EFORWOOD
Tools for Sustainability Impact Assessment

Data platform and data set for reference forest types

Veronique Cucchi, Karl Tojic, Philipp Duncker, Philipp Weiner and Heinrich Spiecker

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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

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EFORWOOD

Sustainability Impact Assessment of the Forestry - Wood Chain

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EFORWOOD

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Data platform and data set for reference forest types

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Dissemination Level		
PU	Public	X
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)	

PD2.1.4: Data platform and data set for reference forest types

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PD2.1.4: Data platform and data set for reference forest types.doc

Abstract: Reference forest types are described and documented in EFORWOOD (PD 2.1.1) for their current situation, and for their future conditions which will be derived from various simulations of forest management alternatives (D 2.1.3). In order to enable an efficient data management, a database platform has been established to collect data and indicator values from the reference forests and related main species. The database will be used to develop analysises of different scenarios independent from the used models and as an interface to transfer directly data to the EFORWOOD and ToSIA database. The structure of the database is described in the following report.

Key words: database, data, forest management alternatives, scenarios, regional cases

Content

Introduction

M2 describes the conditions of reference forest with various attributes, and also simulates the future conditions as well as timber flows for various scenarios. These are big amounts of information which need to be managed with a database to allow other colleagues to work with the data. This is especially important for the data transfer between M2 and M1 as well as M2 and M3, which need the data from M2 to run ToSIA and for further analysises.
This document describes the current M2 database structure, and helps to understand the functions of the database, thus makes some comments and suggestions for improvement of the structure following our aims in the future. The type of stored data is based on the excel spreadsheet developed by WP2.1 used for describing the reference forest types at reference year 2005.
The whole database contains 38 sets of data and additional Meta data descring source and quality of data, as well as important commentaries.
The data sets can be categorized in following subsections:

Data subsections and their correspondingdata sets				
Forest area	Forest Growth	Forest stocking	Forest quality	Deadwood & Damages
Area of regional case	Increment in timber stock by tree species and age class	Timber stock by tree species and tree age class	Average tree height by tree species and age class	Volume of deadwood by type of deadwood
Forested area	Increment in timber stock by tree species and breast height diameter class	Timber stock by tree species and breast height diameter	Average tree height by tree species and dbh class	Share of trees WITH skidding or felling damage by tree species group and dbh class
Forest area by ownership type	Timber stock of the cut stand by tree species and age class	Timber stock by slope of site and tree species	Quality in general terms	Share of trees WITH recent bark-peeling damages by tree species group and development phase
Forest area by ownership size class	Timber stock of the cut stand by tree species and dbh class	No of trunks by tree species and age class	Quality in general terms	
Forest Area by Tree species		No of trunks by tree species and dbh class	Height of crown base by tree species and age class	
Forest area by main tree species and tree age class		Basal area by tree species and age class	Height of crown base by tree species and dbh class	
Forest area by main tree species and admixture		Basal area by tree species and dbh class	Area of pruned trees	
Forest area by main tree species and forest cover structure		dbh of the mean basal area tree by tree species and age class	Number of pruned trees in pruned stands	
Area of young forest cover by main tree species and type of regeneration		dbh of the mean basal area tree by tree species and dbh class		
Area of protected forests by tree species		Timber stock by tree species and age class		
Area of forest with predominately protective function by main tree species		Timber stock by tree species and dbh class		
Forest area by main tree species and naturalness (tree species composition of main forest cover)				
Forest area by tree species group and slope of site				

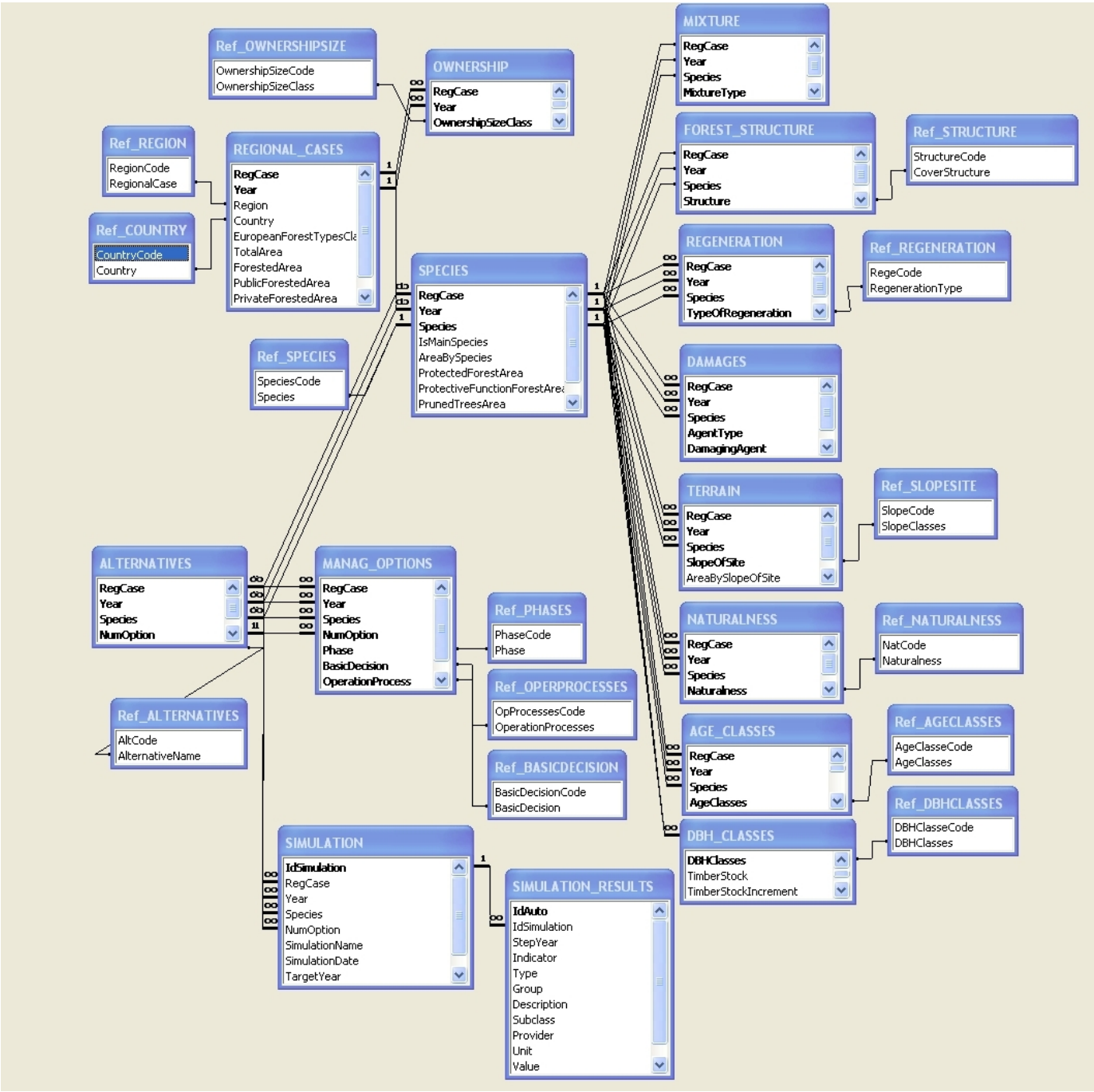
These data sets enable the modelling of the forest management alternatives in scenarios, and also allow comparing the results of the modelling to the base line 2005 (these data sets). It is possible as well to calculate indicator values related to forest resource management with these data sets, which are necessary to run ToSIA. In the best case scenario the results of the models and simulations (or a combination of multiple ones) will have the same detail like the original data and will allow for a total comparison between 2005 and the modelled state of the forest in a regional case.

Database structure

The main units in the database are first the Regional Case (level 1) and second the Species inside each Regional case (level 2). There is a filiation between species and RC (a species cannot exist without being associated to a RC). Each bold combination is unique (see following schema on database general structure). “Year” is the reference year for Eforwood (2005). There is a third level according to level of stored data.

For the main tables, name is always in capital letters. The other tables are lookup lists (made for list of choices), they can be recognized easily as the name always starts with “Ref_” prefix. These tables allow adding or modifying choices in the list with an automatic repercussion on the other tables and data.
All the tables and fields in the database are described (see below).

Forest type (“predominantly conifers”, “predominantly broadleaved”, and “mixed types”) is still being included in the database as well as Deadwood (for instance Volume of deadwood by type of deadwood - standing and lying - and forest type).
Lookup lists tables are helpful for homogeneous classes in the various regional cases and species, particularly for numerical classes as DBH, Age, Slope Site and so on.



M2 Database general structure

Tables and fields description

Table REGIONAL_CASES

Level 1 - Regional cases description

	RegCase	Year	Region	Country	EuropeanForestTypesClass	TotalArea	ForestedArea
+	ALPS	2005	Alpine region	Austria			
+	AQUI	2005	Aquitaine	France			
+	BADE	2005	Baden-Württemberg	Germany			
+	CATA	2005	Catalonia	Spain			
+	LORR	2005	Lorraine	France			
+	PORT	2005	Portugal	Portugal			
+	SCOT	2005	Scotland	Great Britain			
+	SILE	2005	Silesia	Poland			
+	VAST	2005	Västerbotten	Sweden			
*		0				0	0

PublicForestedArea	PrivateForestedArea	ProtectedArea
0	0	0

Field RegCase: text - a short name indicating the regional case
Field region: text (lookup list from Ref_REGION table)
Field Year: numerical - the reference year for Eforwood (2005)
Field EuropeanForestTypesClass: text (lookup list) – see EEA Technical report, No9, 2006
Fields ForestedArea to ProtectedArea: numerical - in ha

Table SPECIES

Level 2 - Species description (for each regional case, many possible species)

	RegCase	Year	Species	IsMainSpecies	AreaBySpecies	ProtectedForestArea	ProtectiveFunctionForestArea	PrunedTreesArea	NbOfPrunedTrees
+	AQUI	2005	Pinus pinaster	☑					
		0		▩					

Field Species: text (lookup list from Ref_SPECIES table)
Field IsMainSpecies: Boolean – should be activated if it is the main species in covered area for the considered regional case
Fields AreaBySpecies of PrunedTreesArea: numerical – ha
Field NbOfPrunedTrees: numerical – number of trees per ha
Additional information on « Conifer » or « Broadleaved » for each species species to follow the indicators definitions will be added in the future.

Table OWNERSHIP

Level 2 - Ownership description (for each regional case, multiple possible ownership classes)

	RegCase	Year	OwnershipSizeClass	AreaByOwnershipSizeClass
▶		0		

Field OwnershipSizeClass: text (lookup list from Ref_OWNERSHIPSIZE table)
Field AreaByOwnershipSizeClass: numerical – ha

Table MIXTURE

Level 3 – Type of cover description (for each regional case and species, one or two possible mixture types)

	RegCase	Year	Species	MixtureType	AreaBySpeciesAndMixtureType
▶	ALPS	2005	Picea abies	Mixed	3168
	ALPS	2005	Picea abies	Pure	4080
	AQUI	2005	Pinus pinaster	Pure	0
	BADE	2005	Fagus sylvatica	Mixed	262263
	BADE	2005	Fagus sylvatica	Pure	26506
	BADE	2005	Picea abies	Mixed	133632

Field MixtureType: list of choice, “pure” or “mixed”.
Field AreBySpeciesAndMixtureType: numerical – ha

Table FOREST_STRUCTURE

Level 3 – Forest structure description (for each regional case and species, many possible structures)

	RegCase	Year	Species	Structure	AreaBySpeciesAndStructure
▶	AQUI	2005	Pinus pinaster	one-layered	0
*		0			0

Field Structure: text (lookup list from Ref_STRUCTURE table)
Field AreaBySpeciesAndStructure: numerical – ha

Table REGENERATION

	RegCase	Year	Species	TypeOfRegeneration	AreaByRegeneration
▶		0			0

Level 3 – Type of regeneration description (for each regional case and species, many possible regeneration types)

Field TypeOfRegeneration: text (lookup list from Ref_STRUCTURE table)
Field AreaByRegeneration: numerical – ha

Table DAMAGES

Level 3 – Damages description (for each regional case and species, multiple possible damages)

	RegCase	Year	Species	AgentType	DamagingAgent	PerOfTreesDamaged
▶		0				

Field AgentType: text, lookup list will be created – abiotic/biotic/human induced
Field DamagingAgent: text, lookup list will be created – grazing, fungi, storm, wind, fire, atmospheric pollutants….
Field PerOfTreesDamaged: numerical – percentage of trees

Table TERRAIN

	RegCase	Year	Species	SlopeOfSite	AreaBySlopeOfSite	TimberStockBySlopeOfSite
▶		0			0	0

Level 3 – Terrain description, mainly slope for M3 considerations (for each regional case and species, many possible type of terrain)

Field SlopeOfSite: text (lookup list from Ref_SLOPESITE table)
Field AreaBySlopeOfSite: numerical - ha
Field TimberStockBySlopeOfSite: numerical – cubic meter per ha

Table NATURALNESS

Level 3 – Naturalness description (for each regional case and species, many possible type of naturalness)

	RegCase	Year	Species	Naturalness	AreaByNaturalness
▶		0			0

Field Naturalness: text (lookup list from Ref_NATURALNESS table)
Field AreaByNaturalness: numerical - ha

Table AGES_CLASSES

Level 3 –Description of age structure (for each regional case and species, many possible age classes)

	RegCase	Year	Species	AgeClasses	AreaBySpeciesAndAgeClasses	TimberStock	TimberStockIncrement	TimberStockOfCutStand	NbOfTrunks
▶		0			0	0	0	0	0

BasalArea	DBHOfMeanBA	AverageTreeHeight	QualityA	QualityB	QualityC	QualityD	HeightOfCrownBase
0	0	0	0	0	0	0	0

Field AgeClasses: text (lookup list from Ref_AGECLASSES table)
Field AreaBySpeciesAndAgeClasses: numerical – ha
Field TimberStock: numerical – cubic meter
Field TimberStockIncrement: numerical – cubic meter per ha per year

Field TimberStockOfCutStand: numerical – cubic meter per ha per year
Field NbOfTrunks: numerical – nb per ha
Field BasalArea: m^2 per ha
Field DBHOfMeanBA: dbh of the mean basal area tree by tree species and age class – numerical - cm
Field AverageTreeHeight: Average tree height by tree species and age class – numerical - meter
Field QualityA to QualityD: numerical – percentage of trees
Field HeightOfCrownBase: Height of crown base by tree species and age class - numerical - meter

Table DBH_CLASSES

Level 3 –Description of diameter structure (for each regional case and species, many possible diameter classes)

	RegCase	Year	Species	DBHClasses	TimberStock	TimberStockIncrement	TimberStockOfCutStand	NbOfTrunks	BasalArea	DBHOfMeanBA
▶		0			0	0	0	0	0	0

AverageTreeHeight	QualityA	QualityB	QualityC	QualityD	HeightOfCrownBase
0	0	0	0	0	0

Field DBHClasses: text (lookup list from Ref_DBHCLASSES table)
Field TimberStock: numerical – cubic meter
Field TimberStockIncrement: numerical – cubic meter per ha per year
Field TimberStockOfCutStand: numerical – cubic meter per ha per year
Field NbOfTrunks: numerical – nb per ha
Field BasalArea: m^2 per ha
Field DBHOfMeanBA: dbh of the mean basal area tree by tree species and DBH class – numerical - cm
Field AverageTreeHeight: Average tree height by tree species and DBH class – numerical - meter
Field QualityA to QualityD: numerical – percentage of trees
Field HeightOfCrownBase: Height of crown base by tree species and DBH class - numerical - meter

The two following tables allow storage of management alternatives and management options description. They are based on D2.1.3 describing management alternatives and silvicultural options.

Table ALTERNATIVES

Level 3 – List of Management Options according to alternatives for each regional case and species

		RegCase	Year	Species	NumOption	ManagementAlternative
▶	+	AQUI	2005	Pinus pinaster	1	Intensive even-aged
✳			0			

Field NumOption: text - number given to a defined option
Field ManagementAlternative: text (lookup list from Ref_ALTERNATIVES table)

One option or more for each regional case, species and type of management alternative is possible.

Table MANAG_OPTIONS

Level 4 – Description of each management options for each regional case and species

	RegCase	Year	Species	NumOption	Phase	BasicDecision	OperationProcess	Details
▶	AQUI	2005	Pinus pinaster	1	Regeneration	selection of tree species	Genetic selection	
	AQUI	2005	Pinus pinaster	1	Regeneration	site preparation	Cleaning	
	AQUI	2005	Pinus pinaster	1	Regeneration	site preparation	Drainage	
	AQUI	2005	Pinus pinaster	1	Regeneration	site preparation	Ploughing, harrowing...	strip
	AQUI	2005	Pinus pinaster	1	Regeneration	type of regeneration	Planting	1000-1100 t/ha
*		0						

Field Phase: text (lookup list from Ref_PHASES table)
Field BasicDecision: text (lookup list from Ref_BASICDECISION table)
Field OperationProcess: (lookup list from Ref_OPERPROCESS table)
Field Details: text free, more details on the corresponding process could be added.
You could have one operation process or more for each regional case, species, option number, phase and basic decision.

The two following tables deal with simulation results storage as imagined at present.

Table SIMULATIONS

	IdSimulation	RegCase	Year	Species	NumOption	SimulationName	SimulationDate	TargetYear	RegionalSimulator
▶	(NuméroAuto)		0					0	

Field SimulationName: text – allow giving a name to the simulation performed
Field SimulationDate: date – probably provided by the regional simulator
Field TargetYear: date at the end of the simulation - probably provided by the regional simulator
Field RegionalSimulator: text – name of the regional simulator used to performed the simulation
Additional information on data provider will be included (person name, telephone number, etc…) and a table for simulators' description. If each simulation is a combination of two (or more) management alternatives/options (in percentage), a field for describing this characteristic will be added.

Table SIMULATION_RESULTS

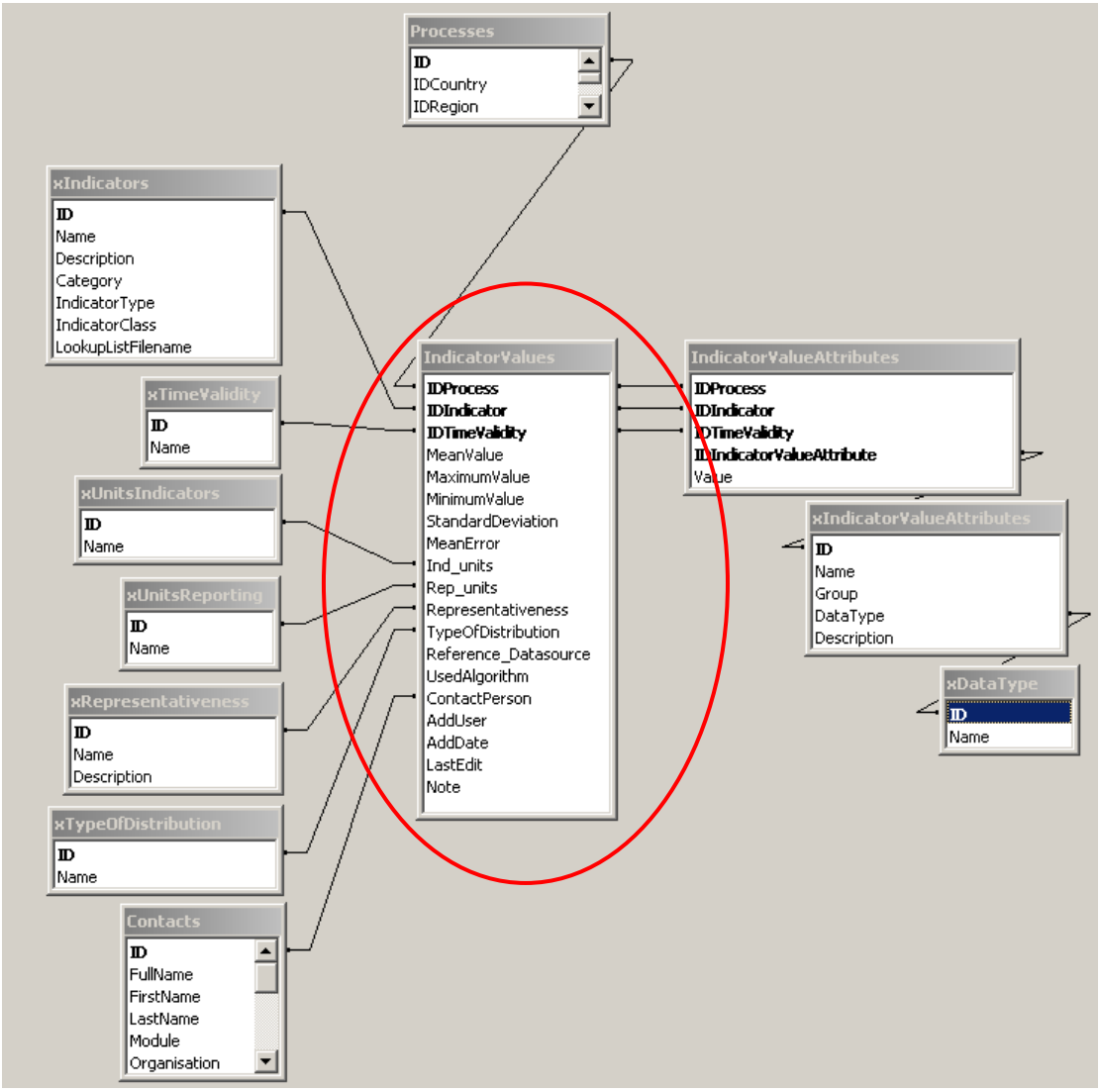
This table allows the storage of the results obtained by simulations. Each value is related to an identified simulation.

	IdAuto	IdSimulation	StepYear	Indicator	Type	Group	Description	Subclass	Provider	Unit	Value	Precision
▶		0										

Field Step year: date or text – year or date at each step of the simulation, should be provided by the regional simulator.

Field Indicator: text – lookup list will be created based on indicator list (Whole chain, lead plus and specific indicators), the same list hosted by the M1 database.
Field Type: text - lookup list will be created (Whole chain, Lead+, Specific)
Field Group: text - lookup list will be created (Economic, Environmental, Social)
Field Description: text – description of the indicator according to Eforwood
Field Subclass: text - Subclass for each indicator (see Indicators description).
Field Provider: text – name of the data provider
Field Unit: text - lookup list will be created
Field Value: numerical – indicator value obtained using regional simulator
Field Precision: text – precision for the value

Some additional fields will be added to make the link with the M1 database table, see M1 table indicators structure below.



M1 Database indicators table