EFORWOOD
Tools for Sustainability Impact Assessment

Options for the policy analysis interface of ToSIA

Thomas Vogelpohl and Ewald Rametsteiner

EFI Technical Report 39, 2011

Options for the policy analysis interface of ToSIA
Thomas Vogelpohl and Ewald Rametsteiner

Publisher: European Forest Institute
Torikatu 34, FI-80100 Joensuu, Finland
Email: publications@efi.int
http://www.efi.int

Editor-in-Chief: Risto Päivinen

Preface

This report is a deliverable from the EU FP6 Integrated Project EFORWOOD – Tools for Sustainability Impact Assessment of the Forestry-Wood Chain. The main objective of EFORWOOD was to develop a tool for Sustainability Impact Assessment (SIA) of Forestry-Wood Chains (FWC) at various scales of geographic area and time perspective. A FWC is determined by economic, ecological, technical, political and social factors, and consists of a number of interconnected processes, from forest regeneration to the end-of-life scenarios of wood-based products. EFORWOOD produced, as an output, a tool, which allows for analysis of sustainability impacts of existing and future FWCs.

The European Forest Institute (EFI) kindly offered the EFORWOOD project consortium to publish relevant deliverables from the project in EFI Technical Reports. The reports published here are project deliverables/results produced over time during the fifty-two months (2005–2010) project period. The reports have not always been subject to a thorough review process and many of them are in the process of, or will be reworked into journal articles, etc. for publication elsewhere. Some of them are just published as a "front-page", the reason being that they might contain restricted information. In case you are interested in one of these reports you may contact the corresponding organisation highlighted on the cover page.

Uppsala in November 2010

Kaj Rosén
EFORWOOD coordinator
The Forestry Research Institute of Sweden (Skogforsk)
Uppsala Science Park
SE-751 83 Uppsala
E-mail: firstname.lastname@skogforsk.se

EFORWOOD

Sustainability Impact Assessment of the Forestry - Wood Chain

Project no. 518128

EFORWOOD

Tools for Sustainability Impact Assessment

Instrument: IP

Thematic Priority: 6.3 Global Change and Ecosystems

PD 1.1.7
Options for the policy analysis interface of ToSIA

Due date of deliverable: Month 30
Actual submission date: Month 38

Start date of project: 011105
Duration: 4 years

Organisation name of lead contractor for this deliverable:
University of Natural Resources and Applied Life Sciences Vienna (BOKU)

Final version

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	**PU**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

PD 1.1.7: Options for the policy analysis interface of ToSIA

AUTHORS:

Thomas Vogelpohl, Institute of Forest, Environmental and Natural Resource Policy, Austria
University of Natural Resources and Applied Life Sciences, Vienna – BOKU

Ewald Rametsteiner, Institute of Forest, Environmental and Natural Resource Policy, Austria
University of Natural Resources and Applied Life Sciences, Vienna – BOKU

WP 1.1.

Abstract:

The purpose of this project deliverable is to provide an overview of the conceptual options for the policy analysis section for ToSIA. The key question concerning the policy analysis section and this deliverable is how it can effectively address the user's needs and provide the information stakeholders are demanding.

One critical task of the ToSIA user interface, the one that this deliverable is mainly concerned with, is to incorporate a policy analysis section that helps stakeholders, particularly policy makers, understand, interpret, and build upon the ToSIA results. I.e. it should support policy makers translate the ToSIA results into policy context. The main part of this deliverable deals with possibilities on how this challenge of effectively informing policy and resource management decisions could potentially be dealt with within ToSIA and where this section should be located within the ToSIA user interface.

CONTENT

1 Introduction

An important task of EFORWOOD is to develop decision-support tools that will help policy makers and stakeholders organize and visualize information related to the sustainability of the forestry-wood chain and analyse potential trade-offs between economic, social, and environental objectives as they make decisions under uncertainty and need to understand the implications of remaining scientific uncertainties for the outcomes they care about.

Assessments are useful to the extent that they can inform policy and resource management decisions. As the EFORWOOD project provides tools for a policy-oriented assessment, it should be an ongoing process that engages both researchers and end-users to analyse, evaluate and interpret information from multiple disciplines to draw conclusions that are both timely and useful for decision makers.

In many cases, the sources of the problems are large in number and diverse, and any remedy is likely to affect a broad cross-section of society and create variable environmental impacts. This may create a dilemma for policy makers who must balance the interests and well-being of their many constituents while responsibly addressing the risks. The search for solutions can be contentious. To tackle the above mentioned challenges several crucial policy related elements should be borne in mind while setting up the ToSIA user interface:

- any policy tool or framework must be transparent and simple to understand and apply
- the tool developers must understand the policy environment and the perspectives of policy makers
- it should include an analysis of response options to improve policy makers' und stakeholders' ability to react effectively to risks and opportunities as they emerge

These three points are particularly relevant in the last phase of the project and to its outputs and results, namely ToSIA and its user interface.

ToSIA (Tool for Sustainability Impact Assessment) will be the predominant product of the EFORWOOD project. ToSIA will allow various end-users to analyse the sustainability effects of changes due to deliberate actions (e.g. in policies or business activities) or due to external forces (e.g. climate change, global markets).[1] ToSIA provides information on sustainability impacts by calculating values of environmental, economic, and social sustainability indicators for production processes along the FWC. These indicators are supposed to capture the impacts of the FWC on sustainability. This set of policy-relevant, coherent and internationally compatible FWC sustainability indicators has been developed within EFORWOOD based on already existing European and international indicator sets.[2] Changes in the sustainability of the FWC will be analysed using scenarios of future conditions. The scenarios used in EFORWOOD lead to alternative forestry-wood chains with different sustainability impacts compared to current chains. These scenarios rest upon two baseline futures which are based on IPCC (Intergovernmental Panel on Climate Change) scenarios. These baseline futures are specified with detailed, contrasting 'storylines' using different assumptions of environmental and socio-economic key variables.[3] By comparing different alternative FWCs, sustainability impacts of external drivers and internal FWC innovations can be evaluated using Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA).

[1] For further information on ToSIA see the combined EFORWOOD deliverable report 1.4.6/1.4.7.
[2] For further information on the development of the EFORWOOD indicator set see EFORWOOD deliverable 1.1.1 or EFORWOOD deliverable PD1.1.6 for the revised FWC-sustainability indicators set.
[3] For further information on the reference futures and scenarios used within EFORWOOD see EFORWOOD scenarios overall document D1.4.7.

Building on these previous works done within the EFORWOOD project, the purpose of this deliverable is to provide an overview of the options for a policy analysis section. Additional to CBA and MCA, this policy analysis section is also supposed help evaluating ToSIA calculation results and to so ensure reaching the goal of serving the needs of the target groups, that is to inform and support decision-making by FWC stakeholders, especially policy makers. Furthermore, this deliverable will determine the location of the policy analysis section within the ToSIA user interface architecture. So the main question to be answered by this deliverable is: how can the policy dimension of FWC sustainability be reasonably integrated into the user-interface and how can the latter inform policy decisions in a timely fashion using the best available scientific and socioeconomic information?

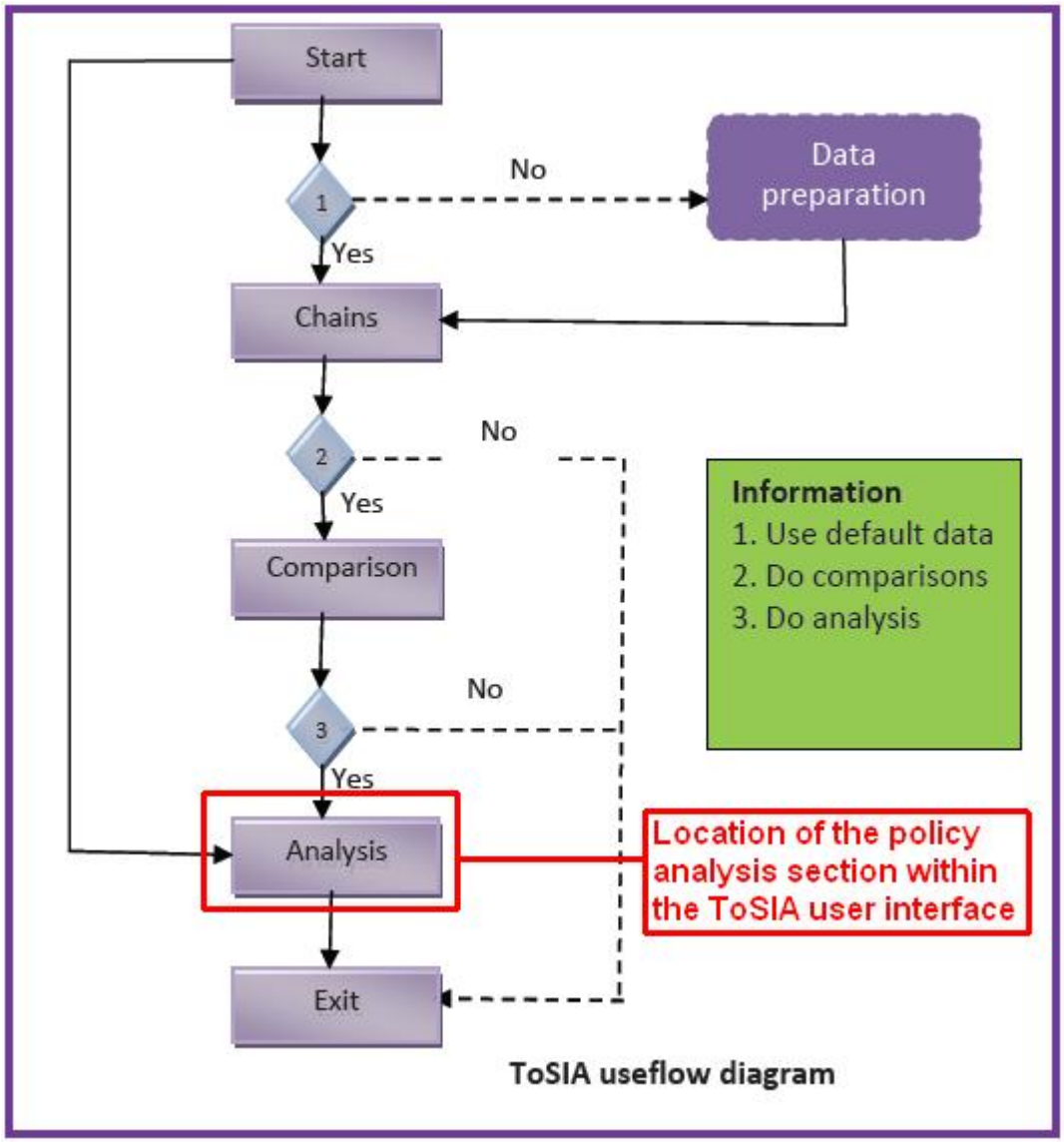
Chapter 2 will briefly describe the basic ToSIA user interface structure and point out where the policy analysis interface will be located in it (a more detailed description using screenshots of the preliminary ToSIA user interface including further options can be found in the annex to this document). Subsequently, the task of supporting the translation of the results of a scientific impact assessment into policy decisions is delineated in chapter 3 along with the depiction of possibilities regarding how this challenge of effectively informing policy and resource management decisions could possibly be dealt with within the policy analysis section. Generally, chapter 3 will follow the logic of policy intervention described in more detail in that chapter. Foremost, it is the aim of the policy analysis interface to present the underlying policy information on ToSIA inputs and outputs. Building on that, several options of analysing FWC-related policies and potential policy impacts of ToSIA results will be proposed to be integrated into the policy analysis section of the ToSIA user interface. Furthermore, policy analysis options that go beyond the policy analysis within EFORWOOD and could serve as an incitation for future projects similar to EFORWOOD are outlined.

However, it shall be noted that a decision-support tool like ToSIA should be policy-relevant and inform decision makers, but it should not make specific policy recommendations. Although science should inform policy decisions, it is important to ensure that the science remains unbiased. Policy decisions should reflect the values of society, based on scientific insights when appropriate. The information needs of stakeholders should help frame scientific research planning. But the scientific research itself should be apolitical, and results must never be influenced by political interests (“Let’s put the facts on the table, we will fight about politics later.”).

2 The location of the policy analysis section within the ToSIA user interface

The general ToSIA use flow and the location of the policy analysis section within is visualized by figure 2.1.

Figure 2.1: ToSIA use flow diagram and location of the policy analysis section



Basically the procedural approach to the ToSIA user interface can be divided in three sections which are shown in the figure above. In the following, it will be depicted briefly how steps will be taken within the ToSIA user interface. A more detailed description of this procedure including some presentation options can be found in the annex to this document.

The ToSIA user interface follows a sequential, but interactive approach, leaving as much freedom in applying the tool for the user as possible. The first step for the user is to choose between certain default chains and creating a new run with own data, i.e. input indicator values to be fed into the program.

After the data processing in ToSIA the direct effects of the setting of input variables on the selected FWC will be displayed to the user. Just like the input data, the output data, i.e. the results of the calculation, will be made available to the user.

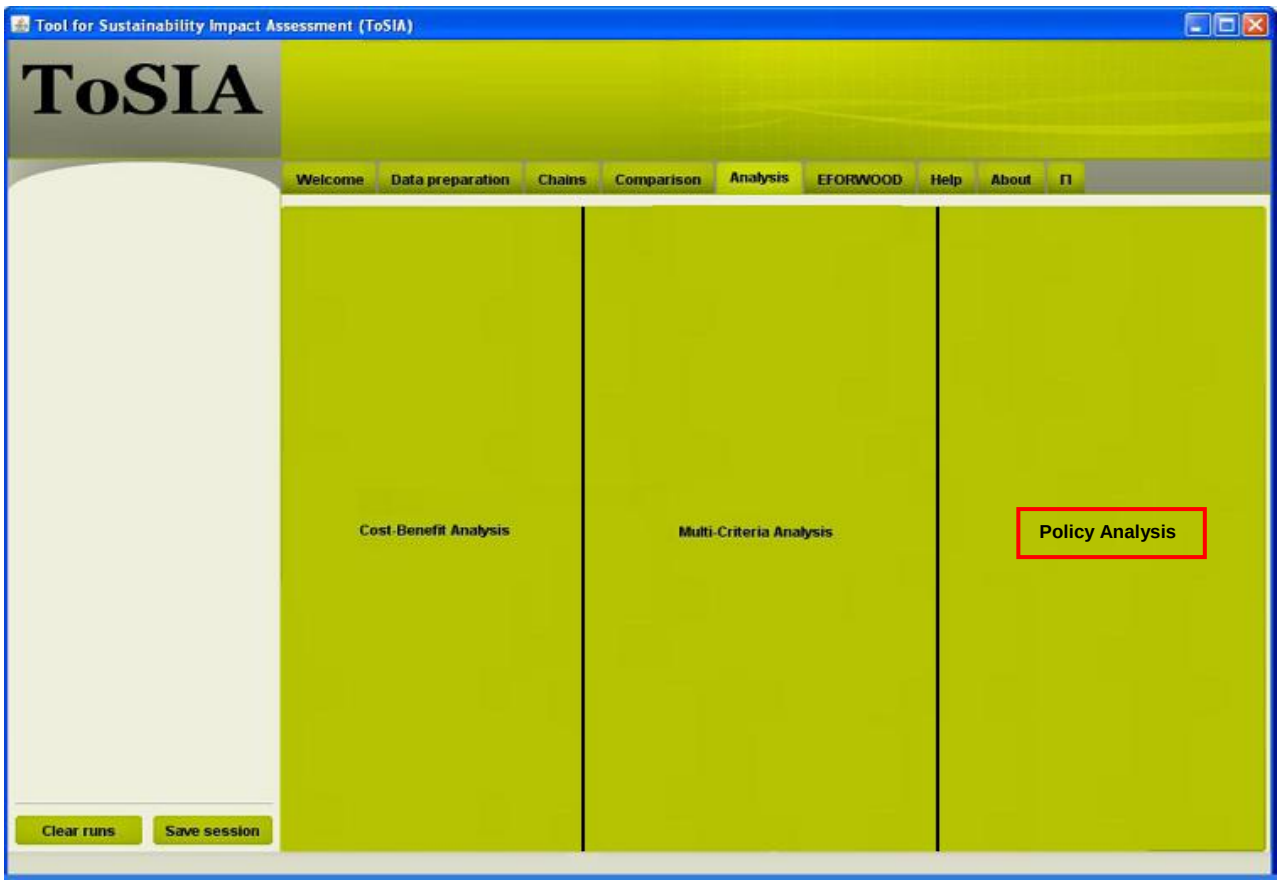
In the next section of the ToSIA user interface, the indicator results of individual runs created in the previous section can be compared. The user can select from the default and self-created runs and a comparison between the selected runs will be shown via a table or a bar chart.

The analysis section of the ToSIA user interface will help the user to further interpret ToSIA results. It is divided in three independent parts. It will consist of

- a cost-benefit analysis that compares the economic, social and environmental costs and benefits measured in monetary terms;
- a multi-criteria analysis that describes the structured approach used to determine overall preferences among alternative options by specifying desirable objectives and identifying corresponding attributes or indicators; and
- a policy analysis section, options for which will be delineated in the next chapter.

So far, the analysis tab in the preliminary ToSIA user interface displays placeholders for the upcoming CBA and MCA. However, by clicking the analysis tab the user should also get access to the policy analysis section of the ToSIA user interface. I.e. this tab would then consist of three analysis sections, as the policy analysis section should be added just here (as it is adumbrated in figure 2.2).

Figure 2.2 The policy analysis section within the ToSIA user interface



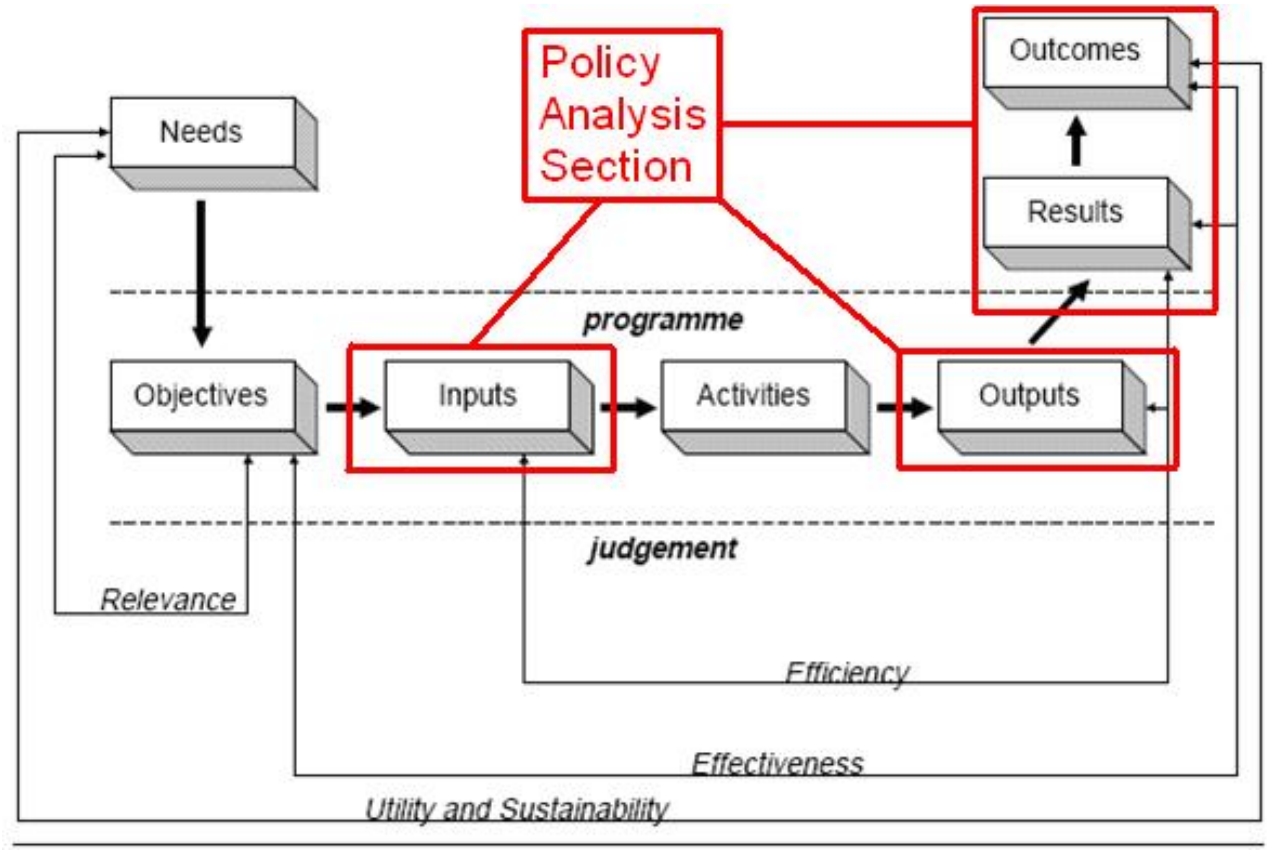
3 Structure and content of the policy analysis section within the ToSIA user interface

One of the most interesting tasks of forest policy consultants is bridging the gap between research and public decision making. The process of translating scientific information into timely and useful insights that inform policy and resource management decisions, despite the existence of uncertainties, is a difficult and challenging task. Policy-oriented assessment is one approach to achieving this end. The process of policy-oriented assessment receives increased attention because of the need, the imperative, for scientists to provide timely insights to risk managers who must make decisions every day despite the existence of scientific uncertainties. It is a particular challenge for assessors to provide the specific types of insights policy makers need to effectively respond to FWC indicator value changes. That is, to narrow the room for policy interpretations between the extremes of "do nothing" complacency and an alarmist call for "hitting the brake as fast as possible" policy intervention. The challenge for a policy analyst, therefore, is to present to elected officials and major stakeholders the critical elements of policy options in a way that:

1. Is clearly understandable.
2. Illuminates the tradeoffs that may be involved.
3. Can assist in educating the larger public as well.

The general approach used for the policy analysis section within EFORWOOD can be well illustrated by the intervention logic of a policy or programme, which is displayed in figure 3.1.[4]

Figure 3.1: The intervention logic of a policy



[4] For further information on this intervention logic and general concepts of evaluating EU activities see the European Commission publication Evaluating EU Expenditure Programs: A Guide - Ex Post and Intermediate Evaluation, January 1997.

So which points of this intervention logic concern the EFORWOOD policy analysis interface? Identifying the needs, problems and issues to be dealt with is clearly not the task of project researchers, but that of society and their representatives. An evaluation of particular policies and programmes is also way beyond the scope of the EFORWOOD project. Thus, it's mainly the central part of the figure which is interesting to us in this respect. The questions to be addressed, that are structuring this document, (see chapters 3.1, 3.2, and 3.3) are:

- On the input side: which FWC-related policies do exist on a European and international level? How are they related to FWC-sustainability? Which indicators are they targeted for?
- On the output side: how could actually existing FWC-related policies affect particular indicator results and FWC sustainability in general? Are targets and thresholds set up in these policies being met under the particular scenarios?
- On the results/outcomes side: what are the impacts of these outputs on a policy level? What are the policy implications? How could be responded to these outputs on a policy level?

These are questions the policy analysis section within the ToSIA user interface is mainly concerned with. How these questions could be answered is the main concern of this deliverable. Due to limited resources and capacities within the EFORWOOD project, however, not all of these questions can be answered exhaustively. The policy analysis section will focus on the first two groups of questions regarding the **input and output dimension FWC-related policies within ToSIA and how these would be affected by the scenarios**, whereas the ones regarding the further impacts thereof and potential response options will be merely touched on. An exhaustive outcomes analysis of particular ToSIA results on a policy level is just out of scope of the EFORWOOD project and an assessment of response options regarding FWC-related policies is simply not feasible within the EFORWOOD project.

The following chapters will deliver some options on how the challenges described here could possibly be tackled within the ToSIA policy analysis section. Subchapter 3.1 will deal with the first set of questions. It will be delineated which insights can be delivered regarding the input side of ToSIA, i.e. which descriptive information would be useful for ToSIA interface users to further understand the political dimension of assessing FWC sustainability. In the second subchapter, it will be described how the questions concerning the output side of ToSIA results could be answered within the policy analysis section of the ToSIA user interface. The last subchapter will then touch on the last questions asked and show how these could be answered, i.e. very narrowly within the EFORWOOD project but maybe more exhaustively in future projects.

3.1 Policy information on the input side of ToSIA

Indicators are central to sustainability assessment projects like EFORWOOD. Thus, a more detailed description of the individual indicators should be incorporated into the ToSIA user interface to help users get further insight into the tool and foremost understand the ToSIA results.

Indicators are at the heart of every integrated assessment mode, as it is at the heart of an integrated assessment model to include as many aspects of sustainability as possible in order to gain comprehensive insights into the full range of issues related to the FWC sustainability. However, it is also crucial to keep integrated assessment models manageable in order to facilitate the direct interaction with decision makers in the analysis of a large number of alternatives in a timely manner. Thus, it is the art of integrated assessment modelling to strike the right balance between a larger range of integration on the one side and practical manageability (for modellers) and transparency (for users) on the other.

3.1.1 Information on FWC sustainability indicators

At least basic information about the indicators should be provided. This information may also be incorporated into the ToSIA user interface at a more general level, because the information provided here might be useful also in other sections of the tool. However implemented technically, this information will comprise not only the names and subclasses of all indicators, but also a description of the purpose of the particular indicator (provided by WP 1.1), the relevant information from the data collection protocols[5], and, as far as possible, information about the relation between the particular indicators (see below). Table 3.1 shows an example of how this information could be gathered and presented to the interface user.

Table 3.1: Information on FWC sustainability indicators

Full name of indicator (including subclasses):	21. Water use
General FWC sustainability indicator subclasses:	21.1 Water use (freshwater intake by industry) 21.2 Water use of the forest ecosystem a: Evapotranspiration from the forest ecosystem b: Groundwater recharge
Measurement units:	21.1 m^3 21.2: m^3ha^{-1}
System Boundaries	• inside/outside FWC Data on water use related to energy generation in industry (i.e. paper mill) need to be collected. For the energy supply chains data collection **is not** necessary. Water use related to other supply chains is outside the system boundary.
Purpose of Indicator	Trees and forests can use more water than shorter types of vegetation. This is mainly due to the interception of rainwater by their aerodynamically rougher canopies. The resulting impact on water supplies is becoming an increasingly important issue for water resource managers and planners as demands for water continue to rise. Climate change predictions of warmer, drier summers will put further pressure on supplies. Forest management can have a marked impact on the water use of a stand of trees. Felling is the most dramatic intervention, although the removal of the trees does not eliminate the use of water. Changes in water use patterns reflect out awareness and willingness as individuals to change the way in which we consume our natural resources. Water consumption is increasingly seen as one of the basic indicators of the sustainability of a region. It needs to take into account local supply, both present and in the future, in relation to current and future demands. Higher water consumption levels can be linked to a relatively plentiful supply and flat pricing systems that do not take into account the true economic value of water.The objective of this indicator is to measure the water use of the forest ecosystem and to so capture the impacts of water use on FWC sustainability in general.
Linkages to other indicators (under default runs)	- (considerable) correlation with other indicators or rather independent? → how are the indicators connected to each other?

A brief description of the purpose of the particular indicator further clarifies why this indicator was incorporated into the FWC SIA, whereas some of this information from the data collection protocols will be very useful for the user to further understand the processes and details of the EFORWOOD SIA, like the system boundaries or measurement units.

[5] "Data collection protocols" specify details of data collection for those FWC indicators where primary data is needed in the prototype development and test runs of TOSIA on single chains, regional cases or the European chain.

Additional information about linkages between the particular FWC SI would also be useful for the interface user. The conduction of this task would be based on ToSIA output data on the FWC sustainability indicators. Since a sensitivity analysis in its traditional meaning will hardly be feasible within ToSIA, the relation between the various FWC SI might be analysed via a correlation analysis of the process indicator values calculated within ToSIA. Therefore, the indicator value changes calculated in the various reference future and scenario runs at the various points in time in ToSIA are needed. If such a correlation analysis would be carried out for each of those settings in every case study, some interesting patterns could appear. For example, it could come to the fore that two indicators are gravitating into the same direction with the same intensity in every run (for example "provision of public forest services" and "consumer attitudes") or that a two indicators are always veering away from each other (for example "forest resources" and "forest damage"). If patterns like these prove to be stable over all (or the vast majority) of the runs, they could be interpreted as (almost) inherent characteristics of these indicators. Even though this wouldn't mean that correlations between indicators like these must necessarily develop this way under other circumstances (this fact should definitely be mentioned at this stage), striking correlations between indicators like the ones mentioned (if there are any) could be presented to the user in the information table . Thus, the user could immediately see which indicators are closely related to each other and which ones are rather independent (under the given circumstances). This could help him/her compare ToSIA runs with own data to default runs and also deal with the remainder of the policy analysis section as some parts of it are based on the relation between the process indicator values calculated within ToSIA (see chapter 3.3).

3.1.2 FWC sustainability indicators and related policies

Having delivered these detailed insights into indicators and their composition, the relevance of FWC-related public policies for the sustainability of FWCs in Europe can be addressed exhaustively by connecting the policy analysis interface to the EFORWOOD policy database. The EFORWOOD policy database comprises current EU and international policies that are deemed to have an effect on SI in the FWC and compile thresholds identified by scientists and set by these policies (see D1.1.3). This policy database will cover all policy areas (biodiversity, trade, forest, climate, and environment), sector-specific policies, and specifications of FWCs (relevant products and production specifications, energy, transport) that are of key relevance to the sustainability performance of the FWC. A preliminary version of the data base will be finalised by the end of December 2008. As of then, EFORWOOD partners should get access to the policy database.

The following figures give an impression on how the policy data base is structured. It consists of four tabs, under which specific information about FWC sustainability-related policies, their connection to specific FWC SI and the targets or thresholds incorporated in these policies is provided.

Under tab 1 "document" all relevant documents (legislation and policy documents) are stored in the database. Those documents can be directly accessed in the database. By selecting a policy document the user gets further information about the particular policy document (see figure 3.2; including direct access to the policy document, see chapter 3.2 for details). The (sub-) indicators the selected policy document refers to are presented. Figure 3.2 shows the example of Directive 2006/32/EC on energy end-use efficiency and energy savings, which can be directly linked to FWC SI 18.2 ("Energy use in total") and 19.1 ("Greenhouse gas emissions in total").

Figure 3.2: Tab "Indicator references" for a particular indicator in the policy data base

The other tabs in the policy database basically provide the same information, just from another perspective. If users click on the tab "Indicators" a table with all 27 FWC SI is shown. Selecting one of these indicators provides information about how often and which of the documents in the policy database refer to this indicator or its sub-indicators (number of "indicator uses"). The tab "indicator use" provides an overview of all found connections between the FWC SI and the documents in the database, ordered by indicators. By selecting one of these indicator uses a page opens that shows the targets or thresholds that the particular policy document sets up for the particular indicator. Under the tab "Targets/Thresholds" the database shows all targets and thresholds that have been found in the policy documents in the database. Further information about the content of the EFORWOOD policy database, especially about the targets and thresholds set up in the policy documents, can be found in chapter 3.2.

Generally the ToSIA policy analysis section should be as transparent and provide as much information to the user as possible. Connecting the policy analysis interface to this policy database will be a huge asset to the interface user as it provides direct insight into the policy documents relevant to the FWC SI and thus to FWC sustainability generally. Taking this into consideration, the policy database will be linked to the policy analysis interface.

As already mentioned in this chapter, regarding the FWC indicators the policy analysis interface should provide at least brief information about the main characteristics of the indicators and explain why this indicator is considered to be important for the FWC sustainability.

At this stage, a linkage to the policy documents in the policy database concerning the respective indicator, via a link button in the pop-up window for example, should be added to the general information about the indicator. This is quite easily feasible as the policy documents in the policy database are already linked to the FWC SI (see above). At this stage, these policy documents are only linked to the EFORWOOD FWC SI. However, it would be valuable to also have the possibility to manually link the documents in the policy database to future sustainability indicators and store these linkage settings. This option needs to be further elaborated but should eventually be implemented within the EFORWOOD policy database.

Implementing this, i.e. giving the ToSIA user direct and structured access to the policy database via the indicator fact sheets integrated in the tool would be of great benefit to the user. It would be instantly visible to the user how many and which policies are related to the indicator he or she is particularly interested in (relevance of European and international policies to FWC sustainability).

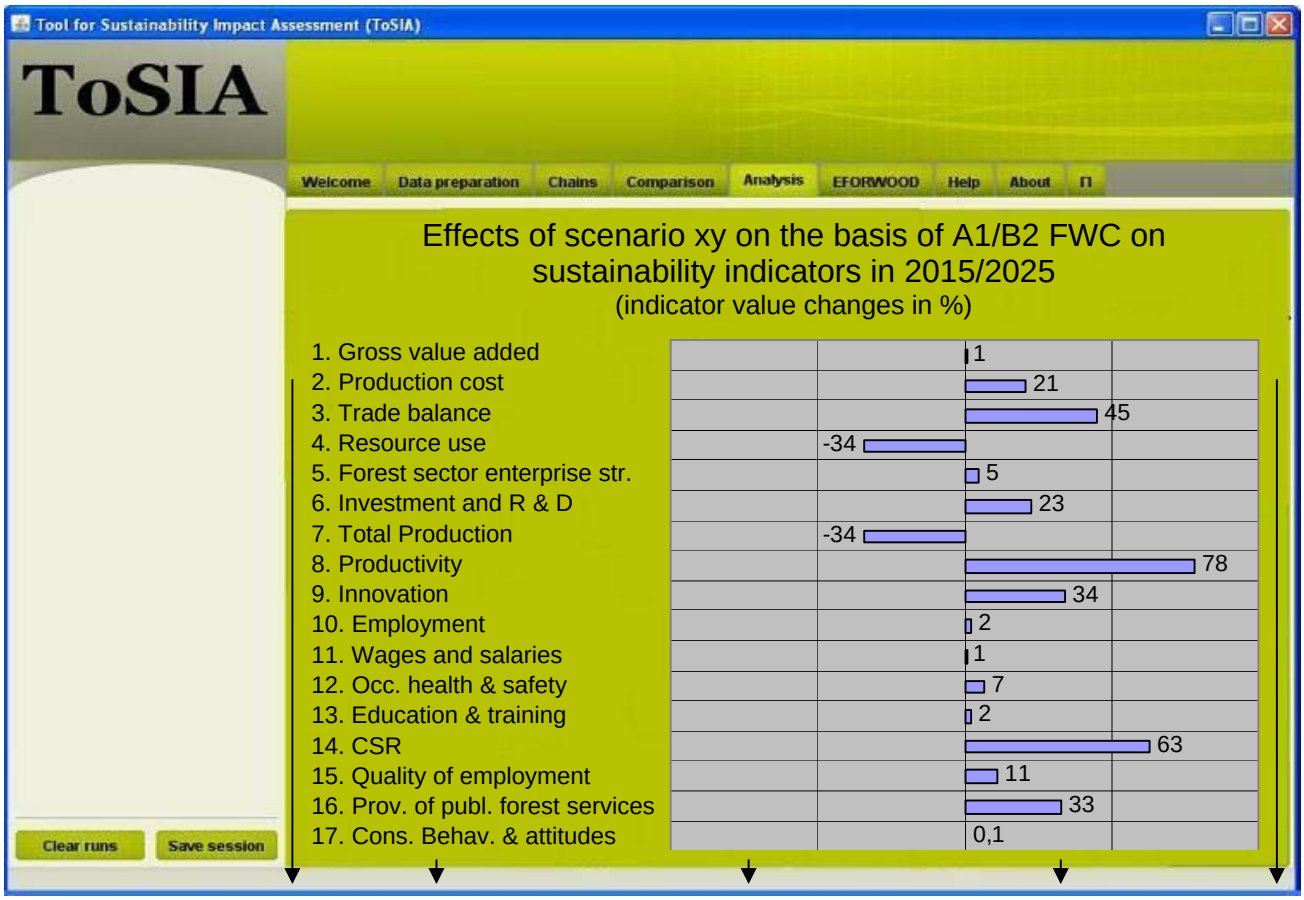
3.1.3 FWC sustainability indicators and scenarios

Another task worthwhile implementing is to connect the FWC sustainability indicators with the scenarios. How do the scenarios affect indicator values? Just as it was the case regarding the correlation between the FWC SI, the indicator value changes calculated in the various reference

future and scenario runs at the various points in time in ToSIA are needed to answer this question. In this case, however, not the correlation between the FWC SI is concerned, but the question if and how the FWC SI are affected under a particular reference future and scenario at a particular point in time. Based on these indicator value changes calculated in ToSIA, this could be made clear for every FWC SI.

It should not only be addressed which indicators are particularly affected by the various reference futures/scenarios/points in time, but also how strong these effects under the various reference futures/scenarios/points in time on the FWC SI are. In the policy analysis section within ToSIA there should be a table for each constellation, showing its effects on every of the 27 FWC sustainability indicators. Figure 3.3 (see next page) exemplifies how this could look like within the ToSIA policy analysis section.

Figure 3.3: Scenario effects on FWC SI values (example)



The figure above showing the effects via bars indicating the percental indicator value changes displays only one option on how to present the scenario effects on FWC sustainability indicators. Alternative scaling or presentation options could be:

- categorizing the scenario effect on a FWC SI as low, medium or high; or
- presentation via a spider diagram.

Furthermore, by doing this it could also be determined which policies are particularly relevant to the scenario areas because the FWC SI are, as already mentioned above, directly connected to policy documents in the policy database. Which are the policies most influential regarding the various scenario areas? Which policies are particularly affected by scenario area assumptions?

However, at least for the nature conservation and bio energy scenario information about the underlying policy assumptions should be provided, as these scenarios rely directly on such assumptions.

If possible, a direct linkage to the policy documents in the policy database (in its existing format and graphic user interface) concerning the respective scenario area in the policy analysis section, similar to the linking of indicators to their related policies suggested in the previous chapter, should be added in the policy analysis section. If such a linkage is not feasible, at least the policies identified as most important to the respective scenario should be briefly mentioned in the policy analysis section.

An extensive and detailed description of the scenarios, their settings and their underlying policy assumptions or implications is indispensable for the usefulness of the ToSIA user interface, as, from a policy maker's perspective, the scenario composition, the selectable settings and their impacts on the FWC SI may be considered the single most important part of ToSIA. Scenarios may be constructed to forecast the future, to explore the consequences of a hypothetical event, or to examine the effects of a policy.

3.2 Policy information on the output side of ToSIA

So what do the ToSIA results further tell in terms of the relation to the European and international FWC-related policies? How can the information provided by a comparative results analysis be related to FWC-related policies. What do policy makers need to know from these results in order to address FWC sustainability further?

3.2.1 Connecting ToSIA results to FWC-related policies

Generally there should be a very close link between the policy analysis interface and the policy data base that allows for a direct connection from the ToSIA results to the respective policy documents. It can be shown which sustainability indicators are particularly affected by certain scenarios (see 3.1.3). Via this roundabout it could also be determined to which policies certain scenarios (and in consequence ToSIA results) relate since the FWC SI are connected to the policies in the policy database.

In the policy database all relevant documents (legislation and policy documents) are listed up (see figure 3.4). They are classified according to several criteria, including the status of the document (in force or not in force, if it concerns binding policy documents (laws)), the type of legislation (e.g. decision, regulation, directive, etc.), the type of policy document (e.g. action programme, action plan, working programme, implementation report, policy strategy, etc.), the organisation that issued the document (e.g. European Union, United Nations Forum on Forests etc.), the year when the document was issued and the geographical scope (e.g. global, European, national)). Furthermore, the document itself (as a word or pdf-file) is included and can be directly accessed by the user.

Figure 3.4: Tab "Documents" of the policy data base

Under the "indicators" tab the user can select one of the 27 FWC sustainability indicators and then gets provided with information about how often and which of the documents in the policy data base refer to this indicator or its sub-indicators (number of "indicator uses"). Figure 3.5 shows the example of FWC SI 26 ("Forest Damage"), to which the documents in the policy database (so far) refer seven times (seven "indicator uses").

Figure 3.5: Tab "Indicators" of the policy data base

The results following from a connection between scenarios and (via the FWC SI) the related policies can be pictured in the ToSIA user interface. This should be done for all the scenarios applied within the EFORWOOD project (see chapter 3.3.1).

This helps the users of the interface to quickly determine which policies (possibly) are of particular importance for FWC sustainability (indicators) under a particular scenario. This is beneficial especially to policy makers, who want to know which policy levers are most effective in making a difference regarding effects on the various parts of FWC sustainability and which policies could have a considerable impact on FWC sustainability.

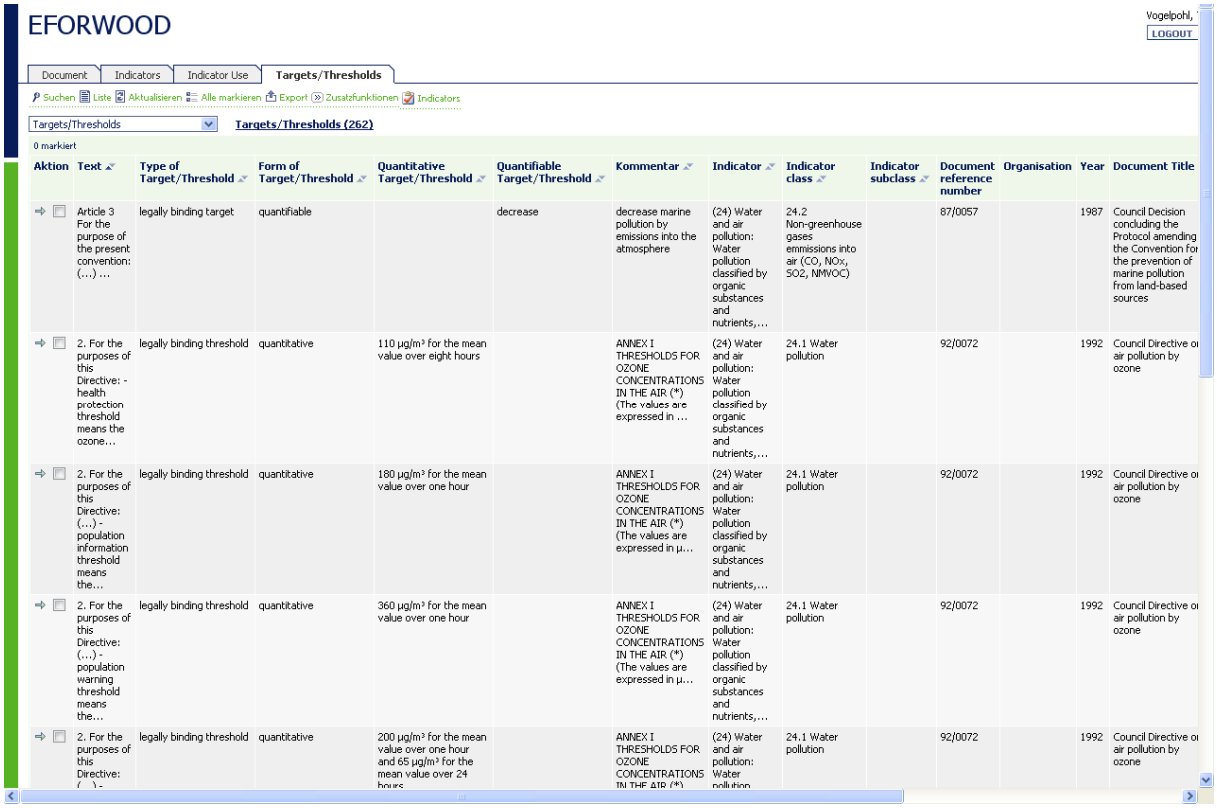
3.2.2 Connecting ToSIA results to targets and thresholds set up in the relevant policies

From here on it's only a small step to also determine the usefulness of certain policies on FWC sustainability. ToSIA results deliver insights into the effectiveness of these policies, because targets and thresholds set up in the FWC-related policies and eventual outcomes/ToSIA results can be

immediately compared. It can so be seen if targets or thresholds set up by these policies are met under the selected settings.

As already mentioned before, the targets and thresholds set up by FWC-related policies are systematically included in the EFORWOOD policy database. The user can derive information about the targets or thresholds set up in the particular policy document concerning the selected (sub)indicator. Under the tab "Targets/Thresholds" the database shows all targets and thresholds that have been found in the policy documents in the database, so it's an exhaustive list of all targets and thresholds providing the same information shown in the upper figure for every single target and threshold at a glance (see figure 3.6).

Figure 3.6: Tab "Targets/Thresholds" of the policy data base



Aktion	Text	Type of Target/Threshold	Form of Target/Threshold	Quantitative Target/Threshold	Quantifiable Target/Threshold	Kommentar	Indicator	Indicator class	Indicator subclass	Document reference number	Organisation	Year	Document Title
	Article 3 For the purpose of the present convention: (...) ...	legally binding target	quantifiable		decrease	decrease marine pollution by emissions into the atmosphere	(24) Water and air pollution: Water pollution classified by organic substances and nutrients,...	24.2 Non-greenhouse gases emmissions into air (CO, NOx, SO2, NMVOC)		87/0057		1987	Council Decision concluding the Protocol amending the Convention for the prevention of marine pollution from land-based sources
	2. For the purposes of this Directive: - health protection threshold means the ozone...	legally binding threshold	quantitative	110 µg/m³ for the mean value over eight hours		ANNEX I THRESHOLDS FOR OZONE CONCENTRATIONS IN THE AIR (*) (The values are expressed in ...	(24) Water and air pollution: Water pollution classified by organic substances and nutrients,...	24.1 Water pollution		92/0072		1992	Council Directive o air pollution by ozone
	2. For the purposes of this Directive: (...) - population information threshold means the...	legally binding threshold	quantitative	180 µg/m³ for the mean value over one hour		ANNEX I THRESHOLDS FOR OZONE CONCENTRATIONS IN THE AIR (*) (The values are expressed in µ...	(24) Water and air pollution: Water pollution classified by organic substances and nutrients,...	24.1 Water pollution		92/0072		1992	Council Directive o air pollution by ozone
	2. For the purposes of this Directive: (...) - population warning threshold means the...	legally binding threshold	quantitative	360 µg/m³ for the mean value over one hour		ANNEX I THRESHOLDS FOR OZONE CONCENTRATIONS IN THE AIR (*) (The values are expressed in µ...	(24) Water and air pollution: Water pollution classified by organic substances and nutrients,...	24.1 Water pollution		92/0072		1992	Council Directive o air pollution by ozone
	2. For the purposes of this Directive: ( ) -	legally binding threshold	quantitative	200 µg/m³ for the mean value over one hour and 65 µg/m³ for the mean value over 24 hours		ANNEX I THRESHOLDS FOR OZONE CONCENTRATIONS IN THE AIR (*)	(24) Water and air pollution: Water pollution	24.1 Water pollution		92/0072		1992	Council Directive o air pollution by ozone

For the use within the policy analysis section of the ToSIA user interface, a different approach to these targets and thresholds than just showing all the existing targets and thresholds for sustainability indicators might be useful, namely via the FWC sustainability indicators. Based on ToSIA results (e.g. the comparative results analysis), the user will be interested to know more about the policy backgrounds of certain indicators. Figure 3.5 shows the policies related to a particular FWC sustainability indicator. By now selecting one of these policies, the user can see which target or threshold is actually set up by the particular policy for the selected FWC sustainability indictator.

For example, figure 3.7 shows that Directive 2006/32/EC sets up one target or threshold in the realm of FWC SI 18.2 ("Energy use in total"), namely a legally binding quantitative target for energy savings of 9% to be reached by 2015.

Figure 3.7: Tab "Targets/Thresholds" for particular indicators in the policy data base

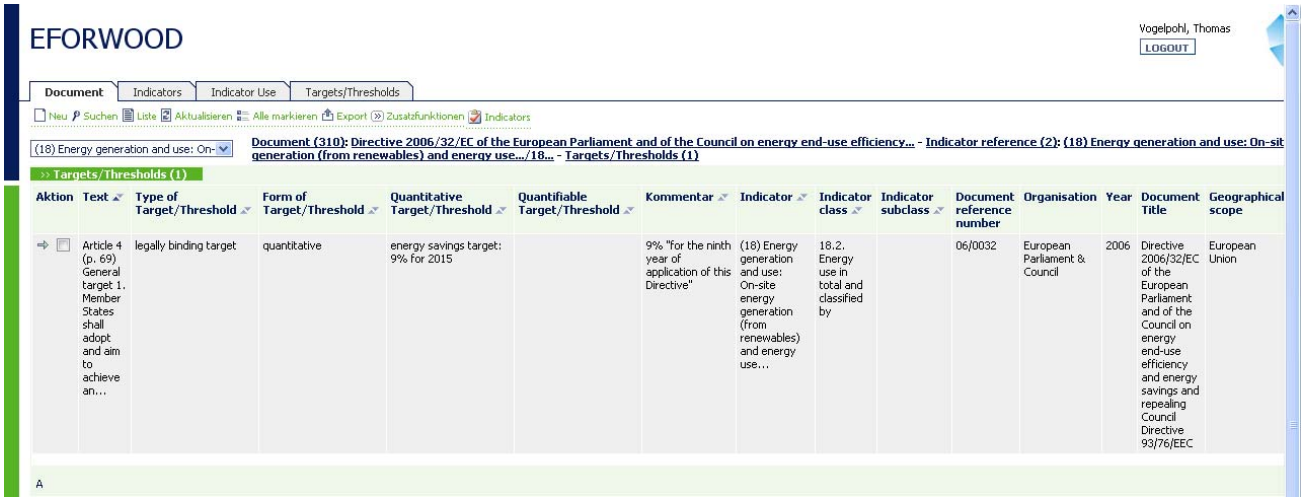
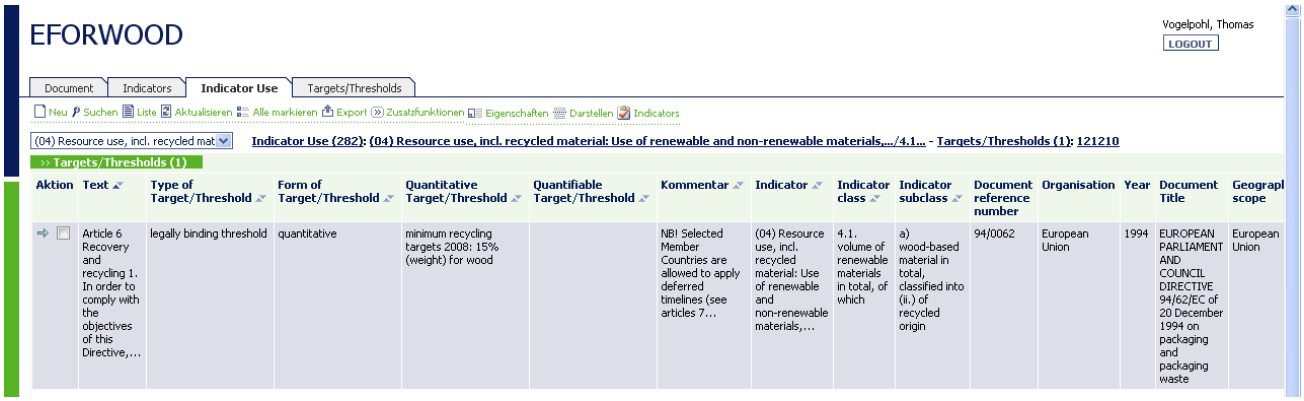


Figure 3.8 shows the example of the minimum recycling target of 15% by weight for wood for 2008, set up in Directive 94/62/EC on packaging and packaging waste and referring to FWC SI 4.1.a ("wood-based material in total").

Figure 3.8: Example of target for a sustainability indicator in the policy data base



The user can now compare ToSIA indicator values with those targets and thresholds set up in European and international policies. The connection between the ToSIA user interface and the EFORWOOD policy data base so does not only provide additional information about the indicators and policies related to FWC sustainability, but also supports the understanding and interpretation of ToSIA results, because by showing these results in the policy analysis it can immediately be seen if the ToSIA results based on the settings the user selected are in line with the targets and thresholds set up in European and international policies.

The connection of ToSIA output on the FWC sustainability indicators to the targets and thresholds set up in FWC-related policies would be of great benefit to user of the interface, especially to policy makers. It would support their ability to interpret ToSIA results and to think of political action to address possible future problems regarding FWC sustainability. On the indicator level, it could provide an informative basis for how to possibly deal with greenhouse gas emissions levels perceived as too high. Which policy levers could be most effective to tackle identified problems? Which policy changes could help to exploit future opportunities that can be anticipated by looking at ToSIA output? The connection of ToSIA output on the FWC sustainability indicators to the targets and thresholds set up in FWC-related policies would at least answer these questions in a rudimentary way and make it easier for the ToSIA interface users to determine policy implications of ToSIA output.

3.3 Advanced policy analysis options (results/outcomes side of ToSIA)

Advanced policy analysis options that partly go beyond the policy analysis within EFORWOOD and could serve as an incitation for future projects similar to EFORWOOD are outlined in this chapter. This is especially true for the analysis of policy outcomes of ToSIA output, whereas analysing its immediate results should be a feasible task within EFORWOOD. Nonetheless, the options presented secondly in this chapter should at least be touched on in the policy analysis section of the ToSIA user interface to show how ToSIA results could further be analysed on a policy level and to at least indicate what the results of these advanced policy analysis options would possibly look like.

3.3.1 Policy results analysis and response options

Subsequent to a closer look on the relation between FWC sustainability indicators, ToSIA output and FWC-related policies, it would be of great value to at least give some consideration to the direct policy effects of ToSIA output (changed indicator values) and how could potentially be responded to problems or opportunities emerging from those results on the policy level.

To formulate the policy results of ToSIA output, the indicator value changes calculated under the baseline and scenario runs in ToSIA at the various points in time are needed (see chapter 3.1.3). Based on this data, the presentation of the policy effects the constellation (reference future/scenario/point in time) would (possibly) induce should imperatively be incorporated into the ToSIA policy analysis section. This means, that this task is based on the connections between policies in the policy database and EFORWOOD scenarios (see chapter 3.2) and further (qualitatively) explores the (possible) implications of these connections on a policy level.

This component of the ToSIA policy analysis section would display the immediate effects of ToSIA output on the policy situation regarding FWC-related policies. The following questions concerning the policy situation under the various scenarios should be answered in this section of the ToSIA policy analysis section:

- What would be the direct policy effects of technological innovations, of changing consumer behaviour, of increased bio energy production or enhanced nature conservation in forestry-wood sector?
- Which targets and thresholds set up in FWC-related policies are met under the particular scenario conditions and which are not?
- Which indicator values point to severe problems meeting these targets and thresholds and which policies are particularly affected by ToSIA output?
- What is to say about the balance of policies affected? In which policy sectors can a need for action be identified and in which regulations are working fine?
- How could, on a policy level, be dealt with unsatisfying results regarding ToSIA output and its immediate effects on the policy situation and the balance of FWC-related policies? Is there a need to respond on the policy level to the depicted developments? How could these response options look like?
- How would stakeholders (possibly) respond to the changed indicator values or policy response options?

The answering of these questions should be implemented within this section of the ToSIA policy analysis section in the form of a descriptive results analysis. For each of the scenarios developed within EFORWOOD there should be a paragraph, accessible e.g. via a pop-up in the policy analysis interface, that descriptively addresses these questions, summarizes policy results of ToSIA output and formulates response options for each scenario.

The last of the bullet points above, the response behaviour of stakeholders, can not be analysed exhaustively but should nonetheless be part of the above mentioned desriptive results analysis. However, based on the indicator value change parameters applied under the baseline and scenario runs in ToSIA (see chapter 3.1.3), some consideration can and should be given also to this issue. The various stakeholders have diverging preferences regarding the EFORWOOD FWC sustainability indicators. These preferences will be explored in collaboration with experts on MCA from M1.5 and stakeholder consultation through M0.1. Based on the preferences of stakeholders regarding the FWC SI, a matrix can be set up showing the direction (positive or negative) and intensity of response of every stakeholder to every indicator. Combined with the indicator value change parameters under the scenarios in ToSIA, informed assumptions can be made about how stakeholders would react to ToSIA results (changed indicator values) under the various scenarios. These assumptions can be summarized descriptively for every scenario mentioning the stakeholders most affected (positively or negatively) and to which implications this might lead, i.e. how these stakeholders would (possibly) respond to the situation constructed under a particular scenario. Based on this, it can also be assumed in which manner a particular stakeholder would react to policy response options developed in the policy analysis section of the ToSIA user interface.

Answering the questions above, or at least giving hints at how could possibly be dealt with ToSIA results on a policy level, is a major task to be performed within the ToSIA policy analysis section. As a decision-support system, ToSIA should address these questions based on the ToSIA output data and help stakeholders, especially policy makers in this case, developing response strategies and policies for ensuring FWC sustainability.

3.3.2 Policy outcomes analysis: impact analysis and risk assessment

a) Impact Analysis:

A decision-support system like the ToSIA tool within EFORWOOD should also be oriented towards the policy impacts of ToSIA output. A policy impact analysis enables decision makers to continuously formulate policies that take into account the existing uncertainties, and to refine policies as new scientific information is developed. It should be designed to provide a framework for integrating and evaluating the best available information from the diverse elements that influence FWC sustainability.

A policy impact analysis incorporated into the policy evaluation framework should capture the key scientific and economic uncertainties, and also reflect the wide range of possible outcomes of alternative policy actions. The impact analysis should allow a wide range of scientific and economic assumptions or scenarios to be represented and explored. Regarding the usability, the policy evaluation framework should be as scientifically detailed as necessary and as simple to use as possible, as this arrangement provides transparency, which also helps policy makers understand and interpret the results.

Although an exhaustive impact analysis of ToSIA output on FWC-related policies will not be feasible or intended within the EFORWOOD project, a at least rudimentary impact analysis on a policy level should be incorporated into the ToSIA policy analysis section. It should be designed to help investigate and answer the following questions:

- What could be the longer-term effects of ToSIA output on a policy level?
- What are the interactions between the various policies concerning FWC sustainability?
- How could reactions to longer-term effects of ToSIA output on a policy level look like?
- What are the policy implications of thresholds or thresholds set up in FWC-related policies?

At least hints on how these questions could be answered could be given within the ToSIA policy analysis section. Based on ToSIA output (especially if targets or thresholds are met or not?)

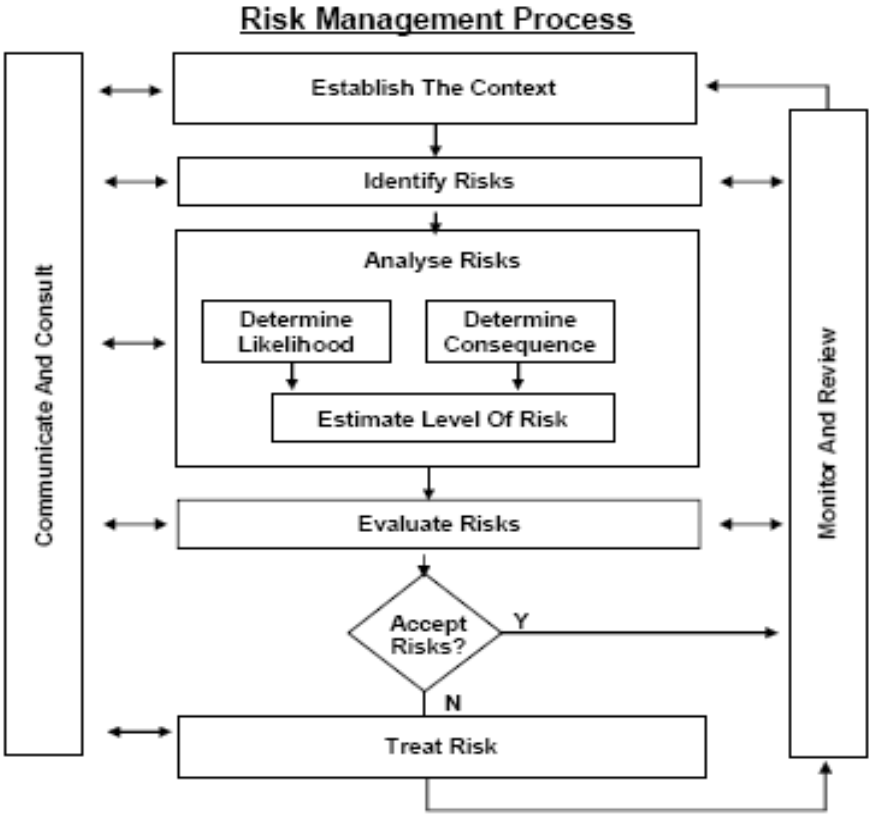
combined with theories on the policy process (agenda setting, policy formulation, policy implementation) answering the above questions at least rudimentarily should possible and be incorporated into the ToSIA policy analysis section.

If feasible and conducted in the right manner, an impact analysis that explores a broader range of longer-term effects of ToSIA output on the policy level would provide a flexible and powerful tool for policy makers to investigate the relationships between the key problems or opportunities and available policy alternatives in the European forestry-wood sector.

b) Risk assessment

Learning how to manage risk effectively enables decision-makers (and other stakeholders) to achieve improved outcomes by identifying and analysing a wider range of issues and providing a systematic way to make informed decisions. Figure 3.9 (see next page) shows the components of a risk management process[6].

Figure 3.9: Diagrammatic representation of Risk Management



The FWC SIA can also be considered some kind of risk assessment, as it is supposed to display the current and future conditions of the European forestry-wood sector and what problems may have to be dealt with now and in the future. The remaining challenge is now to evaluate the effectiveness of potential adaptive responses to these risks. This will be hardly possible within the policy analysis interface of the EFORWOOD project as it is a very broadly designed project with lots of policies involved. Nonetheless, a complete policy-oriented assessment should try to lay out the most important policy adaptation options and the associated risks.

[6] For a more detailed description of risk assessment and management see the Guidelines for Environmental Risk Assessment and Management of the UK Department for Environment, Food and Rural Affairs.

So what does this mean for a possible incorporation of risk management option into the EFORWOOD policy analysis section? As can be seen, a proper risk management is a complex mission that can hardly be accomplished within ToSIA in its entirety. Some of the preconditions for a sound risk management are clearly not within the scope of the EFORWOOD policy analysis section. But still some of its components are. This refers to the mainly technical issues displayed in the upper figure, i.e.

- the identification of risks and
- the analysis of risks (risk level).

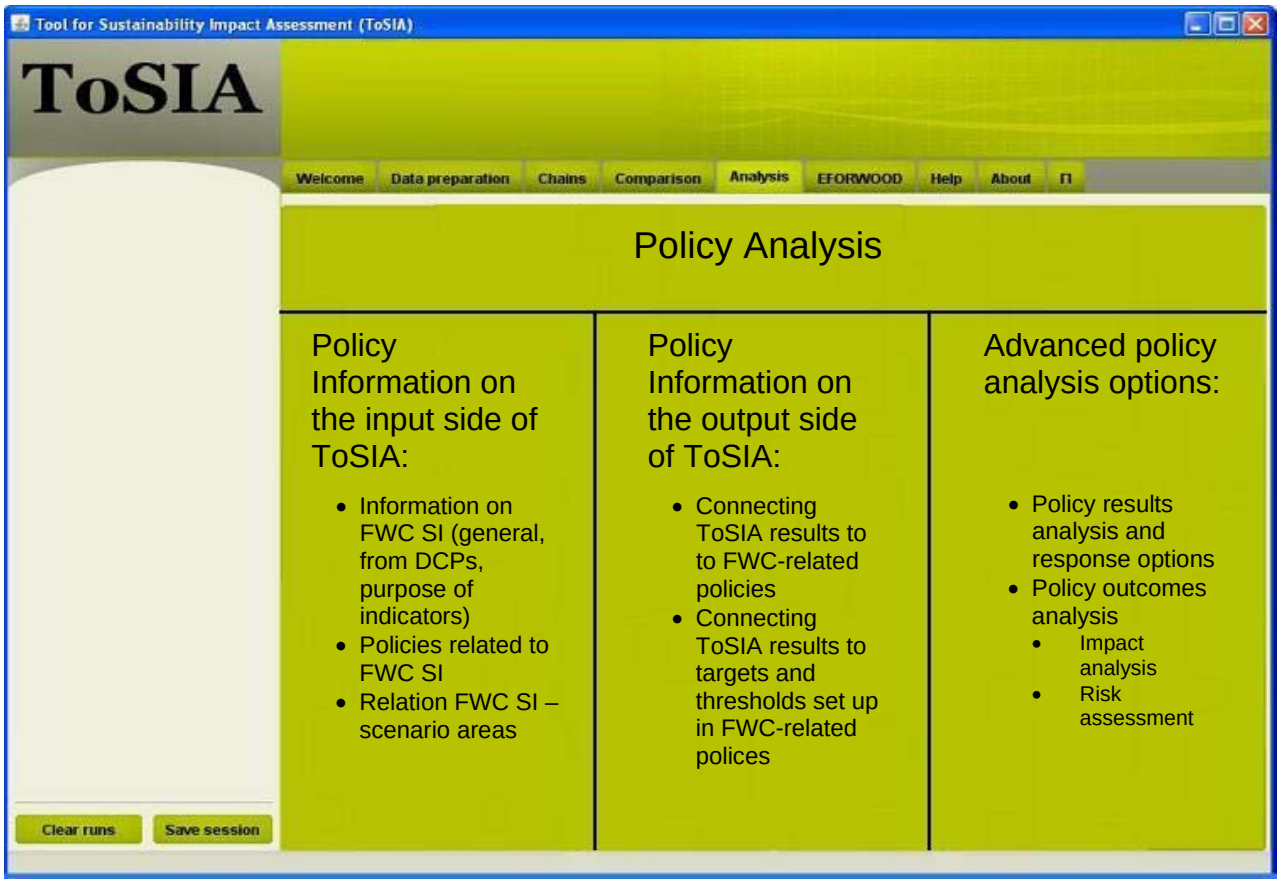
ToSIA can deliver the quantitative data (indicator values, ToSIA output data) that is needed for at least rudimentarily fulfilling these tasks. Risks identification can de done via looking at the scenario effects on indicator values (see chapter 3.1.3). Risks can be identified where indicator values are heavily deflecting from their initial values. Especially the targets and thresholds set up in FWC-related policies are helpful in determining the risk level. Do indicator values go beyond/lag behind these thresholds/targets? And if they do so: how far do they go beyond or lag behind? The estimation of risk levels is thus possible within ToSIA. The results of this rudimentary risk assessment could be summarized in this section of the ToSIA policy analysis interface. The question of whether identified and estimated levels of risk concerning FWC sustainability will or should lead to policy action (treat risk?) and how this treatment will or should look like is, however, clearly out of scope of the ToSIA policy analysis interface, as this clearly is the task of society and their representatives.

Despite the existence of uncertainties, it should be the goal of a policy-oriented project like EFORWOOD to evaluate the consequences of current FWC-related regulations. Once the risks have been identified, an assessment should identify and analyse appropriate adaptive responses to improve society's ability to respond effectively to risks and opportunities as they emerge. Unless this additional analysis is done, the insights gained from the FWC SIA will have limited usefulness for FWC-related policy decisions in the European Union.

3.4 Presentation option for the policy analysis section within the ToSIA user interface

The three policy analysis subsections depicted in this chapter, i.e. the input of policy and indicator information, the information on interpreting the output of ToSIA calculations, and the hint at advanced policy analysis options, should thus be integrated into the policy analysis interface. This means that by clicking the policy analysis button pictured in the figure on page 7, the policy analysis interface should display these subsections via clickable buttons or fields (as it is adumbrated in figure 3.10).

Figure 3.10: Presentation option for the policy analysis section within the ToSIA user interface



Under the tabs denoted in the upper figure the user of the policy analysis interface should get access to the subsections delineated in chapters 3.1, 3.2, and 3.3.

4 Concluding remark

Assessment is an ongoing, iterative *process* that yields specific assessment *products* (e.g. the policy analysis interface) at various points in time. Given the extensive scientific and socioeconomic uncertainties surrounding the issue, it is unlikely that any particular assessment report will answer all of the questions posed by decision-makers. It is therefore important that each assessment tool identifies and prioritizes remaining key research gaps. When successfully implemented, such a process permits scientific research to identify new risks or opportunities and provide information and data required for an assessment. At the same time, assessments identify and prioritize research needs that must be filled in order to better answer questions being asked by the stakeholder community.

Policy-oriented assessments are an important tool for addressing complex problems, be it an economic, social or environmental one. So just assessing the current state of FWC sustainability would not unfold all the potential of a policy-oriented assessment. Further effort must be made to translate the insights gained from the initial stages of assessment into guidance for policy makers. Ultimately, the assessments must help policy makers determine what they should do differently — or the same — about FWC-related policies (response options). Therefore assessment tools shall not be regarded simply as technical/scientific applications but as tools for communication and bridging gaps between the research community and decision-makers.

Good science itself is needed but is insufficient to drive informed decision-making. It has to be translated into a form for others to use and to improve decision-making. Care must be taken to respect the boundary between assessment and policy formation. Policy-focused assessment's goal is to inform decision-makers, not to make specific policy recommendations or decisions. Policy decisions depend on more than the science, and involve societal attitudes towards risk, social values and other factors affecting decision-making. But the information provided by policy-focused assessments is invaluable. Scientists should aim to provide clear recommendations for policy within legislative frameworks. They should not be overly cautious. Policy generally proceeds with or without scientific advice. Providing comprehensible scientific advice for policy from current knowledge, with some caveats if necessary, is better than providing no advice because of uncertainty. An informed decision is always better than an uninformed decision.

At best, ToSIA can enhance a lively traffic between the two worlds of science and policy within the realm of FWC sustainability. It could eventually serve as a unifying boundary object that connects the interests of many different actors to each other and thereby encourages actors from different fields of expertise to become part of the same project, focusing on the same objectives.

To summarise, a model like ToSIA should at best fulfil three different goals. The model can be a policy tool, developed and used in order to create more fair, effect-based and cost-effective strategies to enhance FWC sustainability. It is also a communication tool - a bridge - by which complex economic, social, and environmental issues could be made understandable for policy makers and non-scientists in general. Lastly, ToSIA should be a scientific tool, a way to mobilise heterogeneous scientific practices to speak with a unanimous voice in a scientifically defensible way.