options in selecting a methodology: either using an approved methodology or a new one. If they propose a new methodology, it will first need to be approved by the EB before the project can be validated and registered as a CDM project.

The Voluntary Carbon Standards (VCS) has released a *Guidance for Agriculture, Forestry and Other Land Use Projects* to enable AFOLU projects from around the world to generate Voluntary Carbon Units (VCUs) that are credible, robust, permanent and fungible. The methodology, which includes a part on how to build the baseline, concerns Afforestation, Reforestation and Revegetation (ARR), Agricultural Land Management (ALM), Improved Forest Management (IFM) and Reduced Emissions from Deforestation and Degradation (REDD). The VCS method is freely adapted from the UNFCCC "*Tool for the Demonstration and Assessment of Additionality in A/R CDM Project Activities*".

The majority of the concepts developed in this paper come from the UNFCCC methodology on baseline scenarios.

3.1.2 The EX-ACT tool

EX-ACT is a tool developed by the FAO and aimed at providing ex-ante estimates of the impact of agriculture and forestry development projects on GHG emissions and C sequestration, indicating its effects on the C-balance[2], which is selected as an indicator of the mitigation potential of the project (EX-ACT 2010). It is capable of covering a range of projects relevant for the land use, land use change and forestry (LULUCF) sector. It can compute the C-balance by comparing two scenarios: "without project" (i.e. the "Business As Usual" or "Baseline") and "with project". The main output of the tool consists of a C-balance resulting from the difference between these two alternative scenarios.

[2] C-balance = GHG emissions - C sequestered above and below ground.

The model takes into account both the implementation phase of the project (i.e. the active phase of the project commonly corresponding to the investment phase), and the so called "capitalization phase" (i.e. a period where project benefits are still occurring as a consequence of the activities performed during the implementation phase). EX-ACT was designed to work at a project level but it can easily be up-scaled at program/sector or national level (Bernoux et al. 2010).

3.2 The importance of the baseline scenario to estimate the additionality of a project

A project or a policy has to demonstrate that it reduces emissions compared to a baseline. This is commonly referred to as additionality. The basic steps to developing a baseline and demonstrating the additionality are:

- Establishing a variety of potential scenario options
- Characterizing one of these options as the most likely (i.e. the baseline)
- Proving that the project itself is not the most likely scenario (i.e. demonstrating additionality)

The baseline provides the basis for determining whether GHG emissions from a project are lower or greater than the emissions in the absence of that project; that is, whether the project reductions are additional. The baseline scenario is the bases for testing the additionality of the project; its construction is therefore important regarding the conclusion on the additionality criterion.

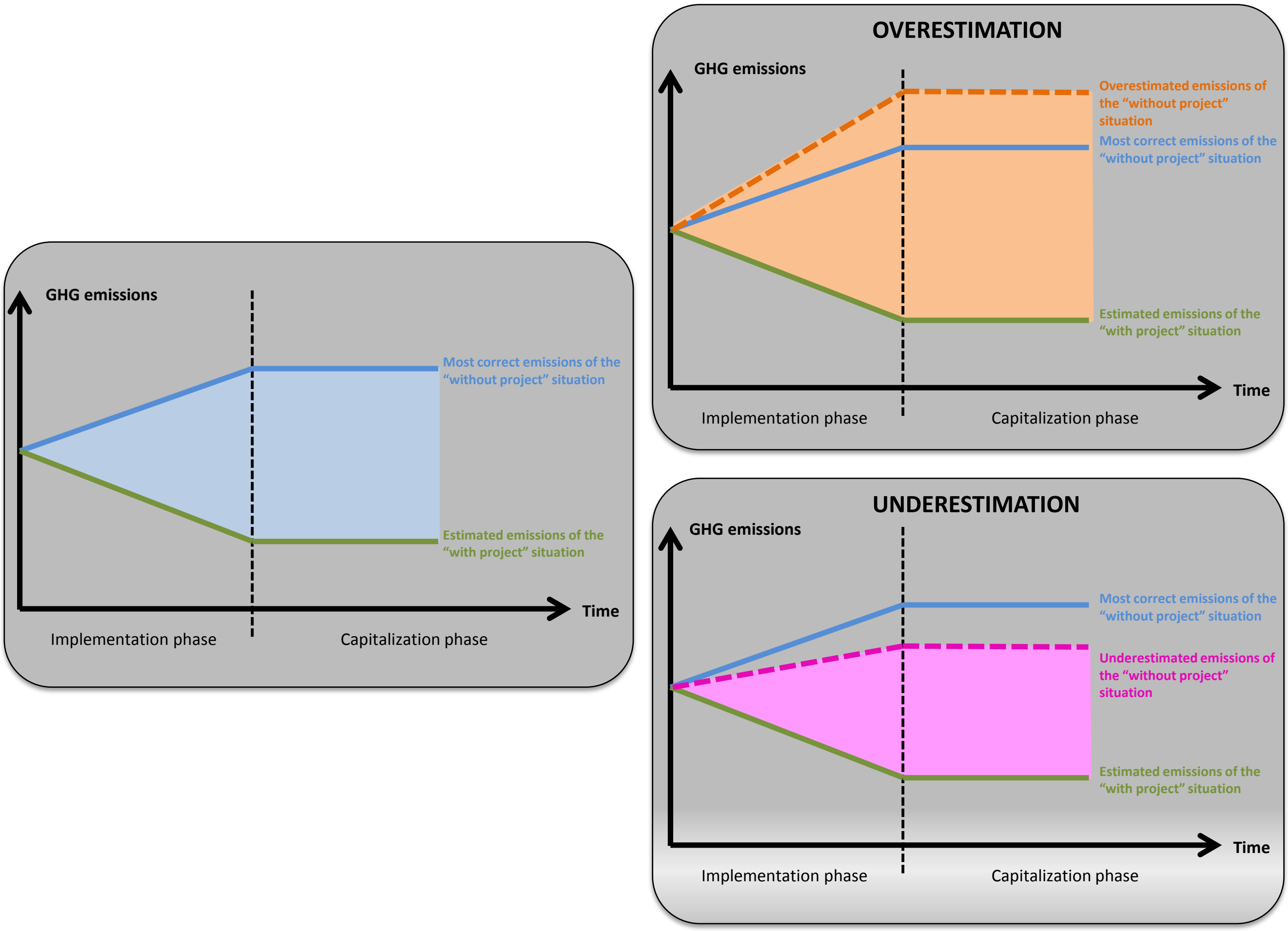
The EX-ACT tool gives the carbon balance of a project or policy, i.e. the GHG emissions of a situation without the project minus the emissions of a situation where the project is implemented.

Within this perspective the final result may highly fluctuate depending on the assumptions taken to build the different scenarios, especially the baseline. For the sake of simplicity, the "with project" scenario is built based on the objectives targeted by the adoption of the project in terms of land use, land use changes, and management practices.

An overestimation of the emissions of the "without project" situation might erroneously illustrate that the project has a great mitigation potential. On the contrary, if the emissions of the baseline scenario are underestimated, the carbon balance of the project could be minimized. (*see figure 1*).

It is thus crucial to build a credible baseline scenario in order to avoid a false idea of the real mitigation impact of a project.

Figure 1: the importance of the baseline scenario in order to avoid an over or underestimation of the carbon balance of a project



The Marrakech Accord defines the baseline as "*the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity*".

The baseline scenario should be the most plausible baseline scenario including the most credible options of land use, possible land use changes and main management practices that could have occurred on the land within the project boundary, without the implementation of the project. (UNFCCC)

Currently, there is no consensual precise methodology to build the baseline. The future GHG emissions are indeed driven by numerous factors such as future economic development, population growth, international prices, technological development, and so on, thus leading any projection to have more or less uncertainty. In any case, some criteria's have to be respected to elaborate the BAU scenario.

3.3 Key concepts of the baseline scenario

3.3.1 Level of emissions

The baseline is the level or quantity of emissions in the baseline scenario as a projection of activities in future that are likely to occur in the absence of the proposed project. EX-ACT is calculating the baseline with the assumptions provided by the user about the baseline scenario. Thus the baseline and the baseline scenario are hypothetical in nature and depend on a number of factors, e.g. availability of various resources to implement the activity, environmental and other policies relevant to the project activity. Therefore, there is a possibility of establishing multiple baselines for a given proposed project due to the subjectivity involved in interpreting the trends of various factors that influence decisions in the choice of alternatives to the proposed project.[3]

3.3.2 Project's boundaries and leakage

The baseline scenario is built according to the activities that may intervene in the project boundaries for which the carbon balance appraisal is conducted. Within the EX-ACT tool, the project boundaries include the surface areas concerned by changes in land use or management practices. The boundaries should also include all the other components that will be impacted by the project: inputs (fertilizers, pesticides, infrastructures, energy consumption) and livestock, as presented in figure 3. Furthermore, a baseline scenario shall cover all the activities that may impact all the sources of GHG, including methane, carbon dioxide, nitrous oxide emissions, within the project boundaries.

By construction, EX-ACT do not allow to have different total area in the "with project" and in the "without project". The user can easily verify in the Matrix (*figure 2*) spreadsheet the repartition of the land-use and the changes in both situations.

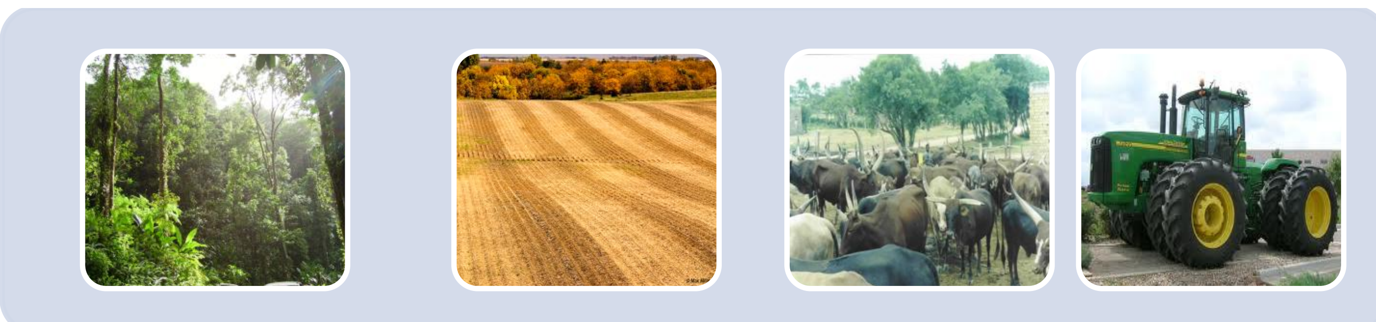
[3] UNEP, November 2005, *Baseline Methodologies For Clean Development Mechanism Projects - A Guidebook, p.15*

Figure 2: Example of complex matrices: Santa Catarina Rural Development Project in Brazil

Mineral soils *Without Project*		FINAL: Forest/ Plantation	Cropland: Annual	Cropland: Perennial	Cropland: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
INITIAL	Forest/Plantation	76316	0	0	0	1810	0	0	78126
Cropland	Annual	0	285529	0	0	0	0	0	285529
	Perennial	0	0	41629	0	0	210	0	41839
	Rice	0	0	0	51422	0	0	0	51422
Grassland		0	0	0	0	193955	0	0	193955
Other Lar	Degraded	0	0	0	0	0	10130	0	10130
	Other	0	0	0	0	0	0	0	0
	Total Final	76316	285529	41629	51422	195765	10340	0	661001
							Organic soils		0

Mineral soils *With Project*		FINAL: Forest/ Plantation	Cropland: Annual	Cropland: Perennial	Cropland: Rice	Grassland	Other Land: Degraded	Other Land: Other	Total Initial
INITIAL	Forest/Plantation	77193	0	0	0	933	0	0	78126
Cropland	Annual	1250	281246	3033	0	0	0	0	285529
	Perennial	0	8718	33121	0	0	0	0	41839
	Rice	0	0	0	51422	0	0	0	51422
Grassland		625	0	55178	0	138152	0	0	193955
Other Lar	Degraded	625	0	9505	0	0	0	0	10130
	Other	0	0	0	0	0	0	0	0
	Total Final	79693	289964	100837	51422	139085	0	0	661001

Figure 3: Example of activities that need to be included in the project's boundaries



- Increased/decreased Deforestation
- Afforestation/Reforestation
- Increased/decreased Forest degradation

- Land use changes
- Expansion/Intensification of cropland
- Plantation of perennials
- Degradation/improvements of grasslands
- Improvements in cropland /paddy management
- Level of inputs used
- Exploitation of organic soils/marshlands

- Increase/reduction of livestock
- Improvements in livestock management

- Energy consumption or production (electricity, fuel)
- Construction of infrastructures
- Installation of irrigation systems
-Liming and other inputs (fertilizers, pesticides,...)

Some emissions can occur outside the project's boundaries, but are still attributable to the project's activities. This is known as leakage. Reductions in GHG emissions by sources within the project boundaries, measured from the baseline emissions, should be adjusted for leakage. For example, a project in region A aims at stopping the deforestation in that region by promoting alternative solutions to wood fuel and through crops intensification. However, it indirectly results in moving deforestation in another region B. Region B is outside the project's boundaries, but the deforestation in this region is attributable to the project and so must be taken into account in the "with" and "without" project" scenarios. If the leakage is significant and measurable, methods to estimate it have indeed to be adopted.[4]

3.3.3 Time frame

Final minus the initial state

Building a scenario consists in defining what would happen from an initial starting point to a final point, occurring in the future. The user will have to assess the changes in AFOLU activities, land uses and changes that may arise during this period without the project implementation.

Common initial start

Within EX-ACT, the initial situation is the same for the two scenarios, without and with project. Most of the time, it matches the first year of the project's implementation.

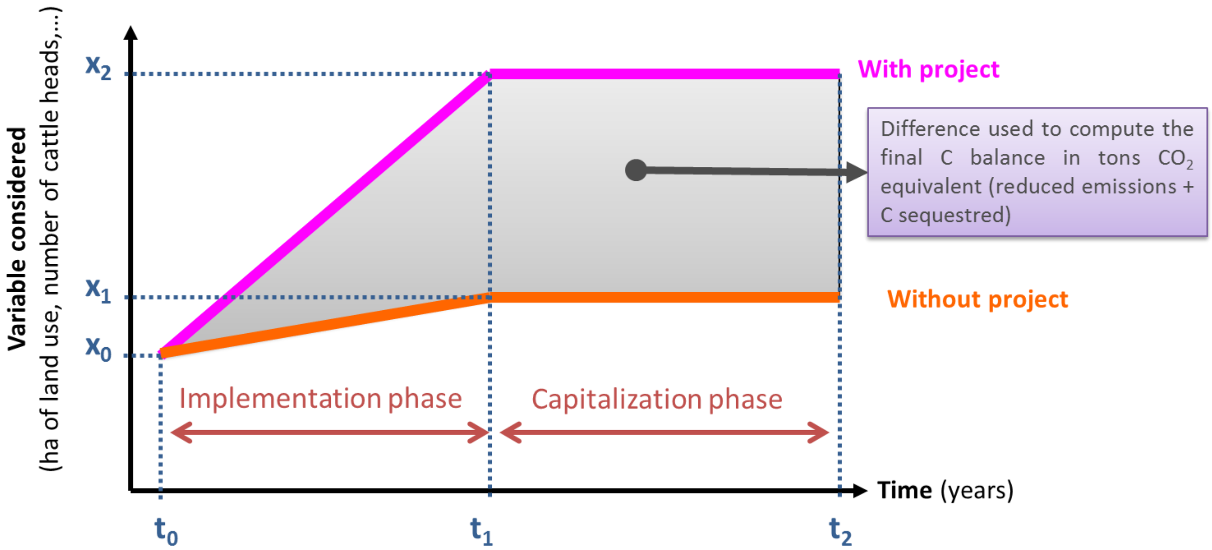
Define the relevant analytic timeframe

The user can set two different time periods for the project, one referred to as the implementation phase and the other as the capitalization phase. The implementation phase is considered as the active phase of the project commonly corresponding to the investment phase. The capitalization phase is a period where project benefits are still occurring as a consequence of the activities performed during the implementation phase.

The user will therefore set information about the duration of the implementation (t1 – t0) and capitalization (t2 – t1) phase, the levels of the variables taken into account (e.g. hectares converted, number of cattle, amount of inputs) at the current stage (x0) and at the end of the implementation phase both for the baseline (x1) or with the project (x2) (*see figure 4*).

[4] UNEP, November 2005, Baseline Methodologies For Clean Development Mechanism Projects - A Guidebook, p.23

Figure 4: Timeframe for the baseline scenario in EX-ACT



3.3.4 Transparency and conservatism

The UNFCCC guidelines to establish the baseline scenario provide two key criteria's to properly build the baseline: transparency and a conservative estimation of the baseline. The choice of approach, assumptions, methodology, parameters, data sources and key factors for developing a baseline should be transparent and should result in a conservative estimate of baseline emissions taking account of uncertainties. Each and every possible uncertainty embedded in the baseline scenario needs to be highlighted.

It is important for the baseline to be conservative, i.e. that the baseline emissions estimated should be on the lower rather than the higher side. The precaution will prevent the carbon balance appraisal to show a massive but unrealistic mitigation potential for a project, compared to the situation without the project. The conservative aspect is linked to the choice of assumptions and key parameters as well with uncertainties in the baseline scenario, i.e. assessment of possible future measures whose outcomes might be unknown at present.

4 BUILDING DIFFERENT TYPES OF SCENARIOS TO REFLECT THE UNCERTAINTY OF THE BASELINE

4.1 Three main types of scenarios

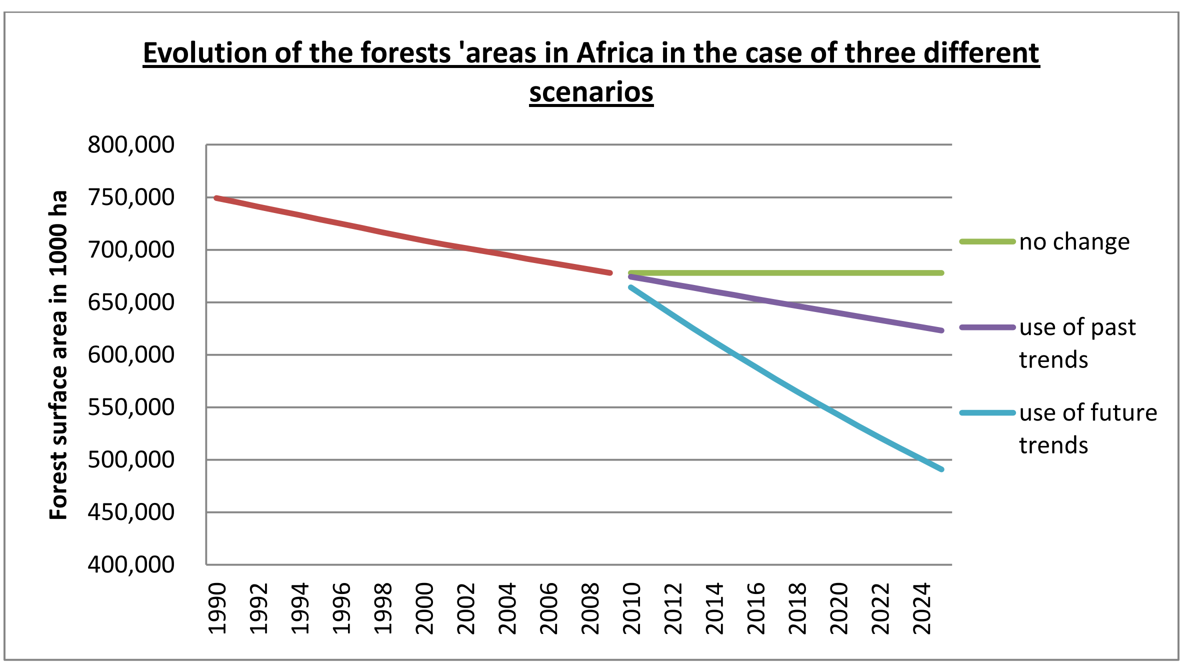
Three different scenarios could be built:

- **No change scenario**: there is no change in the land use or the practices, with respect to the current situation. It represents the most simplistic scenario to build since no additional information is required. However, it does not always reflect the future reality, especially in countries or regions that are very dynamic and have undergone a profound agricultural transformation in recent years, through programs and development policies.

- **Use of past trends**: to get information on the future situation without project, this scenario supposes that the changes in land use and practices will evolve in the same way as it has done in the past. The scenario is therefore forecasted using past trends. Two options are possible here: either using long term or short term past trends. In the first case, we analyze how a specific situation has evolved during the past century or 50 years. In the second case, we use more recent trends, of the past 10-30 years. It is especially recent past trends that are used to build the baseline, for two main reasons. First, in some countries and for some kind of data, the implementation of a monitoring system is quite recent; there is therefore no long term data available. Secondly, the recent changes of the past 10-30 years are often more representative of the current evolution. For example, land use changes in developed countries have been quite important in the previous 19 and 20 centuries, whereas now, the situation is quite stable, with few land use changes. The contrary is happening in developing countries. So it is more relevant to use recent past trends than long term past trends in this case.
- **Use of future trends**: it estimates the future land uses and practices from models based on country planning data. The scenario is the one that requires the most assumptions on how the situation may eventually evolve; however if the models used to build such scenario are robust and fairly reliable, it might logically reflect the future reality.

The graph below demonstrates an example of the different type of scenarios that can be used. In the no change scenario, the assumption is that deforestation ends and the forest area therefore remain unchanged from 2010, which represents the date of implementation of the project. In the past trend scenario, the annual deforestation rate of 0.5% of the past 20 years is used to calculate the future forest areas. In the future trends scenario, it is assumed that the increasing demand for wood and agricultural land will increase the deforestation rate to 2% per year.

Figure 5: Example of results for the three types of baseline scenario (*source FAO Stat*)



The choice between these three type of scenarios will depend on the data availability (especially if future trends are needed), the relevance and the reliability of the data, the type of indicators that requires estimation (*see table* 1) and the scale of the project, as explained in the next paragraph.

For example, the UNFCCC methodologies for afforestation-reforestation CDM projects states that "*Plausible and credible land use alternatives are developed by taking into account current and historic land use/cover changes; national, local and sectoral policies and regulations; and private activities that influence use of land in reserves and protected areas. The level of enforcement of policies and regulations, together with consideration of common practice in the region in which the project is located, are also considered [...]. For identifying the realistic and credible land-use scenarios; land use records, field surveys, data and feedback from stakeholders, and information from other appropriate sources, including Participatory rural appraisal (PRA) may be used as appropriate.* "[5]

Expert consultations should be carried to ensure the most likely use of the quoted different approaches.

A combination of the three approaches is possible: indeed, past trends may be more appropriate for some kind of data, whereas the no change scenario will best suit other types of data, as indicated in the table 1 below.

Table 1: Type of scenario to prefer depending on the type of data to estimate for the future "without project" situation

Type of data	No change	Past trends	Future trend
Land uses	Only if country asks for it	First choice	Preferred if available
Technology adoption: irrigation and fertilizers	No	First choice (e.g. use FaoStat)	No
Technology adoption: SLM & improved varieties	First choice	Preferred if available	No

4.2 Choice of baselines depending on the scale of the project or program

4.2.1 Most plausible small-scale baseline

The no change scenario is often applied on small-scale appraisal for which the project aims at changing a current "static" situation. It is the simplest way of building the baseline scenario, as the current situation is a well-known entry point.

[5] UNFCCC/CCNUCC, October 2007, *Approved afforestation and reforestation baseline and monitoring methodology AR-AM0010 - "Afforestation and reforestation project activities implemented on unmanaged grassland in reserve/protected areas"* http://cdm.unfccc.int/EB/035/eb35_repan15.pdf

Most straightforward baseline scenario is to use the current conditions for the following reasons:

- Present conditions are known
- It is easier to communicate about today's conditions than hypothetical future
- This is a starting point

The current conditions will change with the project. The baseline is thus relatively neutral, not setting more optimistic improvements in the future without project, nor pessimistic further degradation without project. Using a no-change baseline scenario for small-scale project is the easiest and quickest approach, requiring little data and work. However it gives quite a shortcut view of the situation "without project"; this is why when time and resources are available, it is preferable to use past trends or future trends to build the baseline scenario.

4.2.2 Most plausible large-scale baseline

The past trend and future trend approaches will be used according to the availability of data linked to future trends. The use of predictive models should be preferred when available. By default, if no projections have been conducted, the easiest would be to forecast the future by using the past trends.

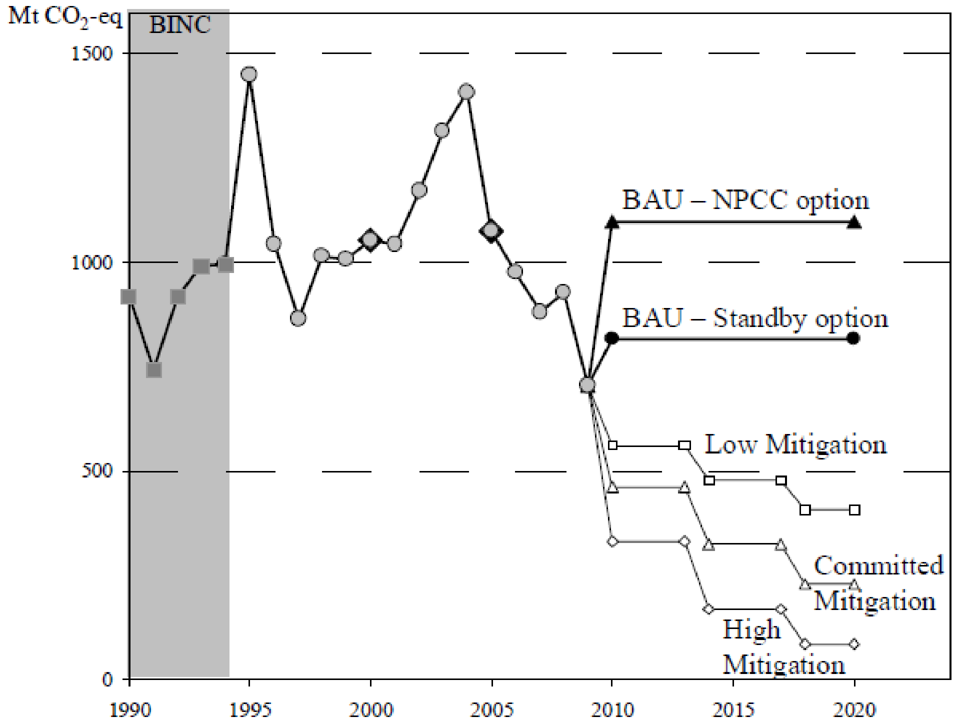
To do so, national inventories are required. Whenever a prospective study has already been conducted in the country of the project, it is recommended to use these results; it will save you time while giving a credible idea of future trends. If no such study is available, own scenarios can be developed by specifying which assumptions have been taken; otherwise, data from other countries with similar characteristics could be used.

Storylines should in most cases be consistent with national and regional scale trends, unless there is a clear indication that the exposure unit will develop in a manner that runs counter to such trends. Project teams will then need to make projections about how indicators could vary in the future under the alternative storylines. Qualitative assessment is important and expert judgment and stakeholder inputs are especially relevant here.

To illustrate the complexity of proposing an acceptable baseline, here is an example of the forecasted emissions from deforestation of the Amazon Basin according to different scenarios:

- the next trends proposed by the Brazilian government:
  - committed mitigation, based on the trend registered in the two last years
  - two scenarios considering that the Brazilian commitment will be more or less applied (low mitigation – high mitigation)
- two other BAU considering different past trends
  - BAU-NPCC corresponds to a proposed BAU in the Brazilian document (evidently a case of overestimation thus the government retains the mean deforestation of the years 1996-2005 that presented the highest deforestation rates)
  - The BAU-standby option considers the 2008-2099 emissions (using the average deforestation rate of the last two year-period available when the paper was written: circa 10000 km2)

Figure 6: Emissions associated with different scenarios of deforestation in the Brazilian Amazon forest (Cerri et al., 2010)[6]



The emissions associated with Land-Use Change are calculated according to available information and are forecasted under different options with or without mitigation scenarios (Grey squares refer to data published in the BINC (Brazil's Initial National Communication), grey circles refer to recalculated emissions based on available deforestation rates or assumptions, and diamonds refer to values calculated by Cerri et al. (2009). BAU: Business as Usual; NPCC: National Plan on Climate Change; Standby: assuming that annual deforestation rates will be on average 10,000 km2.)

4.3 More complex baseline scenarios for the carbon balance appraisal of policies

EX-ACT is able to calculate the carbon balance of programs and policies. Building the baseline scenario in such cases can be more complex than for a simple project. To provide more consistent projections of GHG emissions, it is necessary to consider the complex social, economic and technological relationships that underlie agriculture and resulting emissions. A more studied reflection on politics is required, using growth models.

National growth goals for agriculture through increased yields and arable surfaces, support to one type of crops, subsidies to buy inputs, conservation activities within a policy...have to be taken into account to elaborate the baseline of policies. Such data researches and analysis can require a huge load of work.

[6] Cerri C and al, 2010, Greenhouse gas mitigation options in Brazil for land-use change, livestock and agriculture, *Sci. Agric. (Piracicaba, Braz.), v.67, n.1, p.102-116, January/February 2010*

Reference baseline scenarios in Agriculture and Forestry policy carbon balance appraisal have to be built with the impact of currently implemented growth strategies and investment programmes so that it is possible to measure the incremental impact of low carbon policy options.

Therefore building baseline scenario requires using a prospective projection model that simulates the evolution of land use, forest areas, deforestation trend, agriculture cropped areas and inputs' use.

Two examples of baseline construction for the measurement of policies' carbon balance with EX-ACT are presented here, to illustrate the complexity of the approach that is however necessary to build a reliable "without policy" scenario.

4.3.1 Nigeria Policy reference scenario built on Nigeria Vision 2020

The Federal Government of Nigeria has launched a long term development program aimed at growing and developing Nigeria, integrating the country into the world's 20 leading economies by 2020. The strategy is known as the Nigeria Vision 2020 (NV 2020).

Agriculture has been identified as a major driver of growth in the Nigerian economy and has an essential role in achieving Vision 2020. The agriculture sector shall be a technologically driven sector that is profitable, sustainable and that meets the socio-economic aspirations of the Nigerians. The goal is to achieve a 3-fold increase in domestic agricultural productivity by 2015 and 6-fold increase by 2020.

For the Baseline, two reference scenarios have been assessed: the first one, called the optimistic NV 2020, has an implementation phase of 10 years (2010-2020) and a capitalization phase of 15 years (2020-2035), during which the effects of the Nigerian strategy should still occur. A second scenario, more realistic, called the pessimistic NV 2020, was built to reflect the possibility of reaching the NV 2020 objectives in 2025 and not in 2020.

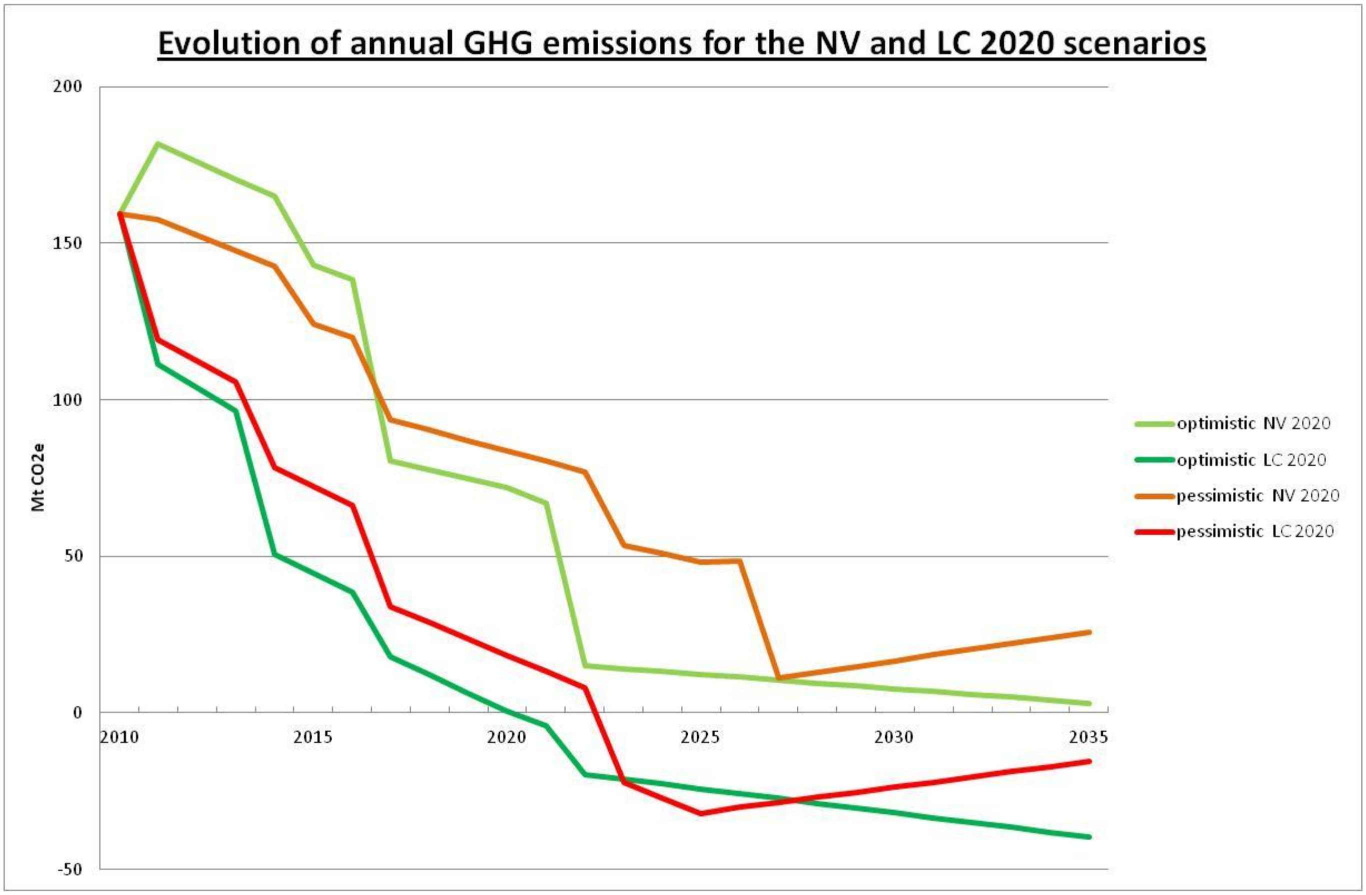
Both scenarios illustrate that the NV 2020 policy will be a net source of GHG. The pessimistic scenario, with an increased implementation phase, provides worse results since the achievement of the Nigerian Vision takes longer. The previous results have shown that the carbon balance of the NV 2020 is a net source of GHGs. Thus, it is be worth analyzing the advantages of using Sustainable Land Management (SLM) practices within the Nigerian policy, in order for mitigation to become a co-benefit. The proposed Low Carbon scenario (LC 2020) integrates a few possible mitigation options adapted to the Nigerian context. Due to the integration of mitigation actions, the LC2020 scenario leads to a sink ranging between 729 and 1017 T CO2-e in 25 years, depending on the implementation length (optimistic and pessimistic scenario).

The difference between the two scenarios underlines the total potential of mitigation that could be reasonably reached. It reflects the necessity of not over evaluating the NV 2020 emissions and LC 2020 sinks in order to avoid an over estimation of the total mitigation potential. Both optimistic and pessimistic scenarios describes a total potential of 1,4 billion T CO2e.

In brief, the Baseline scenario development required a heavy consultation work with parties (Ministry of Environment, Ministry of Agriculture) to clearly state how the country could reach targeted objectives. Agriculture land expansion, spin-off deforestation, yield growth, incremental inputs consumed and possible environmental actions within the current strategy were also discussed.

For practical purposes in EX-ACT, the two baseline scenarios have been entered using the "with project situation" facilities of the software. The results were extracted as levels of emissions.

Figure 7: the Nigeria Vision 2020 scenarios



4.3.2 Congo Brazzaville National Forestry REDD scenarios options towards 2025

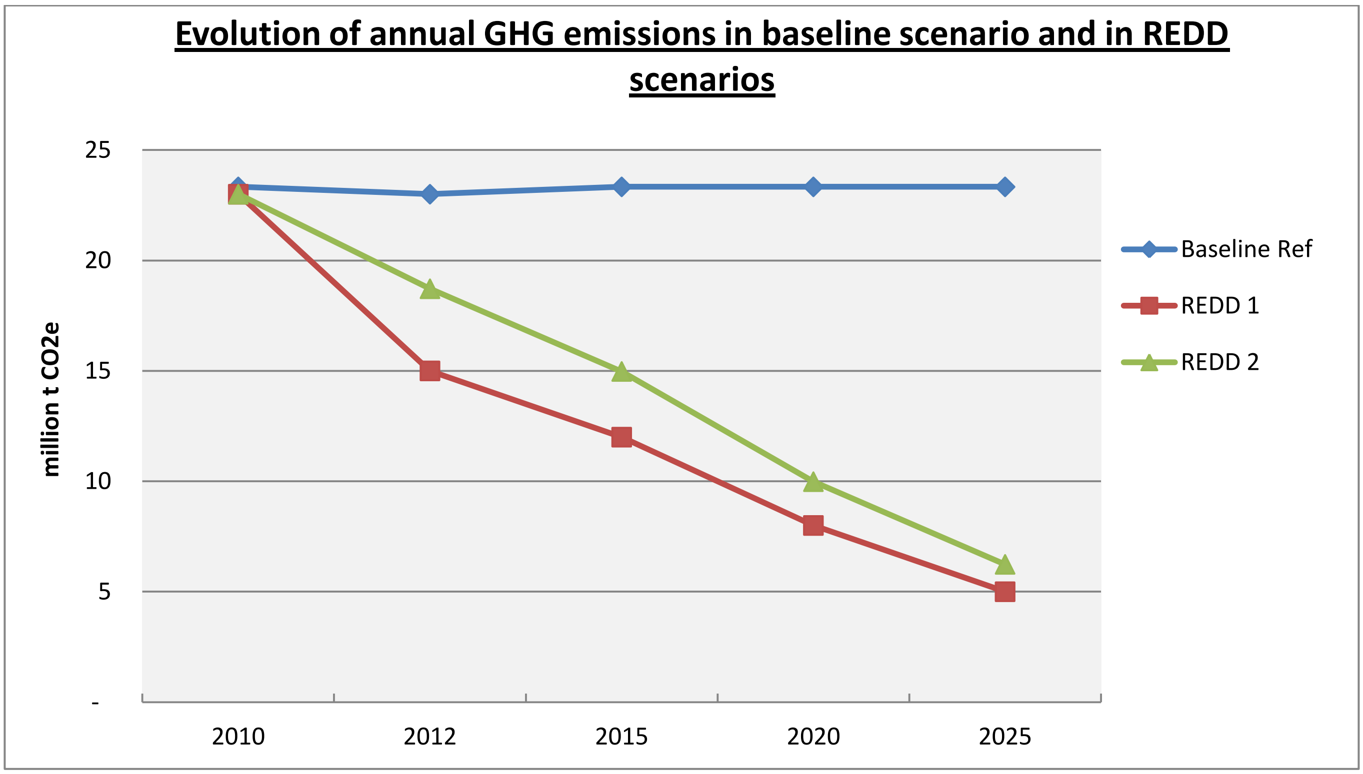
The REDD Readiness Preparation Proposal (R-PP) is a document prepared by a country to participate into the REDD international mechanism. The World Bank, in consultation with the Democratic Republic of Congo, organized a workshop on ex-ante carbon balance methods, to support the preparation of a baseline reference scenario and a REDD scenario.

The preparation of the baseline was managed as a consensus-building based approach with ministry planning experts. Decisions were made on the indicators to use (annual deforestation rate and annual forest degradation rate) and on the main public-private investments and decisions that have a high impact on land use change, such as new road infrastructures, new private agro-business investments, growth of agriculture areas, new protected areas.

To build the baseline scenario, past trends were used. The 2008 report on the state of Central Africa forests estimates that the net annual deforestation rate is 0.03%, corresponding to a gross rate of 0.08%, and the degradation rate is 0,01% per year. The 0.08% gross deforestation rate is similar to the estimation of the Forestry Resources Analysis (FRA, 2005). Country planning framework was used to deduce the impacts of future public and private investments and infrastructure equipments. Current reforestation investments have been integrated in the baseline. The Congo Brazzaville has indeed been supporting reforestation for a long time, even before REDD schemes. Since 1950, based on CNIAFF (2010), 84 420 ha have been reforested; it is equivalent to 1404 ha per year on the last 60 years.

This baseline scenario may be questioned regarding the gross rate of deforestation which should integrate both past and future efforts of reforestation as well as past and future infrastructures investments. However expert discussions drove to consider the incremental option in line with recent rapid growth in infrastructure building (Chinese investments) and land grabbing (wide scale plantations).

Figure 8: Congo Brazzaville National Forestry REDD scenarios options towards 2025



4.3.3 Other Approaches: Special Report on Emission Scenarios (SRES) from IPCC

Users can follow the SRES approach, developed by IPCC. The Special Report on Emission Scenarios (SRES) approach combines four poles, along two major axes:

- Economic versus environmental
- Global versus regional

The combination of these four poles gives four scenarios, detailed in figure 10:

- A1: economic growth and liberal globalization
- A2: economic growth with greater regional focus
- B1: environmentally sensitive with strong global relationships
- B2: environmentally sensitive with highly regional focus

A colourful representation is given below.

Figure 9: Conceptual relationships underlying the SRES scenarios (Nakicenovic and Swart, 2000)

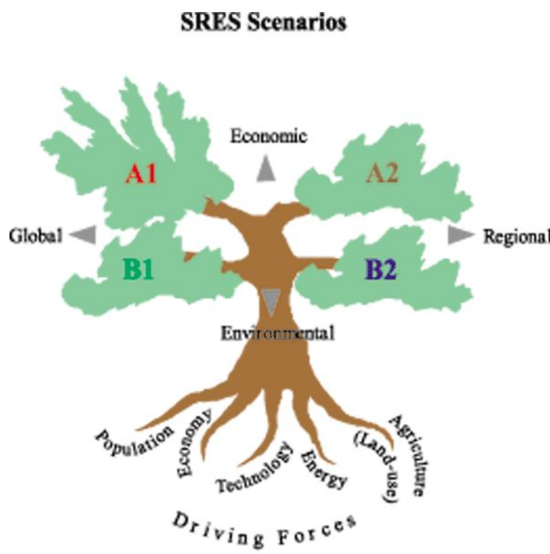


Figure 10: the four standards SRES scenarios[7]

The four standard SRES scenarios

A1 – Economic growth and liberal globalization

- Utilitarian values, affluence oriented
- Rapid economic growth (3% globally)
- Low population growth, long life, small families
- Rapid introduction and adoption of efficient technologies
- Intermediate GHG emissions
- Personal wealth emphasized over environmental quality
- Reduced differences in regional incomes
- Cultural differences throughout the world converge

A2 – Economic growth with greater regional focus

- Local, community, and family centred values
- Greater regional emphasis both culturally and economically
- Less rapid economic growth (1.5% globally)
- High population growth
- Low per capita incomes
- Technology change and adoption depends on resources and culture
- Highest GHG emissions
- Focus on agricultural productivity to feed rapidly rising populations

B1 – Environmentally sensitive with strong global relationships

- High level of environmental and social concern and value
- Emphasis on globally sustainable and balanced development with investments in social infrastructure and environmental protection
- Moderate economic growth (2% globally)
- Low population growth
- Moderate per capita income, slightly less than A1
- Services emphasized over material goods, quality over quantity
- Mitigation technologies rapidly adopted and rapid decline in use of fossil fuels
- Low GHG emissions

B2 – Environmentally sensitive with highly regional focus

- High level of environmental and social concern and value
- Emphasis on decentralized decision-making and local self-reliance
- Moderate economic growth (1% globally)
- Moderate population growth
- Moderate per capita income, slightly less than A1
- Less technology development and adoption, declining global investment, and less international diffusion
- Regional differences in energy use and innovation, transition out of fossil fuels is gradual
- Moderate GHG emissions

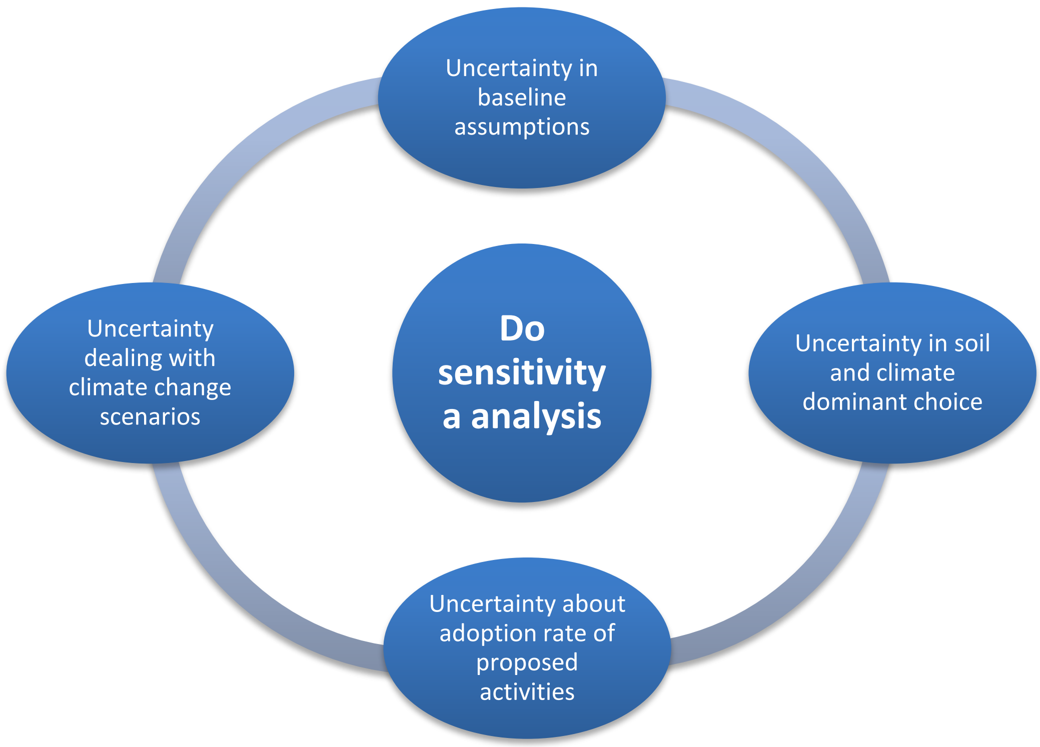
4.4 Development of several baselines: sensitivity analysis

It is recommended to run several simulations of the carbon balance with EX-ACT in order to have an idea of the uncertainty of the results. Not only a sensitivity analysis based on the project data has to be done (description module – climate, soil- or when the project's formulation is not yet final), but also on the baseline scenario.

Building a pessimistic and an optimistic baseline scenario is necessary in order to avoid an excessively optimistic or pessimistic view of the project's mitigation potential. The intention of such scenarios is to identify a range of plausible outcomes.

[7] UNFCCC, Baseline Socio-economic Scenarios

Figure 11: The necessity to do sensitivity analysis through the elaboration of several baseline and project scenarios



5 Information needed to build the baseline scenario within EX-ACT

5.1 Data collection

To build the baseline scenario in EX-ACT, the following data are required:

- land use change data
- land use data
- management practices
- use of inputs
- evolution of infrastructure
- evolution of herd
- tier 2 emission factors
- dynamic of adoption (linear, immediate, exponential)

5.2 Data availability and sources of data

The data needed to help measuring the degree and quality of changes might already exist. In this case, the only task is to collate the data and ensure it can be updated in the longer term. But often, there will be no existing data or it will be incomplete, of poor quality or needing supplementation or further disaggregation. Table 2 presents some databases where the user can find information to build its baseline scenario. The list is, however, not exhaustive.

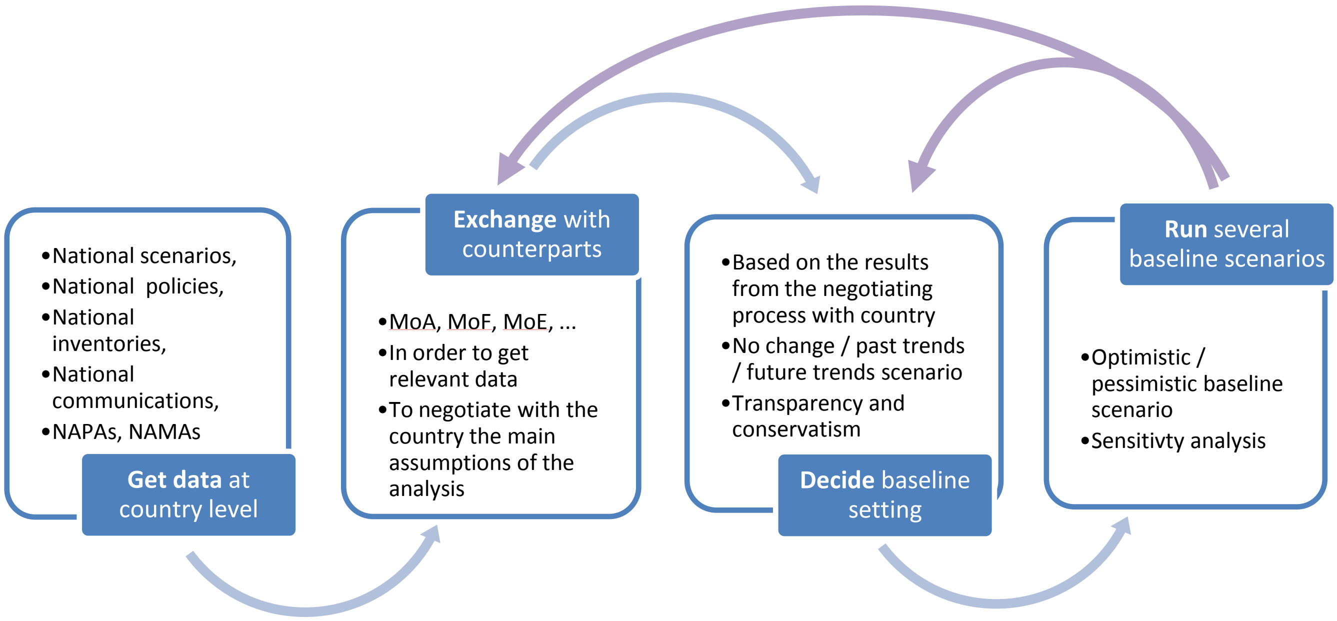
Table 2: Examples of sources and database that could be used to find the required data

Type of data	Database	Access
At national level: Land areas Forest areas Irrigated land Permanent crops Arable land Heads of livestock Fertilizers and pesticides consumption	FAOStat	http://faostat.fao.org/default.aspx
Irrigated land Arable land Permanent crops Natural hazard Environmental issues and international agreements	CIA	https://www.cia.gov/library/publications/the-world-factbook
Forest resources and the carbon content of different carbon pools Deforestation rate	FRA	http://www.fao.org/forestry/fra/fra2010/en
Climate change vulnerabilities National policies and strategies to cope with climate change	UNFCCC submissions (GHG inventory, National communications, NAMA, NAPA)	http://unfccc.int/national_reports/items/1408.php
Numerous agricultural and forestry data at national level	National Statistics organizations, Ministries of Agriculture, Forestry, Environment, Livestock	
Similar projects already implemented that could provide information regarding implementation (barriers, rate of adoption, success)	FPIMS/World bank database	

When data is not available, the users will have to gather experts involved in the project formulation, implementation, or evaluation. They may have a better understanding of the project zone and environment, with much expertise in the location. Their experience and knowledge will be useful to assess what would have happen without the project considering e.g. the socio-economic and the agro-climatic contexts. While appraising the project, the user will have to clearly mention and justify the assumptions taken and with whom, to allow further adjustment of the baseline if required and to better understand the results obtained.

Where data is presenting discrepancy, once again, the user will have to precise which source has been taken and why it has been preferred to another. As explained in 3.3.4, transparency is a vital criterion in the building process of the baseline scenario. The figure 12 summarizes the steps for elaborating the "without project" scenario in EX-ACT. It is an iterative work that requires flashbacks to always adjust the BAU scenario. Building the baseline cannot be a one shot approach; depending on the results of the carbon balance, new discussions with experts and new consideration for the type of baseline to use have to take place again.

Figure 12: Synthesis of the steps to follow to build the baseline scenario within the EX-ACT tool



6 Conclusions

Creating a baseline scenario is not an end in itself; the purpose is really to help defining the additional changes due to the adoption of project activities. However, some aspects have to be respected, such as conservatism, transparency, choice of the type of baseline scenario depending on the scale and activities of the project. As such EX-ACT can give a reasonable fair mitigation potential of the appraised project.

The most desirable outcome is to identify variables that can substantially change the GHG emissions/ C sequestration, and that could also be useful for policy making. It is worth noticing that the baseline scenario can easily be modified within the tool, and allow for the creation of different simulations, with optimistic/pessimistic baseline scenarios, assessing the impact's range of the project, equally generating a review of the appraisal upon time and findings in the data collection.

7 EASYPol links

See all EX-ACT resources in EASYPol under the Resource package, Investment Planning for Rural Development - EX-Ante Carbon-Balance Appraisal of Investment Projects

EX-ACT technical guidelines for version 3

8 References and Further Readings

UNEP, November 2005, *Baseline Methodologies For Clean Development Mechanism Projects - A Guidebook*

BERR, Department for Business Enterprise and Regulatory Reform, April 2008, *A Beginners guide to baselines and additionality - A Climate Change Projects Office Guide*

UNFCCC, *Approved Large Scale A/R Methodologies*, http://cdm.unfccc.int/methodologies/ARmethodologies/approved

UNFCCC, Annex 17, *A/R Methodological Tool - "Tool for the Demonstration and Assessment of Additionality in A/R CDM Project Activities*" - (Version 02)

UNFCCC, *Baseline Socio-economic Scenarios*

VCS, *Approved VCS Tool VT0001 - Version 1.0 - "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities*"

VCS, November 2008, *Guidance for Agriculture, Forestry and Other Land Use Projects*

Brown and al., March 2007, Baselines for land-use change in the tropics: application to avoided deforestation projects, *Mitig Adapt Strat Glob Change (2007)* 12:1001–1026 / DOI 10.1007/s11027-006-9062-5

Cerri C and al, 2010, Greenhouse gas mitigation options in Brazil for land-use change, livestock and agriculture, *Sci. Agric. (Piracicaba, Braz.), v.67, n.1, p.102-116, January/February 2010*