



**System for Environmental and Agricultural Modelling;
Linking European Science and Society**

**Procedure for application of SEAMLESS-IF to
concrete policy and innovation issues**

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General information

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Executive summary

The aim of this document is to propose a first vision of a general procedure that has to be followed to use SEAMLESS-IF for assesment of policy impact, starting from conceptualisation of the problem (i.e. identifying the question, the systems and their expected behaviour), definition of scenarios, selection of tools and methods from SEAMLESS-IF, implementation and model building, simulation and analysis of results.

This procedure is a first proposal to be used in the conceptualisation work of T1.3 and it is based on a cross view between the conceptualisation work conducted in WP1 and the definition of concrete application of SEAMLESS-IF conducted in WP6.

After a brief presentation of the assumptions made on what SEAMLESS-IF is and which type of problem it is supposed to adress, the document describes the procedure by which a prime user (a DG of EU) would use SEAMLESS-IF to analyse the impact of a policy, combined or not with technological changes, on the agricultural systems and their contribution to sustainable development of rural areas.

Specific part

1 Introduction

This report gives a synthesis of informations coming out of Activity A1.3.6 conducted at the cross roads of WP1 (conceptualisation) and WP6 (application to Test cases). It implied many interactions with other WP (WP2, 3, 4, 5 and 7) during WP1 and WP6 meetings and through frequent Email discussions with WP leaders. Frequent and detailed questions by WP6 partners, especially from INRA and CEMAGREF, have also efficiently contributed to this Activity.

The aim of this activity was to specify a general procedure that has to be followed to use SEAMLESS-IF for assesment of policy impact, starting from conceptualisation of the problem (i.e. identifying the question, the systems and their expected behaviour), definition of scenarios, selection of tools and methods from SEAMLESS-IF, implementation and model building, simulation and analysis of results.

The major difficulty was to identify a procedure for using a framework (SEAMLESS-IF) while we were still trying to share our views on what will be this framework and to some extent what it is supposed to do. The procedure described in this document at this stage, is therefore largely depending on the assumptions made by its author on SEAMLESS-IF itself.

After a brief presentation of these assumptions the document describes the procedure by which a prime user (a DG of EU) would use SEAMLESS-IF to analyse the impact of a policy, combined or not with technological changes, on the agricultural systems and their contribution to sustainable development of rural areas.

Vocabulary used in this text is, as much as possible, based on words used by other WPs and in the DEMO version. Key words for the procedure of SEAMLESS-IF are listed in the glossary at the end of this document. Among those a definition is proposed for the word specifically introduced in this text.

When an agreement will be reached inside WP1 on this procedure (should be done during the WP1 meeting in October 2005), a complementary document will be provided by WP6 to describe how this procedure and which models, databases, indicators and methods will be tested and improved by WP6 while running the two Test Cases on the 3 prototypes of SEAMLESS-IF. More informations on the systems, policies and technological changes involved in these test cases are given in PD611 (for Test case 1) and PD612 (for Test case 2).

2 Basic assumptions on the nature of SEAMLESS-IF and the objectives of the prime users (DG of EU)

These assumptions have strong implications on the procedure of using SEAMLESS-IF so they should be confirmed by all WP leaders and WP1 participants before discussion on the procedure itself. Otherwise the assumptions should be discussed until a consensus is reached before re-defining the procedure.

Assumption 1 : SEAMLESS-IF is built primarily for prime users as defined in PD7211 (EU DG) but it can be used without any change in the tools and the software (SEAMFRAME) by other users for the same type of application (policy assesment by regional decision makers for example) or for other type of applications (for example researchers for design of innovative agricultural systems¹). Nevertheless the procedure described here is only for policy assesment by a prime user and specific procedures will have to be used for other types of applications and other types of users.

Assumption 2 : unlike users, stakeholders are not using SEAMLESS-IF but their expert knowledge could be used in the procedure for definition of story lines and analysis of scenarios and indicators. In addition some stakeholders will also be involved in WP6 to evaluate some of the simulation models (FSSIM and APES) on the basis of expert knowledge, but this has nothing to do with the routine procedure of using SEAMLESS-IF which is described here.

Assumption 3 : when using SEAMLESS-IF the objective of a prime user is to assess the impact of a specific policy that he is able to describe (economic as in Test case 1 or environmental as in Test case 2). This policy can eventually be combined with technological or organisationnal innovations (as in Test case 2). SEAMLESS-IF is not designed for policy definition/optimization but for policy assesment. It may be easily adpated to these objectives but this would imply the definition of specific procedure, which are not described here.

Assumption 4 : for this prime user each policy analysis must have a EU coverage but they may be interested to zoom in on specific regions for a more detailed impact assesment. This will require more data, generally not available in databases with EU coverage. This part of the project should be conducted with the same procedure but with additional partnerships with decision makers and stakeholders of this region and the corresponding country.

Assumption 5 : the role of models and databases in SEAMLESS-IF is to provide informations to an 'indicator calculator'² in order to produce a set of indicators for policy assesment. The use of models for more detailed behavioral analysis of the agricultural systems in response to policy is usefull but models should be primarily built for calculation of indicators.

Assumption 6 : each problem/question asked by the user is translated into scenarios (policy versus baseline scenarios) which capture external constraints applied to the agricultural systems. Using SEAMLESS-IF for ex ante assesment requires simulation of the expected

¹ This words design here the networks of systems at differents levels (farm, region, market) which is influenced by a trade change, a policy change or a technological change (see PD 121)

² This component is still not defined in SEAMFRAME but it is important to have it.

behaviour of the systems and not analysis of their actual behaviour by survey or measurements.

Assumption 7 : because of the complexity of agricultural systems and of the policy imposed on them we assume that each problem/question will require its own description of the system, its own dashboard of indicators and therefore its own modelling project.

Assumption 8 : due to the complexity of the system simulated and to the risk of error propagation (due to the multiscale approach, to model quality or to data quality) the prime user cannot follow the procedure itself. A project implemented in SEAMLESS-IF requires interdisciplinary scientific expertise on the agricultural systems and technical expertise on SEAMLESS-IF itself (especially SEAMFRAME). Assessment of a policy will frequently require all the type of users identified in a DEMO version : linker, provider, runner, viewer and, in some cases, coder. The user from DG will then act as a viewer but under the contract with an organisation which has the expertise of coder, linker, provider and runner.

Assumption 9 : one or several “negotiation” steps will be required to adjust the problem definition and the list of assesment indicators to the capability and precision of the models, to the quality and geographical coverage of the databases and to the time and resources allocated by the user to each project.

3 Description of the procedure to use SEAMLESS-IF

Let’s imagine that we are in January 2009 : the SEAMLESS-IP is now finished and has left a SEAMLESS-IF fully operationnal, with people trained to use it and an organisation to manage its applications on requirements of users (called here “the manager”).

We describe below the various steps that should be followed to go from the definition of a question by a EU DG about the impact of a policy to the answer given by SEAMLESS-IF to this user. These steps are grouped in phases which are of different nature in term of expertise required, type of action to conduct, SEAMLESS-IF tools to use, and level of involvement of users and stakeholders. These phases could also define the milestones of the project to manage for adresssing the question.

3.1 Phase 1 : Defining the problem

This phase is initiated by the user and conducted in interaction with him.

Step 1.1 : What is the problem and can it be adressed with SEAMLESS-IF ?

- One user (e.g. a section of DG Environment) or a group of users contact the organisation, in charge of the management of SEAMLESS-IF (still to be defined but it is part of Task 1.5 of WP1). For practical purposes this organisation which manages the use of SEAMLESS-IF will be called here the “manager”.
- The user gives his own definition of the problem he want to address : for example the impact of trade liberalization resulting from of the Doha Round (in Test case 1) on european agriculture and its contribution to multifunctionality and sustainable development in EU and in specific rural areas of Europe and Africa.

- The manager checks that this type of question can be addressed by SEAMLESS-IF knowing its capabilities, the resources allocated to the project and the deadline for its completion.

Step 1.1 can be completed in a two hours meeting provided the manager has a broad knowledge of SEAMLESS-IF and agricultural systems.

If the contracting entity is a group of users we assume that a specific participatory method is required to reach a consensus among the users on the problem definition.

3.2 Phase 2 : Specifying the project

Two versions are proposed for this phase depending on the capabilities of SEAMFRAME and especially of its interface with users.

Version 1 :

Step 2.1 is conducted in interaction with users and stakeholders in a first meeting.

Step 2.2 is conducted only by the manager.

Step 2.3 is conducted in interaction with the users only and in a second meeting.

Version 2 : the three steps are conducted in a single meeting with users and stakeholders.

Version 2 is better to avoid fatigue among users and to save time, but it depends on the capabilities of SEAMFRAME and expertise of the manager.

Step 2.1 : Building a story line in interaction with users and stakeholders

Stakeholders are here to provide expert knowledge on agricultural systems at various scales and to enlarge the point of view on sustainability.

The role of the story line is to provide information which will be used by the manager to translate the problem in a project which can be handled by the SEAMLESS-IF structure. It has the following elements :

- *External Changes* applied to the agricultural systems : for example change in CAP and export subsidies, new regulations, assumptions on the dynamics of inflation, assumptions on future climate This will be important for the definition of the base line and policy scenarios.
- *Aspects of the system* of major importance for the users when considering sustainability and multifunctionality of Agricultural Systems and their contribution to sustainable development (for example : employment in agricultural regions, farm income per ha, pollution of water by nitrate ...). We make the assumption that it is of the interest of the users to involve stakeholders to enlarge the “point of view” on sustainability. This will be important for the definition of indicators.
- *Expected behaviour* of the system in response to the external change, using the expert knowledge of the users, the stakeholders and the manager. This will be important for model and indicator selection.
- *Levels* of application of the story line : all EU ? also on specific regions ? also in some specific countries (Accession Country, Least Developed Country) ?
- *Time scale* of application of story lines : 5 years, 10 years, 30 years ?

Step 2.2 : The manager prepares a preliminary project which can be run with SEAMLESS-IF to address the problem, using information from the story line and its knowledge on the capabilities of SEAMLESS-IF.

This project has the following elements :

- *Scenarios to be compared* : a baseline and one or several policy scenarios. This include also the levels of application of the scenarios as indicated in the story line.
- *Indicators* to reflect the aspects of the systems with regard to sustainability and multifunctionality. This includes also the level of presentation to the users and the level of aggregation of each indicator. At this stage the manager should be able to identify which indicators can be calculated with models and databases and which one would require other approaches : the latter is probably the case for institutional and some social indicators.

It is expected that most frequently the definition of the project will show some discrepancies with the problem definition in the story line : external constraints to which the models cannot respond; aspects of the system which cannot be translated into indicators or not at the scale or level of precision required by the users; lack of data, especially on specific regions is also expected. Step 2.3 will therefore be most frequently required.

Step 2.3 : Presentation of the preliminary project to the user and “negotiation” to reach a compromise between user’s requirements and SEAMLESS-IF capabilities.

The negotiation covers the following aspects :

- *Identification of elements* which cannot be adressed and elements that could be adressed with more data, models and approaches.
- *Adjustment of the problem* definition and story line description.
- *Adjustment of scenario* definition
- *Adjustment of indicators* selection, including adjustment of their spatial and temporal scale and level of precision.

3.3 Phase 3 : Running the project

This phase is conducted by the manager without interaction with users or stakeholders.

Step 3.1 : Check if a similar project has been run previously with SEAMLESS-IF

If matching is complete both on scenarios and indicators (probably rare) the manager goes directly to Phase 4 using the output of this project stored in the knowledge base.

If there are large similarities in scenarios and indicators, the manager extracts these elements from the knowledge base and adapts them following the steps described below.

If no similar project has been run with SEAMLESS-IF the manager completes all steps described below.

Step 3.2 : Scenarios description

- Base line scenario

- One or several policy scenarios

Templates provided by SEAMFRAME (on the basis of the template provided by WP6 in PD623) should be filled out in detail to give all exogenous variables describing each scenario.

Step 3.3 : Indicators description

For each indicator and at the correct level of calculation or aggregation :

- The manager checks in the knowledge base if the indicator has already been calculated in a previous project. If yes he selects it and fills the template to parametrize it and feed it with the required data.
- If not, the manager uses the “indicator calculator”³ provided by SEAMFRAME to define the structure of the indicator (if it is calculated from aggregation of several variables) and proper connections with models, farm typologies⁴ and databases.

At this stage SEAMFRAME should give indication of model and database availability to calculate the indicators. This would allow an adjustment of indicators calculation in step 3.3 in order to be able to complete step 3.4.

Step 3.4 : Definition of the modelling domain required to calculate these indicators

Using SEAMFRAME, the manager

- Selects models at the level⁵ required for calculation of each indicator
- Connect them to data bases.

Step 3.5 : Definition of the procedure to address aspects of the system which cannot be captured by the modeling approach

This procedure is a direct application of step 2.2 in which the need for these approaches has been identified and proper approaches have been selected. Step 3.5 define all elements and steps to calculate the indicators with the available data.

A procedure to define these aspects in response to a scenario cannot be defined until these aspects have been identified and proper methodologies have been described by WP2. It may be the case for example for institutional aspects and probably for some social aspects.

Step 3.6 : Run the models (defined in step 3.4) and the “indicator calculator” (defined in step 3.3) using SEAMFRAME

Several runs are required :

³ This component is still not defined in SEAMFRAME but it is important to have it (to be discussed with WP5).

⁴ A “Crop Typology” will probably be necessary to be able to translate the wide variety of crops or land use (including set-aside, nitrate catch crops) across Europe and in the developing world, into parameters of APES.

⁵ Level means here spatial levels in the agricultural systems (farm, watershed, region ...) at which calculation of an indicator is relevant both from a scientific and user’s point of view.

- For baseline scenario
- For one or several versions of policy options combined or not with technological innovations.
- For sensitivity analysis of the indicators to the assumptions made on model and indicator calculator, on their parametrization, on regions and farm typology, on estimation of missing data...

Step 3.7 : apply procedures defined in step 3.5 to address aspects which cannot be handled with modelling approach

3.4 Phase 4 : Analysing the problem

Steps 4.2 and 4.3 of this phase are conducted entirely in interaction with the users who contracted with the manager for the project.

Step 4.1 : The manager prepares the dashboards and maps of indicators adapted to the scales and time step defined with the user in step 2.3 :

- For baseline scenario
- For policy scenario
- For alternative sets of indicators of the two scenarios

Step 4.2 : Presentation and discussion with the users of the dashboards and maps in order to reach a common conclusion on the assessment of the policy

The role of the manager in this step is crucial to identify what the maps and dashboard can say and what they cannot say, knowing all the assumptions made, the quality of the data and the sensitivity of models and indicators.

Step 4.3. Identification of a new problem to be analysed, on the basis of the results of step 4.2

It is assumed here that most frequently the results of the analysis of a problem will lead the user to ask complementary questions on :

- Modification of the policy scenario
- More detailed analysis on a specific region which appeared to be particularly sensitive to the policy.

The procedure is then started again with step 2.2.

Glossary

A definition is given only for terms which are specific to this deliverable. Others are important to understand the procedure but they have been or will be defined elsewhere.

Technological innovation A technical change made in a farming system or proposed by the extension services and companies and which could reduce environmental impacts of agriculture or increase its productivity.

Organisational innovation A collective organisation of farmers or a new supply chain which can reduce environmental impacts or increase economic add value of agricultural products.

Procedure A series of actions to be conducted to reach an objective which are described in such a way that a non-expert can realize the whole process.

Manager The organisation which can manage the whole process of using SEAMLESS-IF for each policy assesment problem proposed by users.

Users *Prime users ; other users (see reports WP7)*

Stakeholders

Agricultural Systems

Policy assesment

Story lines

Scenario *Baseline scenario ; policy scenario (see report PD611)*

Indicators *Indicators calculation ; Indicators aggregation*

Simulation model

Knowledge base

Problem definition

Modelling domain