



Deliverable D 3.3

Development and modification of support tools for indicators





Funded by the 7th Framework
Programme of the European Union

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ACKNOWLEDGEMENT

This document is a deliverable of the ECODISTR-ICT project, which has received funding from the European Union’s Seventh Programme for research, technological development and demonstration under grant agreement No 608913.

PROJECT DATA		
Project Acronym	ECODISTR-ICT	
Project Full Title	Integrated decision support tool for retrofit and renewal towards sustainable districts	
Call Identifier	FP7-2013-NMP-ENV-EeB	
Grant Agreement	608913	
Coordinator	VITO (BE)	Vlaamse Instelling voor Technologisch Onderzoek nv
Consortium partners	SP (SE)	Sveriges Tekniska Forskningsinstitut ab
	CSTB (FR)	Centre Scientifique et Technique du Batiment
	TNO (NL)	Nederlandse organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
	VABI (NL)	Vabi Software bv
	STRUSOFT (SE)	Structural Design Software in Europe ab
	WHITE (SE)	White Arkitekter Aktiebolag
	OMGEVING(BE)	Multiprofessionele Ontwerpers- en Architectenvennootschap cvba
	BIPOLAIRE (ES)	Bipolaire Arquitectos slp
	ARUP (NL)	Arup bv
Funding Scheme	Collaborative Project	
Project Duration	36 months	
Starting Date	01/12/2013	
Website	http://ecodistr-ict.eu/	

DELIVERABLE DATA	
Title	Development and modification of support tools for indicators
Description	Deliverable D 3.3 from WP3 – Decision support modules for indicators
Lead Beneficiary	SP
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Deliverable Nature	R – Report
Dissemination level	PU – Public
Submission date	31 July 2016
Status	Delivered

DOCUMENT HISTORY			
Version	Date	Author/Reviewer	Description
0.1	06/07/2016	Katarina Lorentzon	First draft
0.2	07/07/2016	Carl-Magnus Capener	Updated version
0.3	08/07/2016	Katarina Lorentzon	Second draft
0.4	13/07/2016	Björn Bracke Johnny Kronvall	Updated version
1.0	26/07/2016	Katarina Lorentzon	Final version

ABSTRACT
<p>Short description of Deliverable:</p> <p>Deliverable D3.3 consists of a description of the process by which the previously identified decision support tools have been developed and/or modified for the particular needs in the different case studies. The calculation modules have been developed and/or modified to answer to the interests expressed by the stakeholders in the different cases, but also to fulfil the overall project case common KPIs. In addition, it describes very briefly non-calculation modules that will enable the targeted holistic functionality of the IDSS that to a large extent have been developed in other work packages.</p>

EXECUTIVE SUMMARY

The Integrated Decision Support System (IDSS) developed in ECODISTR-ICT will help decision makers select the best strategy to increase energy and resource efficiency and the sustainability performance, both on building and on district level. Utilising the connected decision support modules, the IDSS will enable assessment and evaluation of these aspects and their incorporation in district retrofitting and development projects in a multistakeholder decision making process. This document describes the process by which the previously identified decision support tools have been developed and/or modified for the particular needs in the different case studies, supporting the sustainability aspects covered by the proposed KPIs. The calculation modules have been developed and/or modified to answer to the interests expressed by the stakeholders in the different cases, but also to fulfil the overall project case common KPIs. In addition, it describes very briefly non-calculation modules that will enable the targeted holistic functionality of the IDSS that to a large extent have been developed in other work packages.

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Glossary / list of acronyms

Word / acronym	Definition
Calculation Module	Computer application that calculates the score of one or more KPIs
Calculation tool	Software for calculation or simulation of KPIs
District	A subdivision of a city or municipality. In this project we expect a district to encompass +- 1000 buildings.
DoW	Description of Work, our project description which is part of our contract with the EU
ICT	Information and communication technologies
IDSS	Integrated Decision Support System
IDST	Integrated Decision Support Tool. Abbreviated as IDST, the part of the whole IDSS system (see Module)
KPI	Key performance indicator`, a measurable indicator for one aspect of the users' ambition
KPI Value	Required or predicted score of a KPI
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
MCMSMV	Multicriteria, multistakeholder, multivariant
Module	An independent functional part of the IDSS. A Module can consist of several coherent components e.g. calculation model, IMB client, data storage, assessment of variants visualization (in order to gather, create, change, present, and/or analyse data)
ROI	Return on Investment
Stakeholder	A person, group or organization that has interest or concern in an organization. Stakeholders can affect or be affected by the organization's actions, objectives and policies.
WP	Work Package

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1 INTRODUCTION

1.1 PURPOSE, INTENDED AUDIENCE AND SCOPE

The purpose of this deliverable is to describe the process with which the previously identified decision support tools have been developed and/or modified for the particular needs in the different case studies, supporting the sustainability aspects covered by the proposed KPIs.

The primary intended audience of this report are the participants of the ECODISTR-ICT project. In addition, parties and stakeholders in the close vicinity of the project and its case studies are also addressed.

The scope of the document is the work carried out in task T3.4 and its connections to data management (WP2) and development of the IDSS framework (WP4).

1.2 APPLICABLE DOCUMENTS

- ECODISTR-ICT Description of Work (DoW, December 2012; amendment January 2016)
- ECODISTR-ICT Deliverable D3.2 Scheme of chosen and verified decision support tools for indicators
- ECODISTR-ICT Deliverable D5.1 A road map for the analysis of the case studies
- ECODISTR-ICT Deliverable D5.2 Brief progress reports to WP 2, 3 and 4 on stakeholder experiences on (prototypes of) the ECODISTR-ICT tool

The public deliverables and reports can be found at <http://ecodistr-ict.eu/>.

1.3 PROJECT CONTEXT

This deliverable is the third result of work package 3, *WP3 Decision support modules for indicators* of the ECODISTR-ICT project. WP3 mainly provides input to *WP4 Integrated decision support system* but also to *WP2 Methods for data collection*. The structure of the ECODISTR-ICT work packages is shown in Figure 1 below.

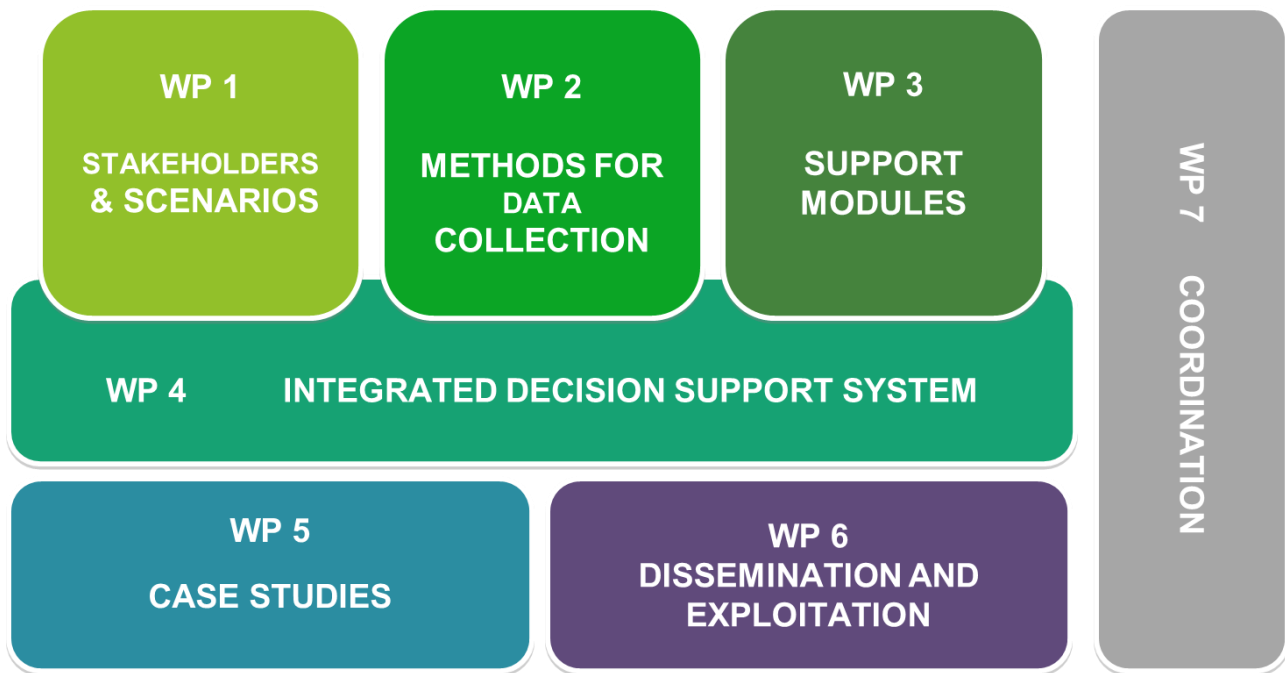


Figure 1 The ECODISTR-ICT work package structure as described in the DoW.

WP3 “Decision support modules for indicators” contains five tasks:

- Task 3.1 Overview and inventory of existing decision support tools suitable for district renovation
- Task 3.2 Evaluation of decision support tools and sub-tools
- Task 3.3 Identification of “lack of support tools” and develop an action plan for solutions
- Task 3.4 Development of needed support tools to fill in gaps
- Task 3.5 Evidence-based verification of decision support tools for indicators

This deliverable is the result of task T3.4 Development of needed support tools to fill in gaps.

To complete the project context in Figure 1, Figure 2 gives an overview of the interactions and dependencies between different components in the IDSS and, in particular, the integration of different support modules, represented by blue Lego pieces, into the IDSS.

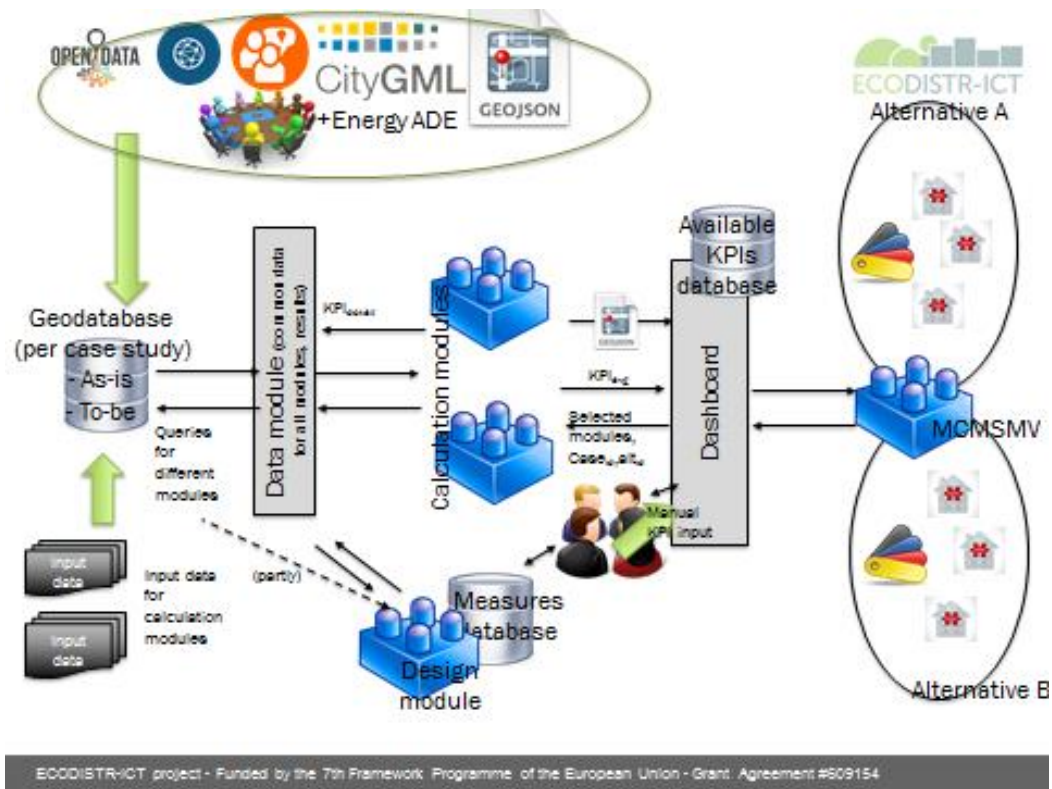


Figure 2 The support modules, represented by blue Lego pieces, in the IDSS structure

1.4 READING GUIDE

This document was written after the finalisation of three of the in total five case studies but before and during the preparations for the two last case studies, when the development and modification of support tools still was ongoing. Hence, there is a mixed use of past and present tense in the text.

Chapter 2 describes the modification and development process, final selection of key performance indicators and modules per case study.

Chapter 3 describes non-calculation/support modules.

Chapter 4 provides conclusions and outlines planned future work.

This document could be read by the ECODISTR-ICT participants or project stakeholders.



Integrated decision support tool for retrofit and renewal towards sustainable districts

2 MODIFICATION AND DEVELOPMENT PROCESS

2.1 PURPOSE

The Integrated Decision Support System (IDSS) developed in ECODISTR-ICT will help decision makers to select the best strategy to increase energy and resource efficiency and the sustainability performance, both on building and on district level. Utilising connected or integrated decision support modules, developed or modified in WP3, the IDSS will enable assessment and evaluation of these aspects and their incorporation in district retrofitting and development projects in a multistakeholder decision making process, based on a selection of KPIs. Hence, the support modules are able to calculate and/or visualise these KPIs.

2.2 SELECTION OF ECODISTR-ICT PRIORITIZED AND CASE COMMON KPIs

As mentioned in D3.2, the selection of prioritized and case common KPIs was made at the annual ECODISTR-ICT meeting held in December 2014 in Valencia. Five case common types of KPIs were agreed upon:

- Energy performance of buildings (e.g. kWh/m², year)
- Renewable energy production and/or use (%)
- Return on investment (years) /Life cycle cost (€/year)
- Affordability for tenants (e.g. overall housing costs)
- Availability/Level of services, including (e.g. average distance to):
 - Services (public facilities, shops)
 - Mobility
 - Green
 - Safety
 - Employment
 - Health

These types of KPIs were initially used as the “common denominator” at the beginning of each case study. However, considering diverging interests from stakeholders and, in some cases, limited data availability, exceptions to this rule were made after initial stakeholder sessions.

2.3 ADDITION OF CASE SPECIFIC KPIs

In addition to the five common KPIs, case specific KPIs were to be introduced and supported by coupled calculation modules. As presented in D3.2, and referring to the annual ECODISTR-ICT meeting held in December 2014 in Valencia, these KPIs were:

- Rotterdam
 - water retention (% surface permeability)
 - inclusive decision making
- Valencia

- biotope area factor
- green spaces per capita
- thermal comfort
- life cycle assessment (reduction of the carbon footprint)
- coverage of basic social services
- Stockholm
 - democratic capacity/inclusive decision making
 - daylight access
- Warsaw
 - modal split
 - contribution to rating
 - tools/labelling
- Antwerp:
 - housing appropriateness (housing typology in relation to capacities of residents)
 - employment

2.4 FINAL SELECTIONS OF KPIS

Both the case common and the case specific KPIS were reconsidered and further specified in the initial phase of each case study, to ensure relevance to and commitment from stakeholders. Furthermore, insights gained during previous case study/studies were also taken into account, e.g. the need for limiting the number of KPIS both for pedagogic reasons and due to restrictions in time scheduled for stakeholder sessions, resources for data collection and data availability.

In Table 1, the calculation modules developed or modified in WP3, in close relation with WP2 and WP4, and the KPIS that were calculated or will be calculated in each case study are listed using the actual level of integration of the modules in the IDSS:

- S1 Using expert opinion to estimate scores; use qualitative KPIS to add their scores to the process
- S2 Use modules separately from IDSS; use qualitative KPIS to add their scores to the process; view graphical output of these modules in IDSS
- S3 Use modules separately from IDSS; view graphical output of these modules in IDSS; use output processing module to calculate KPIS from module results
- S4 Completely connected to IDSS

The targeted level of final integration is S4 for modules that are freeware and/or entirely developed within the project, while the targeted level of integration for other modules is S2 or S3.

The calculation modules have been described in D3.2 Scheme of chosen and verified decision support tools for indicators, except for the following tools that were developed later and specifically for the needs in the project:

- SP Energy tool
- SP Affordability tool
- Arup mobility tool

These additional tools will be described in a future deliverable (D3.4).

Table 1 Final selection of KPIs and modules per case study

Type of KPI	Module	KPI	Unit	R	V	S	W	A
Energy	Vabi Asset Policy	Gas consumption	m ³ /m ² , dwelling, year	S2				
		Electricity use	kWh/m ² , dwelling, year	S2				
		Energy label	---	S2				
	Dimosim	Total energy consumption	kWh/m ² , year		S2/3 *			
		Total energy consumption for heating	kWh/m ² , year		S2/3 *		S4? *	
		Production of renewable energies per total energy used	%		S2/3 *			
		Thermal heat demand per built area	W/m ²			S2/3 *		
		Total primary energy demand per built area	kWh/m ² , year			S2/3 *		
		Energy performance improvement	%					S4? *
	BIM Energy Map **	Total energy consumption	kWh/m ² , year					S4? *
		Production of renewable energies per total energy used	%					S4? *
SP Energy tool	Yearly energy demand	kWh/m ²					S4? *	
Teaser	Yearly energy demand	kWh/m ²					?	
LCA/GWP	Vabi Asset Policy	GWP	kg CO ₂ eq/dwelling, year	S2				
	SP LCA tool	Change in GWP per heated area	tonnes CO ₂ eq/m ²		S3			
	BIM Energy Map	GWP	kg CO ₂ eq/m ² , year					S4? *
LCC/ROI	Vabi Asset Policy	Investment costs	€/dwelling	S2				
		Financial gains	€/dwelling, year	S2				
		Payback period	Years	S2				
		Building related energy costs	€/dwelling, year	S2				
	SP LCC tool	Life cycle cost	k€				S4? *	S4? *
		Years to payback	years				S4? *	S4? *
Affordability	SP Affordability tool	Minimum disposable income	k€/year			S2		S4?
	(Expert judgements)	The extent to which the dwellings are affordable for the target group	---	S1				
Social & services/Distances to services	Common Sense	Proximity of the population to basic services	% population covered		S2/3			
Mobility	Arup mobility tool	Modal split	%				S4?	
Green	Biotope Area Factor (BAF) Berlin version	Ecologically effective areas / total land area	%		S2/3			
	Biotope Area Factor (BAF) Stockholm version (Manual insertion)	Ecologically effective areas / total land area	%			S2/3		
	(Expert judgements)	Green spaces per capita	m ² green spaces/inhabitant		S1			
		The extent to which the green areas contribute to a better living environment	---	S1				
Heat stress/thermal comfort	Rayman model	Heat stress in summer	PET Index		S2			
		Heat stress in winter	PET Index		S2			
Water drainage and storage capacity	(Expert judgements)	The extent to which water retention and drainage capacity is sufficient		S1				

* District and building level	** Former VIP Energy	*** Additional quantitative KPIs were used, all of which were established by expert judgements.		R = Rotterdam, V = Valencia, S = Stockholm, W = Warsaw, A = Antwer				

3 NON-CALCULATION MODULES

In addition to the calculation modules, WP3 has also included the development of non-calculation modules to enable module-common data management (data module), combining measures (design module), support for multicriteria decision making (MCMSMV module) and inhabitant data collection (crowd sourcing module). However, the actual development has mainly been carried out as part of the more technically oriented work packages WP2 and WP4 and the case study work package WP5. Their function in the IDSS is illustrated in Figure 2.

3.1 DATA MODULE

The data module retrieves data from the case database using queries, triggered by the KPIs and modules selected by the user, and returns results to the database. The data module includes a conversion from cityGML (storage format) into geoJSON (dashboard format). The module is also capable of filtering exported data by level of detail, features type (roof, building, roads etc) and module properties.

3.2 DESIGN MODULE

The design module enables the stakeholder to combine different measures represented by different calculation modules to a set of measures, a so called alternative/variant.

3.3 MULTI-CRITERIA, MULTI-STAKEHOLDER, MULTI-VARIANT (MCMSMV) MODULE

The MCMSMV module collects input on the weight and the ambition that each stakeholder puts on different KPIs. The MCMSMV displays

- The scores of the KPIs of different alternatives per stakeholder
- The scores of the KPIs of all stakeholders per alternative

3.4 CROWD SOURCING MODULE

The crowd sourcing module is expected to enable generating geo-coded questionnaires. This module is currently under development and will be used only in the last case study.

4 CONCLUSIONS

The development and modification of calculation modules have been triggered both by the commitments made in the DoW, completed by stakeholders prioritisations, and by insights gained during previous case study/studies. The future and final deliverable from WP3 should address functionality, data requirements, calculation methods, delimitations and references. Since the IDSS will enable connection of additional calculation tools after project finalization, requirements on these tools and prerequisites for connection to the IDSS are also to be described.