

## Seventh Framework Programme



**Call FP7-ICT-2009-6**

Project: 247708 - SUDPLAN

Project full title:

Sustainable Urban Development Planner  
for Climate Change Adaptation

**Deliverable D7.3.2**

**Linz Pilot:  
Product Validation Report V2**

Due date of deliverable: 31/10/2011

Actual submission date: 23/02/2012

<b>Title</b>	D7.3.2 Product Validation Report V2
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<b>Editor</b>	Guenter Gruber
<b>Description</b>	Validation of the SUDPLAN product from the pilot's point of view.
<b>Publisher</b>	SUDPLAN Consortium
<b>Contributors</b>	WP7, WP2
<b>Type</b>	Text
<b>Format</b>	application/msword
<b>Language</b>	EN-GB
<b>Creation date</b>	01/11/2011
<b>Version number</b>	0.4
<b>Version date</b>	23/02/2012
<b>Last modified by</b>	Guenter Gruber
<b>Rights</b>	Copyright "SUDPLAN Consortium". During the drafting process, access is generally limited to the SUDPLAN Partners.
<b>Audience</b>	<input type="checkbox"/> internal <input checked="" type="checkbox"/> public <input type="checkbox"/> restricted, access granted to: EU Commission
<b>Review status</b>	<input type="checkbox"/> Draft <input checked="" type="checkbox"/> WP Manager accepted <input checked="" type="checkbox"/> PMC quality controlled <input checked="" type="checkbox"/> Co-ordinator accepted
<b>Action requested</b>	<input type="checkbox"/> to be revised by Partners involved in the preparation of the deliverable <input type="checkbox"/> to be revised by all SUDPLAN Partners <input type="checkbox"/> for approval of the WP Manager <input type="checkbox"/> for approval of the Quality Manager <input type="checkbox"/> for approval of the Project Co-ordinator <input type="checkbox"/> for approval of the PMC
<b>Requested deadline</b>	31/10/2012

<b>Version</b>	<b>Date</b>	<b>Modified by</b>	<b>Comments</b>
0.1	2012-01-19	Stefan Andersson	Template
0.2	2012-02-21	Guenter Gruber	First draft
0.3	2012-02-22	Guenter Gruber	Conclusions added and last editing
0.4	2012-02-23	Guenter Gruber	Minor modifications after QA
0.4	2012-02-23	Lars Gidhagen	Co-ordinator approval

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## 1. Management Summary

This document D7.3.2 Product Validation Report V2 validates the usability of the SUDPLAN product from the Linz pilot's point of view.

The pilot validations are performed in two steps. The first is for WP leaders to encourage as many individuals as possible to fill in the LimeSurvey web questionnaire. The second step is to merge all individual answers into this pilot product validation document. The criteria for identifying the persons that should fill in the questionnaire is that they know about SUDPLAN as being either a developer, a primary (using the system hands on) end user or a secondary (using SUDPLAN results without operating the system) end user. More formally SUDPLAN defines three types of professional profiles that may serve to validate the Linz pilot product (Analyst, Modeller, System Manager):

- Analysts – primary users: End users of SUDPLAN output, e.g. city planners or their technical staff, working directly with the system.
- Analysts – secondary users: End users of SUDPLAN output, e.g. city planners or their technical staff, using SUDPLAN results but without working directly with the system.
- Modellers: Developing, integrating and configuring the different models of the type used in SUDPLAN applications for a city. They are considered secondary end users, as they normally do not work directly with the system.
- System Managers: Installation, maintenance and system administration. They are considered secondary end users, as they normally do not work directly with the system.

The results of the validation LimeSurvey questionnaire include impressions from all four professional profiles with exception of the second professional profile (Analysts not working with the system directly).

The results of the LimeSurvey questionnaire after project's second year (2011) are collected in Annex A and also summarised in the main text document. The following conclusions can be aggregated based on the Linz product validation V2:

- A total of 5 persons worked out parts of the LimeSurvey questionnaire, representing SUDPLAN staff (4 persons) and 1 external primary end-user from LINZ AG with a strong modelling background and who is also a member of the sewerage designing team at LINZ AG.
- Comments and answers show that SUDPLAN has the potential to give increased access to future climate and environmental scenarios of great use especially in the fields of urban sewerage planning and which today are difficult to get. To attract users, more scenarios must be accessible and user interface made more flexible and powerful (allow export, reports, result comparisons etc.) and easy to handle.
- The overall visualization is well done. Some refinements in detailed visualization can still be done. Due to the implemented tree-structure and the combination with the model run wizards all model elements are easily accessible and the management of (different) model

runs and outputs is intuitive. The already fully implemented concept to define, execute and analyse a scenario was appreciated.

- Defining and executing scenarios is fluid in the working process. Result visualization could in some parts be ameliorated (e.g. resulting CSO efficiency rates visualized like a speedometer in a car is not used in environmental engineering).
- Uncertainties can currently only be estimated by scenario comparison, a specific visualization of the uncertainties from several scenarios would be great.
- Contextual help functionality, a small tutorial to get a quick overview about the SMS and export and reporting functionalities are requested.

Most participants in the validation process had little experience in handling the GUI since a first running WP7 SMS prototype was released shortly before the validation process could be started. After all, it was essential to have involved at least one external primary end user in the validation process. The external feedback was overall positive and gave vital feedback for the final development cycle.

## **2. Methodology**

The common methodology for all V2-V3 Product Validation Reports is described in detail in D2.1 Product Validation Plan (revised after 1<sup>st</sup> ATR) document dated June 15, 2011; hereafter only referred to as D2.1 Product Validation Plan.

### **2.1. Documents involved**

D2.1 Validation Plan describes the methodology used for the deliverables D[5-8].3.x Product Validation Report and the three versions of deliverable D2.2.x Validation and Evaluation Report.

The D[5-8].3.x Product Validation Report objective is to validate the usability of the SUDPLAN product from the Pilot's point of view. There are three versions of the D[5-8].3.x Product Validation Report for each of the four pilots. These are used as the main input for the three versions of the D2.2.x Validation and Evaluation Report.

Each of the three versions of the D2.2.x Validation and Evaluation Report summarises the input from the four instances of D[5-8].3.x Product Validation Report from the pilots. Here a main focus is the potential usability of the SUDPLAN product beyond the project and for an arbitrary city in Europe. Furthermore the SUDPLAN product is assessed against the impacts expected by the call which are defined as SUDPLAN objectives in the DoW.

A table of all documents used or referenced in this document is given in the Section 4 at the end of this document.

## **2.2. Validation aspects**

### **2.2.1 Fulfilment of the pilot goals**

Validating the level of fulfilment of the pilot goals as defined in D7.1.3 Pilot Definition Plan V3 is out of the scope of this document.

### **2.2.2 Professional profiles taking part of pilots product validation**

The pilot validations are performed in two steps. The first is for WP leaders to encourage as many individuals as possible to fill in the LimeSurvey web questionnaire. The second step is to merge all individual answers into this pilot product validation document. The criteria for identifying the persons that should fill in the questionnaire is that they know about SUDPLAN as being either a developer, a primary (using the system hands on) end user or a secondary (using SUDPLAN results without operating the system) end user. More formally SUDPLAN defines three types of professional profiles that are suited to validate the product:

- Analysts – primary users: End users of SUDPLAN output, e.g. city planners or their technical staff, working directly with the system.

- Analysts – secondary users: End users of SUDPLAN output, e.g. city planners or their technical staff, using SUDPLAN results but without working directly with the system.
- Modellers: Developing, integrating and configuring the different models of the type used in SUDPLAN applications for a city. They are considered secondary end users, as they normally do not work directly with the system.
- System Managers: Installation, maintenance and system administration. They are considered secondary end users, as they normally do not work directly with the system.

The results of the validation LimeSurvey questionnaire should include impressions from all four professional profiles, but one individual can only belong to one professional profile.

### 2.2.3 Interaction between WP3 and WP4 and usability of the SUDPLAN Product

This deliverable assesses and documents the usability of the main results of WP3 Scenario Management System and WP4 Common Services for the SUDPLAN pilot applications.

The summary and generalization of the pilot validations are compiled as a part of the WP2 work, and reported in D2.2.x Validation and Evaluation reports. That document also draws conclusions on the pilot validations to provide feedback to WP3 and WP4. It is essential for them to know whether they are on track and where improvement or even changes have to be implemented. Furthermore, this document also assesses the independence of the implementation of the SUDPLAN product from the specific pilots and the usability for an arbitrary European city.

In order to allow overall project evaluation, all four Product Validation Reports have to be based on the document template provided by WP2.

### 2.2.4 Technical requirements of WP3 and WP4

The fulfilment of the technical requirements of WP3 (Scenario Management System) and WP4 (Common Services) is validated by unit- and integration tests done during the product development. This purely technical validation is out of the scope of the present document.

## 2.3. Rating

SUDPLAN product validation contains questions of the following types:

1. Rating starting with 1 for lowest (not fulfilled at all) to 7 for highest rating (fulfilled beyond expectations, which should be awarded only in exceptional cases and explained in the text), or NA (not applicable). Please answer the question with NA rather than leaving it open in the case you are for any reason unable to answer the question. Please give here the number of answers given for each alternative. *Example where 5 persons related to this pilot have filled in the questionnaire:*

	1	2	3	4	5	6	7	NA
<b>Define scenario:</b>			2		1	2		
<b>Execute scenario</b>					1	3		1

2. Rating from 0 to 7 indicating the comparison with e.g. state of the art solution, with 4=on pair with the state of art, 1=way below state of the art, and 7=way above the state of the art. NA can be used to indicate that the comparison is impossible, useless or beyond your knowledge. Please give here the number of answers given for each alternative. *Example where 5 persons related to this pilot have filled in the questionnaire::*

	1	2	3	4	5	6	7	NA
<b>Compared to state of the art solutions</b>					2	2	1	
<b>Compared to SUDPLAN project objectives</b>					1	4		

3. Yes|No|NA type of questions. Please give here the number of answers given for each alternative. *Example:*

<b>Dynamic workflow composition supported by</b>	Y	N	NA
<b>Pilot application:</b>		5	
<b>SUDPLAN product:</b>	4		1

4. Multiple choice questions, where a single question can have only a limited number of answers. (with or without NA). Please give here the number of answers given for each alternative. For example, in Q 2.2.1 the users are asked to list the SUDPLAN service interfaces and indicate their type (OS = Existing Service Interfaces with open standard specifications, re-used in the SUDPLAN; P = Existing proprietary Services with no open specifications, re-used in the SUDPLAN (if any); (N) New service Interfaces defined in the SUDPLAN (if any):

<b>Service interface</b>	OS	P	N
Dummy 1:			
Dummy 2:			
Dummy 3:			
Dummy 4:			

5. Free text fields are used to collect overall impressions and comments beyond the simple yes/no or rating level. Quite often, the users are given the opportunity to explain the way a requirement has been fulfilled. In case of partial fulfilment or failure to fulfil the requirement, the description should also explain e.g.:

- Which part of the requirement was not fulfilled?
- Why the requirement was dropped/not fulfilled?

- What are the consequences of not-fulfilling the requirement?
- Will the requirement be fulfilled later (e.g. “planned for 2-nd development cycle”)

**Note1:** in some cases the number of answers may be larger than the number of free fields in the table. Feel free to add new table rows if needed.

**Note2:** In the first phase, the questionnaire has to be filled in before the release of the SUDPLAN tool. Consequently, the questions should be answered based on the software already made available, the mockups and specifications.

**Note3:** For the Linz pilot a first running prototype of an integrated SMS was available shortly before the validation report V2. Therefore not the full already implemented functionality could be tested and assessed in detail for this validation report V2.

## 3. Validated components and aspects of the pilot product

The following table indicate what components and aspects have been validated during the V2 period, as well as how many individuals that have given their opinion. A complete list of the validated requirements is given in Annex A.

A summary of the validation results is given in Section 4.

<b>Components and aspects evaluated:</b>	<b>V2</b>	<b>V3</b>
Graphical User Interfaces	4	
Visualisation	4	
Common Services: Pan-European visualisation		
Common Services: Rainfall	5	
Common Services: Hydrology		
Common Services: Air Quality		
Local models	5	
External services	1	
SOA interfaces		
SOA services		
Usage of standards	1	
Open source software	1	
Completeness of functionality	1	
Conclusions	5	

## 4. Summary and conclusions

A complete list of all questions and answers in the LimeSurvey is available in Annex A. For this V2 validation WP7 involved two types of persons to support the validation. Most important has been at least one external end user linked directly to Linz urban (sewerage) planning. In WP7 there is one person directly involved who is a member of the sewerage designing group within the LINZ AG. He is not a direct SUDPLAN team participant but a typical primary end user with a strong modelling background and who is very interesting in using the SMS for different future scenarios in practise. The other group involved in this validation process consists all of SUDPLAN team members of TU Graz. Two of them are also typical primary end users, one of them has also a very strong modelling background. The other two colleagues are IT experts.

Since a first executable WP7 SMS prototype was available only some days before the validation process could be started no detailed tests could be done by the two groups and the filled in LimeSurvey is mainly based on an on-line presentation given by the WP7 IT stewards.

At the extended WP7 deadline February 20, 2012 we counted in total 5 persons in the LimeSurvey log, of which 4 persons are members of the SUDPLAN team and 1 person from the Linz AG sewer planner.

In this section the characteristics of the validation participants are given, followed by summaries of the most important conclusions concerning each of the validated components and aspects.

### 4.1. Professional profiles and user categories of respondents

The following tables are taken from Annex A.

<b>Name</b>	1: Martin Hochedlinger 2: David Steffelbauer 3: David Camhy 4: Guenter Gruber 5: Valentin Gamerith
<b>E-mail address</b>	1: ma.hochedlinger@linzag.at 2: david.steffelbauer@tugraz.at 3: camhy@sww.tugraz.at 4: gruber@sww.tugraz.at 5: gamerith@sww.tugraz.at
<b>Organization</b>	1: LINZ AG 2: TU Graz 3: TU Graz 4: TU Graz 5: TU Graz

The particular interest and profile of the participants have been classified according to the following table (note that one person can be interested in more than one environmental risk):

Type of environmental risk	Analyst primary	Analyst secondary	Modeller	System Manager
Urban stormwater flooding during intense rainfall		4		1
Dimensioning of sewage water systems				
Risks of flooding of rivers	1			
Hydrological conditions	1			
Air pollution	2	2		1
Other				

SUDPLAN deals with both long term and short term planning. Apparently not all of the questionnaire participants are interested in long term planning where climate change is of importance.

Temporal planning interest	Y	N	NA
Present conditions and short term (<10 years) planning	5	5	
Long term planning (>10 years) planning	6	4	

This report is based on persons that marked interest only in the Linz pilot.

Application	Y	N
Stockholm pilot		
Wuppertal pilot		
Linz pilot	5	
Czech pilot		
Overall application		

The professional profiles have been classified according to the following table:

Type of user	Y	N
SUDPLAN team member	4	1
Analyst	0	5
Modeller	1	4
System manager	0	5
IT expert	2	3
Climate change expert	0	5
Have seen presentations and documentations	4	1
User of the SUDPLAN / model results	4	1
Working with the actual system	5	0

## 4.2. Summary for Graphical User Interfaces

A total of 4 persons gave input to this aspect.

The overall visualization is well done. Some refinements in detailed visualization can still be done. Due to the implemented tree-structure and the combination with the model run wizards all model elements are easily accessible and the management of (different) model runs and outputs is intuitive.

Contextual help is currently not available.

The concept to define, execute and analyse a scenario was appreciated, but low rating on export facilities. Export of results would be very important for a scientific workflow.

The GUI was given high usability while using high resolution monitors, but much lower rating for laptop use (problem to display both map and time series in visualisation).

Especially, the result visualization could be improved, e.g. resulting CSO efficiency rates visualized like a speedometer in a car is not used in environmental engineering and should be changed.

Defining and executing scenarios is fluid in the working process. Result visualization could in some parts be ameliorated. Uncertainties can currently only be estimated by scenario comparison, a specific visualization of the uncertainties from several scenarios would be great. For scientific work uncertainty analysis is a must have for data.

On small laptops it is because of the number of windows in SUDPLAN not really well-arranged.

Usability of any modelling environment is better on larger displays. I did not test the GUI on netbooks or 3D displays.

Currently in the Linz Pilot no 3D visualizations are implemented. The Data set and geo-referenced data are well presented.

## 4.3. Summary for Common Services: Pan-European visualisation

No person validated this part.

#### 4.4. Summary for Common Services: Rainfall

A total of 2 persons participated in the validation of this component.

The rainfall downscaling component for the regional downscaling of long rain time series was considered to well fulfil the requirements.

A running IDF curve SMS implementation was not available during validation V2 and could therefore not be validated.

#### 4.5. Summary for Common Services: Air Quality

No person validated this part.

#### 4.6. Summary for Local models

A total of 5 persons participated in the validation of this component.

The local WP7 model (U.S. EPA SWMM) is fully implemented in the SMS. The SUDPLAN SMS allows the execution and comparison of different model input files and different climate scenarios.

Specification of parameters for the model runs should be improved as planned in V3. Configuration of the model is only partly handled by SUDPLAN, many settings are directly linked to the input (=scenario) configuration. Model validation and calibration is (for the Linz pilot SWMM model) not carried out directly in the SUPDLAN platform.

#### 4.7. Summary for External services

A total of 1 person participated in the validation of this component.

OGC WMS (Web Map Service) is used in WP7 with some configuration by the user.

OGC SOS (Sensor Observation Service) and OGC SPS (Sensor Planning Services) is used in WP7 with some configurations by the administrator / developer.

#### 4.8. Summary for Usage of standards

A total of 1 person participated in the validation of this component.

SOS has too much overhead for big datasets. SOS and SPS are too complicated to use.

#### 4.9. Summary for Open source software

A total of 1 person participated in the validation of this component.

U.S. EPA SWMM is used and fully implemented in the SMS as local WP7 model.

## 4.10. Summary for Conclusions

A total of 5 persons participated in the validation of this component.

Only 1 out of 5 persons had access to similar information as available in SUDPLAN.

One person considered the SUDPLAN output to be scientifically sound and credible, while 3 persons answered not possible to judge on quality.

Three persons stated the SUDPLAN output to be useful as a base for planning to certain extent, one person as highly useful.

For a future assessment of the sewer behaviour when precipitation will be changed due to climate change (tool for scenario management and resulting conclusions).

The really positive thing about the SUDPLAN SMS is the integration of CS and local models and to have the possibility to compare different scenarios.

The output is useful for its purpose: a scenario management using future predicted scenarios.

For 5 persons most information which they expected is given by the current SMS WP7 state.

"Help" button, rough description of implemented climate change scenarios, no possibility to generate automatic reports, export or a result file which can be import in other software.

All relevant outputs from the model runs are given, additional information on sensor data should be implemented in V3.

The graphical presentation of SUDPLAN results were ordinary (5) for these persons.

The graphical presentation of the SUDPLAN results could be improved. The speedometer visualisation for the CSO eta values is not realized proper.

Graphical presentation of the model structure is excellent; the model results presentation could still be improved.

The strength of SUDPLAN output is

- Scenario management
- To have a first comparison of the discharged outflows of CSO facilities
- Spatial aspects and comparability of results & scenarios

The weakness of the current SUDPLAN output is

- There is no result reporting functionality implemented at the moment.
- Data export could be improved.

Further comments:

- Helpful tool for future scenario management to get information what should be changed in your sewer system (general).
- The SUDPLAN product could make climate predictions easier to integrate in local scientific methods. So it could be a very helpful tool for city planning.
- The first impression is quite good. A short tutorial could be useful to become familiar with the whole functionalities of the SMS.
- Overall the SUDPLAN product is easy to use concerning the scenario management for model runs, model and result visualization. Visualization and usability are on a high level of quality.
- It is an unfinished product which has the potential to make climate scenarios understandable for people, to make predictions of future events and to have a base for planning infrastructure, for example sewerage facilities.

Proposals for improvement of the SUDPLAN product:

- Help menu and a tutorial for the product, to make it easier for not experienced users to handle the program. Reporting functionality to make presentations of the data. Export functionality for data in desired formats.
- The ease of integration of local data sources and models could be improved. The help system could be improved. More information about the climate scenarios. Reporting functionality. Tutorials for the product Export functionality.
- Add a short tutorial to become faster familiar with the whole functionalities of the SMS. Add context sensitive help functionality to explain for example the base and differences of different climate scenarios.
- Implementation of additional climate scenarios in the CS.

## 5. Conclusion

The following conclusions can be summarised based on the Linz product validation V2:

- A total of 5 persons worked out parts of the LimeSurvey questionnaire, representing SUDPLAN staff (4 persons) and 1 external primary end-user from LINZ AG with a strong modelling background and who is also a member of the sewerage designing team at LINZ AG.
- Comments and answers show that SUDPLAN has the potential to give increased access to future climate and environmental scenarios of great use especially in the fields of urban sewerage planning and which today are difficult (but not impossible) to get. To attract users, more scenarios must be accessible and user interface made more flexible and powerful (allow export, reports, result comparisons etc.) and easy to handle.
- The overall visualisation is well done. Some refinements in detailed visualisation can still be done. Due to the implemented tree-structure and the combination with the model run wizards all model elements are easily accessible and the management of (different) model runs and outputs is intuitive. The already fully implemented concept to define, execute and analyse a scenario was appreciated.
- Defining and executing scenarios is fluid in the working process. Result visualization could in some parts be ameliorated (e.g. resulting CSO efficiency rates visualized like a speedometer in a car is not used in environmental engineering).
- Uncertainties can currently only be estimated by scenario comparison, a specific visualization of the uncertainties from several scenarios would be great.
- Contextual help functionality, a small tutorial to get a quick overview about the SMS and export and reporting functionalities are requested.
- Most participants in the validation process had little experience in handling the GUI since a first running WP7 SMS prototype was released and presented shortly before the validation process could be started. Unfortunately only one external primary end user could be involved in the validation process. After all, it was essential to have involved at least one external primary end user in the validation process. The external feedback was overall positive and gave vital feedback for the final development cycle.

## 6. References

This is the list of documents and software deliverables that have been used as input for this document.

Document	Version
DoW	2009-12-01
D2.1 Validation Plan (revised after 1 <sup>st</sup> ATR)	2011-06-15
D3.1.2 Requirement Specification V2	2011-11-28
D3.3.1 Integrated Scenario Management System	2011-07-20
D7.1.3 Pilot Definition Plan for Linz V3	2012-01-29

**Table 1: List of documents and software deliverables that has been referenced or used for this document**

## 7. Glossary

2D	Two-dimensional, typically a field that varies in east-west and north-south direction. The field may also vary in time –this is typical for e.g. air pollution and population density. The former varies from one hour to another while the latter maybe varies from one year to another.
3D	Three-dimensional, typically a field that varies in east-west and north-south direction as well as vertically. The field may also vary in time.
4D	Four-dimensional. Most often 3D field that explicitly also varies in time. It could also be when a certain 3D parameter (e.g. a particular air pollutant) also varies according to another 3D parameter (e.g. temperature). It will then be possible to study the variation of the first 3D parameter as a function of space (x,y,z) and the second parameter.
Airviro	Air quality management system consisting of databases, dispersion models and utilities to facilitate data collection, emission inventories etc, see <a href="http://www.Airviro.smhi.se/">http://www.Airviro.smhi.se/</a>
Climate scenario	<i>Climate scenarios</i> means the resulting climate evolution over time, as simulated by global (GCMs) and regional (RCMs) climate models. Climate scenarios are products of certain emission scenarios that reflect different economic growth and emission mitigation agreements.

Common Services	<i>Common Services</i> is the climate downscaling services for rainfall, river flooding and air quality, developed in the SUDPLAN project and accessed through the SUDPLAN platform (Scenario Management System)
Common Services server	<i>Common Services</i> models will be executed at a SMHI server, accessible through OGC communication.
<p>Emission scenario</p> <ul style="list-style-type: none"> <li data-bbox="284 779 587 857">- <i>IPCC emission scenarios</i></li> <li data-bbox="284 1373 587 1496">- <i>European tracer gas emissions (air pollutants)</i></li> <li data-bbox="284 1697 587 1776">- <i>Local emission scenarios</i></li> </ul>	<p>These are of three types, of which the first one is behind the climate scenarios used in all SUDPLAN Common Services. The two remaining emission scenario types are only relevant for air quality downscaling.</p> <p><i>IPCC emission scenarios</i> are estimates of future global greenhouse gas concentrations based on assumptions about global development (economic growth, technical development, mitigation agreements, etc). During the first two years of the SUDPLAN projects, the climate scenarios based on SRES (Special Report on Emission Scenarios) A1B scenario from the 4<sup>th</sup> assessment have been used. The SRES emission scenarios do not include emissions of the pollutants of interest for air quality. If available the climate scenarios based on the 5<sup>th</sup> assessment RCP (Representative Concentration Pathways) emissions scenarios will also be used within the SUDPLAN project. They include emissions of air pollutants.</p> <p><i>European tracer gas emissions (air pollutants)</i> thus may or may not be included in IPCC emission scenarios. For creating Pan-European air quality fields under climate scenarios driven by the SRES A1B emission scenario, SUDPLAN uses tracer gas emissions from the more recent RCP emission scenarios. This inconsistency will be solved when climate scenarios based on RCP emission scenarios are available.</p> <p><i>Local emission scenarios</i> (to the atmosphere) are those of a particular European city. These will to a large extent influence future air quality in the city, but have little influence on global climate, nor do they influence air pollution concentrations in incoming long-range transported air. SUDPLAN will typically need gridded emissions with 1x1 km or finer spatial resolution as input to its urban air quality downscaling model.</p>

Hind cast	A simulation of a historical period. Often done to compare model simulations with data which is available during that period.
Hot spot	Point (or small area) which is very different from its surroundings. In the present context, most often high concentrations of air pollutants, or extreme meteorological conditions.
Information product	Raw data, such as the results of mathematical modelling, and the analysis thereof, will often need to be packaged in such a way as to be accessible to the various stakeholders of an analysis. The medium can be one of a wide variety, such as print, photo, video, slides, or web pages. The term <i>information product</i> refers to such an entity.
Mockup	A model of a design used for demonstrating the functionality of a system.
Model	A <i>model</i> is a simplified representation of a system, usually intended to facilitate analysis of the system through manipulation of the model. In the SUDPLAN context the term can be used to refer to mathematical models of processes or spatial models of geographical entities.
PM <sub>10</sub>	‘PM10’ shall mean particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM10, EN 12341, with a 50 % efficiency cut-off at 10 µm aerodynamic diameter;
PM <sub>2,5</sub>	‘PM2,5’ shall mean particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM2,5, EN 14907, with a 50 % efficiency cut-off at 2,5 µm aerodynamic diameter;
Profile	Within SUDPLAN a <i>profile</i> is a set of configuration parameters which are associated with an individual or group, and which are remembered in order to facilitate repeated use of the system.
Regional downscaling	A climate scenario may be downscaled to a higher spatial resolution, typically 25-50 km, by a Regional Climate Model (RCM). The regional downscaling in SUDPLAN will be performed by SMHI's RCM (RCA, see below) and will generate climate scenarios at 44 or 22 km resolution.

Report	A <i>report</i> is a particular type of information product which is usually static and might integrate still images, static data representations, mathematical expressions, and narrative to communicate an analytical result to others.
Scenario	<p>A <i>scenario</i> is a set of parameters, variables and other conditions which represent a hypothetical situation, and which can be analysed through the use of models in order to produce hypothetical outcomes.</p> <p>In SUDPLAN a scenario is an individual model simulation outcome to be used in urban planning. The model simulation may or may not include Common Services downscaling (with specific input) and may or may not include a local model simulation (with specific input and parameters).</p>
Scenario Management System	<i>Scenario Management System</i> is synonymous with SUDPLAN platform
Scenario Management System Framework	The <i>Scenario Management System Framework</i> is the main Building Block of the Scenario Management System. It provides the Scenario Management System core functionalities and integration support for the other Building Blocks.
Scenario Management System Building Block	Scenario Management System Framework is composed of three distinct <i>Building Blocks</i> : The Scenario Management System Framework, the Model as a Service Building Block and the Advanced Visualisation Building Block.
Street canyon	Volume between high buildings in cities. Due to poor circulation (and high emissions) prone to poor air quality. Street canyons have unexpected circulation patterns, thus dedicated models are needed to study air pollution here.
SUDPLAN application	A <i>SUDPLAN application</i> is a decision support system crafted by using the SUDPLAN platform and integrating models, data, sensors, and other services to meet the requirements of the particular application.
SUDPLAN platform	The <i>SUDPLAN platform</i> is an ensemble of software components which support the development of SUDPLAN applications.
SUDPLAN system	<i>SUDPLAN system</i> is synonymous with SUDPLAN application

<p>Urban downscaling</p>	<p>This refers to further downscaling of the regional climate scenarios for Europe to the urban scale within SUDPLAN. This will be possible for</p> <p>a) <i>rainfall/precipitation</i> where the temporal resolution will be 30 minutes or less. The spatial resolution will be that of a precipitation gauge, i.e. representative for a point rather than a certain area.</p> <p>b) <i>hydrological variables (river runoff, soil moisture etc)</i> where the temporal resolution is daily and the spatial resolution linked to catchment areas which presently count approximately 35000 and with average size 240 km<sup>2</sup>.</p> <p>c) <i>air quality (PM, NO<sub>2</sub>/NO<sub>x</sub>, SO<sub>2</sub>, O<sub>3</sub>, CO)</i>. The temporal resolution will be hourly for gridded output fields and the spatial resolution typically 1x1 kilometres.</p>
<p>User</p>	<p>The term <i>user</i> refers to people who have a more or less direct involvement with a system. Primary users are directly and frequently involved, while secondary users may interact with the system only occasionally or through an intermediary. Tertiary users may not interact with the system but have a direct interest in the performance of the system.</p>
<p>Web-based</p>	<p>Computer applications are said to be <i>web-based</i> if they rely on or take advantage of data and/or services which are accessible via the World Wide Web using the Internet.</p>

## 8. Acronyms and abbreviations

Acronym	Description
A1B	Emission scenario used for global climate modelling in IPCCs Fourth Assessment Report (AR4)
Airviro	Air quality management system to facilitate data collection, emission inventories etc, see <a href="http://www.airviro.smhi.se/">http://www.airviro.smhi.se/</a>
cids	Component Integration for Distributed Systems
CS	Common Services
AVDB	Airviro Time Series database (used for storage in Common Services)
AR4, AR5	Fourth and Fifth Assessment Report of IPCC
AQ	Air Quality
C API	Application Programming Interface written in C
CA	Consortium Agreement
CMIP5	Coupled Model Intercomparison Project, phase 5 (coordinated model exercise in support to AR5)
COD	Chemical Oxygen Demand
concall	conference (phone) call
CS	Common Services (SUDPLAN functionality)
CSO	Combined Sewer Overflow
CTM	Chemistry Transport Model
CTREE	FairCom CTREE database (Index database, core of AVDB)
DBS	Distribution-Based Scaling, a method to bias-correct (i.e. remove systematic errors in) the temperature and precipitation of the RCM output
DoW	SUDPLAN Description of Work
DSS	Decision Support Systems
ECHAM5	GCM developed at Max Planck Institute for Meteorology, DE
ECMWF	The European Centre for Medium-Range Weather Forecasts (also coordinating FP7-SPACE project MACC)
EDB	Airviro Emission database
EEA	European Economic Association
E-HYPE	HYdrological Predictions for the Environment (European set-up), hydrological rainfall-runoff model developed and used by SMHI
EM&S	Environmental Modelling and Software
ESA	European Space Agency
ESDI	European Spatial Data Infrastructure
EU	European Union
GCM	Global Climate Model or, equivalently, General Circulation Model. Physically based computer model that simulates the global climate on a 200-300 km resolution. Can be used both to reproduce historical climate and estimate future climate, e.g. in response to changes in greenhouse gas concentrations.

GHG	GreenHouse Gases
GTE	Georeferenced Time-series Editor
GIS	Geographic Information System
GSA	Global Sensitivity Analysis
HadCM3	GCM developed at Met Office Hadley Centre, UK
HIRLAM	HIgh Resolution Limited Area Model, numerical weather prediction model developed and used operationally by SMHI
ICT	Information and Communication Technologies
ID	Identifier
IDF-curve	Intensity Duration Frequency-curve, a curve (or a table of values) showing the rainfall intensity associated with a certain duration (i.e. time period) and frequency (i.e. probability, generally expressed as a return period). Calculated from short-term rainfall observations and widely used in design of urban drainage systems.
iEMSs	International Environmental Modelling & Software Society
IFIP	International Federation for Information Processing
IPCC	The Intergovernmental Panel on Climate Change, the leading body for the assessment of climate change
IPR	Intellectual Property Rights
ISAM	Indexed Sequential Access Method, a method for indexing data for fast retrieval
ISO	International Standardization Organisation
ISESS	International Symposium on Environmental Software Systems
IST	Information Society Technology
MATCH	Multiple-scale Atmospheric Transport and Chemistry modelling system, a CTM developed and used by SMHI.
MODSIM	International Congress on Modelling and Simulation
NA	
netCDF	Network Common Data Form
OASIS	1) Organization for the Advancement of Structured Information Standards 2) Open Advanced System for Disaster and Emergency Management (FP6 project)
OGC	Open Geospatial Consortium
O&M	Observation and Measurements
OpenSDM	Open Scientific Data Management
ORCHESTRA	Open Architecture and Spatial Data Infrastructure in Europe (FP6 IST-511678)
OSGeo	Open Source Geospatial Foundation
OSIRIS	Open architecture for Smart and Interoperable networks in Risk management based on In-situ Sensors (FP6 IST-33799)
PM	Person Month
PMC	Project Management Committee

QA	Quality Assurance
RC	Rosby Centre, climate research unit at SMHI
RCA	Rosby Centre Atmospheric model, RCM developed by SMHI and used in SUDPLAN
RCM	Regional Climate Model, commonly used to increase the spatial resolution of climate scenarios to 25-50 km in a specific region.
RCP4.5	Radiative Concentration Pathways: A set of four emission scenarios to be used for the AR5 simulations. The scenarios are named according to their radiative forcing at 2100, e.g. 4.5 W/m <sup>2</sup> .
RNB	Airviro Field database
SANY	Sensors Anywhere (FP6 IST-033654)
SDI	Spatial Data Infrastructure
SISE	Single Information Space in Europe for the Environment
SISE	Single Information Space in Europe for the Environment
SMHI	Swedish Meteorological and Hydrological Institute
SMS	Scenario Management System
SOA	Service Oriented Architecture
SOS	Sensor Observation Service
SPS	Sensor Planning Service
SWE	Sensor Web Enablement
SUDPLAN	Sustainable Urban Development PLANner for climate change adaptation
SWE	Sensor Web Enablement
SWMM	Storm Water Management Model
tbd	To be determined
TSS	Total Suspended Solid
U.S.-EPA	United States Environmental Protection Agency
UWEDAT	AIT environmental data management and monitoring system
WCC	World Computer Congress
WCS	Web Coverage Service
WFS	Web Feature Service
WP	Work Package
WPS	Web Processing Service
WMS	Web Map Service
wrt	with respect to
WWTP	Waste Water Treatment Plant

## Annex A – Lime Survey

### 1.1. Type of users

<b>Name</b>	1: Martin Hochedlinger 2: David Steffelbauer 3: David Camhy 4: Guenter Gruber 5: Valentin Gamerith
<b>E-mail address</b>	1: ma.hochedlinger@linzag.at 2: david.steffelbauer@tugraz.at 3: camhy@sww.tugraz.at 4: gruber@sww.tugraz.at 5: gamerith@sww.tugraz.at
<b>Organization</b>	1: LINZ AG 2: TU Graz 3: TU Graz 4: TU Graz 5: TU Graz

Please indicate for what type of environmental risk SUDPLANS has been used (Y= SUDPLAN used, N = SUDPLAN not used, NA= concept not applicable). For other, please indicate what other risk.

Type of environmental risk	Analyst primary	Analyst secondary	Modeller	System Manager
Urban stormwater flooding during intense rainfall	2		1	
Dimensioning of sewage water systems	2		1	2
Risks of flooding of rivers				
Hydrological conditions				
Air pollution				
Other				

Please indicate what is the temporal planning interest (Y= of interest, N = not of interest, NA= not applicable).

Temporal planning interest	Y	N	NA
Present conditions and short term (<10 years) planning	2	3	
Long term planning (>10 years) planning	5	0	

Please indicate what part of SUDPLAN the validation is made (Y= Yes, N = No). Only one answer per user possible.

Application	Y	N
Stockholm pilot		
Wuppertal pilot		

Linz pilot	5	0
Czech pilot		
Overall application		

Please describe the user’s knowledge with respect to the SUDPLAN product (Y= Yes, N = No).

Type of user	Y	N
SUDPLAN team member	4	1
Analyst	0	5
Modeller	1	4
System manager	0	5
IT expert	2	3
Climate change expert	0	5
Have seen presentations and documentations	4	1
User of the SUDPLAN / model results	4	1
Working with the actual system	5	0

SUDPLAN team member: You were developing SUDPLAN.

Analysts are those people who will be using the SUDPLAN applications on a regular basis to carry out analyses in order to arrive at an environmental management decision. In some cases they may be the decision makers, and in other cases they may be supporting the decision makers. This category of user would include expert planners and city planners, as defined in the DoW, and are likely to be primary users (i.e. they will use the SUDPLAN applications directly and regularly).

Modellers are those people who develop, integrate, and/or configure mathematical models to be used within SUDPLAN applications. While these users might be expert planners as well, this category is reserved for people performing specific model development tasks; if and when they work as planners, they revert to the Analyst category. Modellers may be seen as secondary users in that they will not generally, in this role, use the SUDPLAN application on a regular basis, and might not use it directly at all.

System Managers are those people who install and maintain SUDPLAN applications and carry out general system administration tasks. This would include the integration of components, such as models, into SUDPLAN applications. While this task might be performed by the same people who developed the models, when they are carrying out the integration into an application they have switched into a role as a System Manager. These users could be considered secondary users. While they will definitely use the SUDPLAN applications directly, it will only be occasionally (in this role).

IT-Experts are people working in the development or administration of IT systems. If you have some GIS and SOA background please select this also.

Climatic Change experts are people with knowledge in the Climate Change domain. They may or may not act as any of the other roles within SUDPLAN.

## 1.2. 1 Graphical user interface

### 1.2.1 1a – GUI specific

*SUDPLAN shall provide user-friendliness of services and interfaces, in particular ergonomics of the graphical user interface (GUI) and the visualization components*

*Enable usage by untrained users, not only “SUDPLAN” experts.*

#### **REQ-DOW-2.10: Offer user-friendly interfaces**

9 1a/Q1a: Please indicate the key concepts used in SUDPLAN to assure the GUI ergonomics (Y = concept used, N = concept not used, NA = concept not applicable). Please give the number of answers for each alternative.

Key concepts	Y	N	NA
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Task-Oriented Menu structure	4	0	0
Multi-lingual user interface	0	3	1
Smart scaling for small screens	0	4	0
Workflows for common tasks	4	0	0
Colour-coding for colour-blind	0	1	3
Contextual help system	0	2	2
Alerts when processing finished	1	0	3
Panning/browsing through results (in time)	1	0	1
Panning/browsing through results (in space)	1	0	1
Highlighting recently changed data	0	1	3
Comparing two result sets	2	0	2

10 1a/Q1c: Please give a short textual explanation on the user friendliness of the SUDPLAN application and suggestions for improvement.

In general the user friendliness of the product is ok, but the workflow could be made easier for people not that familiar with the product.

Contextual help is currently not available.

Due to the implemented tree-structure and the combination with the model run wizards all Model elements are easily accessible and the management of (different) model runs and outputs is intuitive.

*SUDPLAN shall provide easy-to-use planning, prediction, decision-support and training tool. The main idea of the SUDPLAN project is to develop an easy-to-use web-based planning, prediction, decision support and training tool, for the use in an urban context, based on a what-if scenario execution environment, which will help to assure population's health, comfort, safety and life quality as well as sustainability of investments in utilities and infrastructures within a changing climate.*

**REQ-DOW-1.1: Build an easy-to-use system**

*SUDPLAN shall employ user-centred design principles in the design of the user interface. SUDPLAN shall provide user-friendly services and interfaces, graphical user interfaces (GUI), and data visualization components.*

*Systematic user-centred design helps ensure that the intended users are successful and improves overall productivity. Furthermore it enables the use of the SUDPLAN product by untrained users, not only SUDPLAN experts.*

**REQ-USR-1.1.1: User-centred design**

11 1a/Q1d: Please assess the ease of use of the SUDPLAN application (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
Define a scenario				1	3	1		

Execute existing scenario "as is"				2	1	1		
Execute existing scenario with changed parameters	1		1	2	1			
Save results			1	1		2	1	
Share results with others				1	1			
Visualize results				2	3			
Visualize uncertainties	3	1	1					
Compare the results of various scenarios				1	3	1		
Export results in different formats	3	2						

12 1a/Q1e: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

Especially, the result visualization could be improved for e.g. efficiency rate visualized like a speedometer in a car is not used in environmental engineering.

For scientific work uncertainty analysis is a must have for data.

Export of results would be very important for a scientific workflow.

Defining and executing scenarios is fluid in the working process. Result visualization could in some parts be ameliorated. Uncertainties can currently only be estimated by scenario comparison, a specific visualization of the uncertainties from several scenarios would be great.

*SUDPLAN shall allow automation of recurring tasks wherever possible.  
In SUDPLAN application analysis and management there will be tasks which must be performed repeatedly. Allowing the users to automate such tasks will greatly enhance ultimate productivity.*

**REQ-USR-1.2.1: Recurring task automation**

*SUDPLAN shall allow users to configure tasks which are to be executed on a recurring basis.  
Recurring tasks will generally require configuration of input data, parameters, and other variables.*

**REQ-USR-1.2.2: Recurring task configuration**

*SUDPLAN shall support the development and maintenance of user interface profiles for different users.*

*User interfaces generally allow configuration by users to suit their needs or preferences. Keeping these configurations in a profile prevents any given user from having to reconfigure the application each time they use it.*

**REQ-USR-1.3.1: Profiling of the user interface**

*SUDPLAN shall support establishment of user groups with shared profiles.  
Some aspects of the user interface configuration may be associated with categories of users rather than individual users.*

**REQ-USR-1.3.2: Establishment of user groups**

*SUDPLAN shall support the development and maintenance of automation task profiles.  
Automatically recurring task configurations should be stored in a profile to allow users to re-establish similar task executions without having to completely re-enter configuration information.*

**REQ-USR-1.3.3: Profiling of automation tasks**

*SUDPLAN shall support profiling of business processes for different users and user groups. SUDPLAN applications will often require combinations of information and services requested from diverse sources, and these request transactions will need to be configured. Saving of request transaction profiles will help users and user groups to streamline their analyses by avoiding extensive reconfiguration.*

**REQ-USR-1.3.4: Profiling of business processes**

13 1a/Q1f: Please assess the ease of use of the profiling and automation capacities of SUDPLAN (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Recurring task automation</b>				1	1			
<b>Recurring task configuration</b>				2				
<b>Profiling of the user interface</b>								
<b>Establishment of user groups</b>								
<b>Profiling of automation tasks</b>								
<b>Profiling of business processes</b>								

14 1a/Q1g: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

As I did not test any profiling I cannot answer to these questions.

*SUDPLAN shall enhance the current state of the art in interactive visualization by the support of different types of output devices (the system can be adapted to a wide variety of hardware from single-user desktop to immersive multi-user environments)*

*Depending on the systems available to the user proper visualization techniques have to be used.*

**REQ-DOW-10.4: Provide support of different output devices**

15 1a/Q2a: Please assess the usability with various output devices used (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Overall</b>					4			
<b>High resolution PC monitor (22-26 Inch, 1080p)</b>					2	1	1	
<b>Laptop (15-17 Inch, 1280x800 pixel or better )</b>					3		1	
<b>Small Laptops (12-14 inch, 1024x800 pixel)</b>				3	1			
<b>Netbooks (about 10 inches, below 1024x800 pixel, low processing power)</b>			4					

Small 3D Displays (Desktop monitors)									
Large 3D displays (for presentation to a large audience )									

16 1a/Q2c: Please give a short textual explanation of the special features allowing the use of the SUDPLAN’s GUI elements across the large range of screen sizes, key advantages of SUDPLAN wrt. to state of the art (if any), and suggestions for improvement.

On small laptops it is because of the number of windows in SUDPLAN not really well-arranged.

Usability of any modelling environment is better on larger displays. I did not test the GUI on netbooks or 3D displays.

*Certain general elements of the user interface design enhance system usability.*

**REQ-USR-1.1: Usability**

*SUDPLAN shall employ user-centred design principles in the design of the user interface. SUDPLAN shall provide user-friendly services and interfaces, graphical user interfaces (GUI), and data visualization components.*

*Systematic user-centred design helps ensure that the intended users are successful and improves overall productivity. Furthermore it enables the use of the SUDPLAN product by untrained users, not only SUDPLAN experts.*

**REQ-USR-1.1.1: User-centred design**

*SUDPLAN shall employ user interface design features that help prevent users from making errors when possible, allow users to reverse an error if one is made, or minimize the consequences of user errors if neither of these is possible.*

*Preventing or successfully mitigating user errors is necessary to ensure a productive outcome of the users’ use of the system.*

**REQ-USR-1.1.2: User errors**

*SUDPLAN shall employ design features which allow the software to carry the burden of remembering information needed from one part of an application by another.*

*Avoiding a reliance on the users’ short-term memory significantly increases productivity, reduces error rates, and increases user satisfaction.*

**REQ-USR-1.1.3: Short-term memory**

*SUDPLAN shall provide contextual help to users.*

*When users are expected to provide input to an application they may need clarification or explanation of the input that is expected of them.*

**REQ-USR-1.1.4: Contextual Help**

*SUDPLAN shall be easy to understand and to learn.*

*SUDPLAN users should be able to learn how to use the user interface easily and to readily understand its functionality.*

**REQ-USR-1.1.5: Ease of learning**

*SUDPLAN's user interface shall be easy to remember.  
SUDPLAN users should be able to readily remember how to use the user interface.*

**REQ-USR-1.1.6: Memorability**

*SUDPLAN shall present a transparent user interface.  
SUDPLAN users should not need to have technical knowledge outside of their domain.*

**REQ-USR-1.1.7: Transparency**

17 1a/Q3a: Please assess the usability of SUDPLAN (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>User-centred design</b>			2	1	1			
<b>User errors</b>				4				
<b>Short-term memory</b>		1						
<b>Contextual Help</b>		1						
<b>Ease of learning</b>			1	2	1			
<b>Memorability</b>				4				
<b>Transparency</b>				1				

18 1a/Q3c: Please give a short textual explanation on the (dis)advantages of the usability in SUDPLAN, and suggestions for improvement.

Contextual help can be improved. I do not understand what is meant by Transparency.

*SUDPLAN shall support visualization based on geo-spatial paradigms.  
Environmental data are very often spatial in nature, and therefore require geo-spatial visualization techniques.*

**REQ-USR-2.5.2 Spatial visualization**

*SUDPLAN shall support visualization of time-based phenomena.  
Environmental phenomena are dynamic in nature, and therefore often require the use of visualization techniques representation variation of one or more variables as a function of time.*

**REQ-USR-2.5.3 Temporal visualization**

*SUDPLAN shall support visualization of phenomena varying in both time and space.  
More complex environmental data sets vary in both time and space.*

**REQ-USR-2.5.4 Spatio-temporal visualization**

*SUDPLAN shall support the visualization of an individual model run.  
Many SUDPLAN modelling runs will generate spatial and/or temporal data which need to be visualized to be interpreted by the analyst.*

**REQ-USR-2.5.5 Visualization of a model run result**

*SUDPLAN shall support the visual comparison of multiple model runs.*

*Analysis of the results from multiple comparable model runs (such as under different scenarios) requires the ability to simultaneously represent model results visually.*

**REQ-USR-2.5.6 Comparison of model run results**

19 1a/Q4a: Please assess the usability of SUDPLAN for visualization (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Spatial visualization</b>					3	2		
<b>Temporal visualization</b>				1	2	2		
<b>Spatio-temporal visualization</b>					2			
<b>Visualization of a model run result</b>				4	1			
<b>Comparison of model run results</b>				3	2			

20 1a/Q4c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

Overall visualization is well done, some refinements in detailed visualization can still be done.

**1.2.2 1b – 3D GUI**

*SUDPLAN shall extend the state-of-the-art in the field of environmental decision support systems by offering to users highly integrated and interactive 3D / 4D*

Rationale: Proper visualization is needed to understand large data sets, especially if they are georeferenced. The visualization will not only be used by experts for themselves but also to inform other persons.

**REQ-DOW-3.2**

22 1b/Q1a: Please indicate the usability of the SUDPLAN 3D/4D visualization as compared to state of the art applications (1 to 7 or NA, with 4=on par, 1=way below, and 7=way above. NA can be used to indicate that the comparison is impossible, useless or beyond your knowledge). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Large data sets</b>					1			
<b>Geo-referenced data</b>					1			
<b>3D data</b>								
<b>3D data, georeferenced, on a map</b>								

1D Time-series				1				
2D Time-series								
3D Time-series								
Multi-dimensional data								

23 1b/Q1c: Please give a short textual explanation for the above marks, key advantages and suggestions for improvements. Please indicate also the "state of the art" applications used in the comparison above.

Currently in the Linz Pilot no 3D visualizations are implemented. The Data set and geo-referenced data are well presented.

*SUDPLAN shall enhance the current state of the art in interactive visualization by a highly interactive, extendable 3D / 4D visualization framework combining geometric, volumetric and information visualization algorithms as well as interaction techniques for analyzing, comparing and presenting of simulated what-if scenarios (in the area of sustainable urban development). A proper visualization is required to understand and compare complex or large data sets. This is needed to understand the implications of different scenarios.*

**REQ-DOW-10.1: Provide 3D / 4D visualisation framework**

24 1b/Q3a: Please assess the capabilities of the SUDPLAN 3D/4D visualization framework (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
Overall impression								
Interactive applications								
Geometric visualisation algorithms								
Volumetric visualisation algorithms								
Other information visualisation algorithms								
Presenting of simulated what-if scenarios								
Comparing of simulated what-if scenarios								
Analyzing of simulated what-if scenarios								

25 1b/Q3b: Please give a short textual explanation for the above marks, key advantages of SUDPLAN wrt. to state of the art (if any), and suggestions for improvement.

*SUDPLAN shall enhance the current state of the art in interactive visualization by an extendable framework; regarding visualization as well as interaction metaphors (the system can be adapted to a wide variety of data)*

*The 3D/4D visualization shall also be usable for direct interaction with the SUDPLAN system to allow an intuitive use.*

**REQ-DOW-10.2: Provide interaction framework**

26 1b/Q4a: Please describe the key enhancements of the “state of the art” in interactive visualization developed by SUDPLAN.

## 1.3. 2 Common Services

### 1.3.1 2a – Climate Scenario Information

*All forecast models depend on the selected climate scenario. So information about the available scenarios is needed by the user.*

28 2a/Q1a: Please indicate the usability of the provided climate scenario information (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Available number of different climate scenarios</b>			2					
<b>Available area over Europe</b>				1	1			
<b>Available time range</b>				1	1			
<b>Available scenario documentation</b>		1		1				

### 1.3.2 2b – Common Services Rain

SUDPLAN shall provide the possibility to assess maximum rain intensity  
 Maximum rain intensity to be expected over sealed surfaces is needed to know how water run-off systems must be dimensioned.

**REQ-DOW-1.3: Assess maximum rain intensity**

SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by providing statistical measures (IDF curves) for future intense rainfalls, based on climate model results  
 This data is needed (at least in WP7) to plan efficient strategies to prevent damage, as input to a local model of the waste water infrastructure caused by future storm water events.

**REQ-DOW-5.1: Provide IDF curves**

SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by enabling the user to improve the quality of the simulated precipitation results by adding local historical precipitation data.

**REQ-DOW-5.2 Improved precipitation simulation results**

SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by identifying future periods – typically 1-2 months – with extreme precipitation events, for which SUDPLAN provides precipitation grids with high temporal (30 min) resolution  
 This data is needed to plan efficient strategies to prevent damage caused by future accumulations of heavy rain events.

**REQ-DOW-5.3: Identify extreme precipitation events**

30 2b/Q1a: Please assess the quality of the SUDPLAN precipitation prediction with respect to the state of the art (1 to 7 or NA, with 4=on par, 1=way below, and 7=way above. NA can be used to indicate that the comparison is impossible, useless or beyond your knowledge).  
 Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Maximum rain intensity</b>					1			
<b>IDF curves</b>						1		
<b>High temporal resolution rain data</b>						1		
<b>Identification extreme precipitation events</b>					1			
<b>Upload of historical data to improve the results</b>						1		

31 2b/Q1c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

SUDPLAN shall provide the possibility to assess maximum rain intensity

Maximum rain intensity to be expected over sealed surfaces is needed to know how water run-off systems must be dimensioned.

**REQ-DOW-1.3: Assess maximum rain intensity**

SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by providing statistical measures (IDF curves) for future intense rainfalls, based on climate model results

This data is needed (at least in WP7) to plan efficient strategies to prevent damage, as input to a local model of the waste water infrastructure caused by future storm water events.

**REQ-DOW-5.1: Provide IDF curves**

SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by enabling the user to improve the quality of the simulated precipitation results by adding local historical precipitation data.

**REQ-DOW-5.2 Improved precipitation simulation results**

SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by identifying future periods – typically 1-2 months – with extreme precipitation events, for which SUDPLAN provides precipitation grids with high temporal (30 min) resolution

This data is needed to plan efficient strategies to prevent damage caused by future accumulations of heavy rain events.

**REQ-DOW-5.3: Identify extreme precipitation events**

32 2b/Q2a: Please assess the ease of use of the SUDPLAN precipitation prediction results. So this question is not about the GUI but the provided results, which might be used for visualisation or as input to other models (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Maximum rain intensity</b>			1		1			
<b>IDF cuves</b>	1		1		1			
<b>High temporal resolution rain data</b>				1	2	2		
<b>Identification extreme precipitation events</b>	1	2	1		1			
<b>Upload of historical data to calibrate the results</b>	1				3	1		

33 2b/Q2c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

Model calibration is not a goal of the project!  
 A running IDF curve implementation was not available during validation V2.

**1.3.3 2c – Air Quality**

SUDPLAN shall provide possibility to assess the risk from air pollution and extreme temperature  
 Spatial distribution of air pollution, risk for extreme events and high ambient temperature in built-up residential and work areas.

**REQ-DOW-1.4: Assess risk from air pollution and extreme temperatures**

*SUDPLAN shall extend the state-of-the-art in the field of air pollution by offering the possibility for countries or groups of countries to assess future exposure and health risks caused by air pollutants and high ambient temperature*

*Air quality has a huge impact on human health, so assessing the air quality means also to assess human health risks. For example a visualization of air quality together with population density will help to make proper decisions.*

**REQ-DOW-7.4: Assess future health risks**

35 2c/Q1a: Please assess the capability of SUDPLAN to assess the risk of pollution and extreme temperature (1 = below, 4 = on par, 7 = far above). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Air pollution: Compared to the state of the art</b>								
<b>High ambient temperature: Compared to the state of the art</b>								
<b>High ambient temperature: Compared to SUDPLAN objectives</b>								
<b>Air pollution: Compared to SUDPLAN objectives</b>								

36 2c/Q1b: Please assess the usability of the SUDPLAN tool as the basis for assessment of the air pollution and extreme temperature risks (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Overall</b>								
<b>Scenario Management System (SMS)</b>								
<b>Common Services (CS)</b>								

37 2c/Q1c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN, and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of air pollution by delivering long term (10 year) air quality and temperature simulations over the entire Europe, for different climate scenario windows (e.g. 2006-2015, 2026-2035, 2046-2055 etc), enabling the end user to identify trends in poor air quality and heat wave incidents.*

**REQ-DOW-7.1: Provide long term air quality simulation**

38 2c/Q2a: Please indicate the level of support for following functionality (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Long term (10 year) air quality and temperature simulations over entire Europe</b>								
<b>Choice of climate scenario windows (e.g. 2006-2015, 2026-2035, 2046-2055 etc)</b>								
<b>Identify trends in poor air quality</b>								
<b>Identify trends in heat wave incidents</b>								

39 2c/Q2c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN, and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of air pollution by performing year long downscaling air quality and temperature simulations that allow the assessment of how local sources, activities and land use impact future air quality in particular European cities*

**REQ-DOW-7.2: Assess local influence to air quality**

40 2c/Q3a: Please indicate the level of support for following functionality (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Perform year long downscaling air quality simulations</b>								
<b>Perform year long downscaling temperature simulations</b>								
<b>Assess how local sources, activities and land use impact future air quality in particular European cities</b>								

41 2c/Q3c: Please give a short textual explanation on your experience with assessing the impact of local sources, activities and land use on future air quality in European cities (in SUDPLAN), and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of air pollution by allowing local emission scenarios and dispersion models to be nested to the downscaled air quality grids, demonstrating the relative importance of local sources within individual industrial, urban and residential environments*

**REQ-DOW-7.3: Connect local emission models**

42 2c/Q4a: Please indicate the level of support for following functionality (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Use of the downscaled air quality grids in local emission scenarios and dispersion models</b>								
<b>Allow users to estimate the relative importance of local sources within individual industrial, urban and residential environments</b>								

43 2c/Q4c: Please give a short textual explanation on your experience with assessing the importance of local sources to future air quality (in SUDPLAN), and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of air pollution by offering the possibility for countries or groups of countries to assess their possibilities to fulfill national air quality standards and environmental objectives, also in a climate change perspective*

*Assess the implications of decisions met now to the fulfillment of actual and future air quality standards (Strictly spoken this would also require a model of future air quality standards).*

**REQ-DOW-7.5: Assess future fulfilment of air quality standards**

44 2c/Q5a: Please indicate the usability of SUDPLANs air quality results (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>As information about expected future environmental conditions</b>								
<b>Comparing the results of future city development plans</b>								
<b>Assess the feasibility of fulfilling national air quality standards and environmental objectives, in a climate change perspective</b>								

45 2c/Q5c: Please give a short textual explanation on your experience with the usability of SUDPLANs air quality results, and suggestions for improvement.

### 1.3.4 2d – Hydrology

*SUDPLAN shall provide the possibility to assess river flooding scenarios*

*Risk for river flooding and inundations of built-up areas and other developed areas have to be assessed based on future climate scenarios*

**REQ-DOW-1.2: Assess risk for river flooding and inundations**

47 2d/Q1a: Please assess the capability of the application to assess the river-flooding scenarios (1 = below, 4 = on par, 7 = far above). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Compared to state of the art solutions?</b>								
<b>Compared to SUDPLAN objectives?</b>								

48 2d/Q1b: Please assess the usability of the SUDPLAN tool as the basis for river-flooding assessment applications (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Overall</b>								
<b>Scenario Management System (SMS)</b>								
<b>Common Services (CS)</b>								

49 2d/Q1c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN wrt. to state of the art (if any), and suggestions for improvement. Please state also which state-of-the art product was used for comparison.

*SUDPLAN shall extend the state-of-the-art in the field of flood and draughts by leaving local end users the possibility to improve SUDPLAN model results by adding local precipitation, river runoff and land use data.*

*To get more accurate results some fine grain local data can be used by the downscaling services.*

**REQ-DOW-6.2: Provide better downscaling results by using local data**

50 2d/Q4a: Please assess the usability of SUDPLAN to improve the model results by adding local and historical data (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations).

Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>River runoff</b>								
<b>Land use</b>								

51 2d/Q4b: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of flood and draughts by forming a tool which evaluates how different local land use and urbanization scenarios respond hydrologically to climate changes*

*Land use, and to a somewhat lesser extent the urbanisation (e.g. building architecture, requirements on infrastructure, sustainable population density) are very sensitive to climate changes.*

**REQ-DOW-6.3: Assess future land use scenarios**

52 2d/Q5a: Can the end user evaluate the impact of different scenarios? (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Climate change scenarios</b>								
<b>Land use scenarios</b>								
<b>Urbanisation scenarios</b>								

53 2d/Q5b: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of flood and draughts by delivering time series output of future river runoff suitable to feed local hydraulic flooding models  
To protect existing and plan future infrastructures the risk of flooding has to be assessed.*

**REQ-DOW-6.4: Provide future runoff time series**

54 2d/Q6a: Please assess the quality of the future runoff time series (1 = below state of the art, 4 = on par with state of the art, 7 = above state of the art). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Ease of use</b>								
<b>Data quality</b>								
<b>Suitable to feed into local hydraulic flooding model</b>								

55 2d/Q6c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement. Please state also which state-of-the art product was used for comparison.

56 2d/Q7a: Please indicate the usability of SUDPLANS result in the hydrological domain (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>As information about expected future environmental conditions</b>								
<b>Comparing the results of future city development plans</b>								

57 2d/Q7c: Please give a short textual explanation on your experience with the usability of SUD-PLANS results in the hydrological domain, and suggestions for improvement.

## 1.4. 3 Local models

*SUDPLAN shall extend the state-of-the-art in the field of extreme precipitation by enabling the user to improve the quality of the simulated precipitation results by adding local historical precipitation data. Local historical data can be used to calibrate the results according the local conditions*

### **REQ-DOW-5.2: Provide input for local models**

*SUDPLAN shall support modellers in integrating their models into a SUDPLAN application. Integrating models into a SUDPLAN application, possibly with other models, means that the modeller needs to be able to specify the role of the model(s) within the application and to make the necessary connections between the model(s) and other components of the application.*

### **REQ-USR-3.1.1: Model Integration**

*SUDPLAN shall support modellers in the configuration of models for analysts. Modellers need to be able to configure models by specifying those data which are necessary for the model but which will not be under the control of the analyst.*

### **REQ-USR-3.1.2: Model configuration**

*SUDPLAN shall support modellers in calibrating their models within a SUDPLAN application. If a SUDPLAN application provides access to sufficient measurement data, it may be desirable to calibrate the model(s) used within the application to those data.*

**REQ-USR-3.2.1 Model calibration**

*SUDPLAN shall support modellers in validating their models within a SUDPLAN application. If a SUDPLAN application has access to sufficient measurement data, using these data to validate the model(s) can increase confidence in the results of the model(s) within the context of the application.*

**REQ-USR-3.2.2: Model validation**

59 3/Q1a: Please assess the ability of SUDPLAN in the field of model integration (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Ease of integration of models as a service</b>		2			2	1		
<b>Running models directly from the SUDPLAN GUI</b>					3	2		
<b>Specifying parameters for model runs</b>				3	2			
<b>Using model results as input for another model (Service chaining)</b>	2	1	1			1		
<b>Configuration of models</b>	1	1			1			
<b>Model validation</b>		1		1				
<b>Model calibration</b>	1	1						
<b>Distinguish between different model version</b>				1	2	1		

60 3/Q1b: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

The SUDPLAN SMS allows the comparison of different model input files and different climate scenarios.

Specification of parameters for the model runs should be improved as planned in V3. Configuration of the model is only partly handled by SUDPLAN, many settings are directly linked to the input (=scenario) configuration. Model validation and calibration is (for the Linz pilot SWMM model) not carried out directly in the SUPDLAN platform.

## 1.5. 4 Usage of external services

*SUDPLAN shall extend the state-of-the-art in the field of environmental decision support systems by offering ubiquitous integration with information sources and services in SOA-based infrastructures Needed for easy integration of existing and future services.*

**REQ-DOW-3.4: Provide integration with SOA-based infrastructures**

62 4/Q3a: Please indicate the level of support offered by the SUDPLAN product (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
Service and resource discovery								
Service and resource integration								
Access standardised SOA services								
Interpret underlying data model								
Transform data to different models								
Data interpolation / extrapolation								
Fusion of data from heterogenous sources								

*SUDPLAN shall extend the state-of-the-art in the field of environmental decision support systems by offering ubiquitous integration with information sources and services in SOA-based infrastructures Needed for easy integration of existing and future services.*

**REQ-DOW-3.4: Provide integration with SOA-based infrastructures**

*SUDPLAN shall support the integration of spatial layers through standardized services. Spatial data will play a crucial role in SUDPLAN applications, and integration of these data using standard tools is essential.*

**REQ-DEV-1.2.1: Web map services**

*SUDPLAN shall support the integration of models through standardized web services. Integration of distributed models through standardized web services is essential to support the development of SUDPLAN applications.*

**REQ-DEV-1.2.2: Model service integration**

*SUDPLAN shall support information product modelling. Elements of SUDPLAN application information products can also be structured using information modelling methods.*

**REQ-DEV-1.2.3: Sensor Service integration**

63 4/Q3b: Please indicate which external service types can be used by SUDPLAN. Please give the number of answers for each alternative.

	Yes without any configuration	Yes with some configuration by the user	Yes with configuration by the administrator / developer	No	NA
OGC WMS (Web Map Service)		1			
OGC WFS (Web Feature Service)					
OGC WCS (Web Coverage Service)					
OGC SOS (Sensor Observation Service)			1		

OGC SPS (Sensor Planning Services)			1		
OGC WPS (Web Processing Service)					

64 4/Q3c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN (if any), and suggestions for improvement.

## 1.6. 5 SOA

### 1.6.1 5a – Provide a SOA interface

*SUDPLAN shall define and publish interfaces to access SUDPLAN (in order to access results or to invoke services), which are based on open standards*

*This will allow other systems to use data and services provided by SUDPLAN.*

#### **REQ-DOW-2.2: Publish interfaces**

*SUDPLAN shall extend the state-of-the-art in the field of service-oriented infrastructures by adding to SOAs new types of services (both specifications and implementations)*

*If there are no proper service specifications SUDPLAN will provide new specifications and implementations.*

#### **REQ-DOW-9.3: Provide new SOA specifications**

66 5a/Q1a: Please name the SUDPLAN service interface specifications. This includes standard interfaces, extended or new interfaces as well as proprietary interfaces.

67 5a/Q1b: Please describe the SUDPLAN service interface specifications from the previous question. Please give the number of answers for each alternative.

	pre-existing service specification	extension	new SUDPLAN development	open source specification	proprietary
Please					
fill in interfaces					
from					
question					
66 5a/Q1a!					

68 5a/Q1c: Please indicate the level of completion (at least of the new or extended) service interface specifications. Please give the number of answers for each alternative.

	No specification	Functional description	Complete formal description	Considered "best practice" by relevant community	De-facto industry standard	De-facto standard e.g. OGC/ISO /CEN standard	No answer
Please							
fill in interfaces							
from							
question							
66 5a/Q1a!							

69 5a/Q1d: Please give pointers to publicly available service documentations / specifications (at least for new or extended specifications). Please give the number of answers for each alternative.

Please	
fill in interfaces	
from	
question	
66 5a/Q1a!	

70 5a/Q1e: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

**1.6.2 5b – Provide SOA service**

*SUDPLAN shall define and publish interfaces to access SUDPLAN (in order to access results or to invoke services), which are based on open standards*

**REQ-DOW-2.2: Publish interfaces**

72 5b/Q1a: Please name the service instances and data sets used in SUDPLAN. This includes new as well as pre existing services, models and data sets. Examples: Model of Linz sewerage system, Rain time series.

73 5b/Q1b: Possible usage of the service instances and data sets named in the previous question. Please give the number of answers for each alternative.

	Free of charge	Commercial	SUDPLAN internal only	NA
Please				
fill in data sets				
from				
question				
72 5b/Q1a!				

*SUDPLAN shall provide user-friendliness of services and interfaces, in particular ergonomics of the graphical user interface (GUI) and the visualization components*

**REQ-DOW-2.10: Offer uses-friendly interfaces**

74 5b/Q3a: Please indicate the key concepts used in SUDPLAN to assure the usability of the service interfaces. Please give the number of answers for each alternative.

	Yes	Uncertain	No	NA
Self-describing service interfaces				
Self-describing data models				
Service ontology				
Data ontology				
Response time estimate				
Response size estimate				
User-requested limits for response time				
User-requested limits for response size				
Subscribe / alert mechanism				
Panning / browsing through results (in time)				
Panning / browsing through results (in space)				
Fetching the recently changed data only				

75 5b/Q3c: Please give a short textual explanation on the user friendliness of the SUDPLAN service interfaces and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of service-oriented infrastructures by complementing SOAs in the field of modelling services*

*The models used within SUDPLAN will be provided as services*

**REQ-DOW-9.4: Provide new SOA modelling services**

76 5b/Q4a: Please list the "model as a service" services developed in SUDPLAN. This includes common services as well as local models integrated as services.

	Service name	Type (e.g. OGC SOS)	URL to access the service


*SUDPLAN shall contribute to the extension of the state-of-the-art in the area of model integration and expose the models used in SUDPLAN applications as services in loosely coupled SOA  
The models used within SUDPLAN shall be offered as services to allow re-using them in multiple contexts without repeated model development efforts.*

**REQ-DOW-8.1.: Provide models using SOA**

*SUDPLAN shall support the integration of models through standardized web services.  
Integration of distributed models through standardized web services is essential to support the development of SUDPLAN applications.*

**REQ-DEV-1.2.2: Model Service Integration**

77 5b/Q4b: Please assess the ease of use of “models as services” (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>using already configured model services</b>								
<b>integrating a new model service</b>								

78 5b/Q4c: Please give a short textual explanation on your experience with integrating and using the models as services (in SUDPLAN), and suggestions for improvement.

*SUDPLAN shall contribute to the extension of the state-of-the-art in the area of model integration as models become more available to administrative end users  
Models available as services should be offered to SUDPLAN users.*

**REQ-DOW-8.2: Provide models for the end user**

*SUDPLAN shall support modellers in integrating their models into a SUDPLAN application.  
Integrating models into a SUDPLAN application, possibly with other models, means that the modeller needs to be able to specify the role of the model(s) within the application and to make the necessary connections between the model(s) and other components of the application.*

**REQ-USR-3.1.1: Model integration**

79 5b/Q5a: Please assess the capability of SUDPLAN “model as a service” concept (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA

Dynamic linking the models with data sources								
Configuration of the models								
Running of the models continuously								
Running of the models on request								
Informing the users about the model run progress								
Propagation of the data and model uncertainties								
Providing rich self-describing data models for model results								
Handling large data sets								

80 5b/Q5c: Please give a short textual explanation on your experience with the SUDPLAN’s “model as a service” concept, and suggestions for improvement.

*SUDPLAN shall contribute to the extension of the state-of-the-art in the area of model integration as emerging SOA development is fostered  
Techniques and tools used for model integration in SUDPLAN shall also be available outside of SUDPLAN.*

**REQ-DOW-8.3: Foster SOA development in the area of model integration**

81 5b/Q6a: Please name the extensions of the state of the art in the area of “model as a service” achieved by SUDPLAN (if any).

*SUDPLAN shall extend the state-of-the-art in the field of service-oriented infrastructures by supporting the spreading of SOA-type service networks  
Since SUDPLAN will allow the access to and from SOA based service networks users will have an interest to use SOA networks*

**REQ-DOS-9.2: Spread SOA-type service networks**

82 5b/Q7a: Please list the projects and products using (parts of) the SUDPLAN service infrastructure (if any).

	Service name	Type (e.g. OGC SOS)	URL to access the service

83 5b/Q7b: Please give a short textual report on the achievements wrt. spreading of the SOA infra-structures by SUDPLAN, and suggestions for improvement.

**1.7. 6 Usage of standards**

*The SUDPLAN product service interfaces, data and meta-information models shall be entirely based on open standards*

*The usage of open standards is needed to enable connections to other (existing and future) systems. For example, we need to access already existing city-local data and services which are not based on open standards. This should be done by providing standard based interfaces to this data storages and services.*

**REQ-DOW-2.1: Use open standards**

*SUDPLAN shall contribute to the extension of the state-of-the-art in the area of model integration as existing standards (e.g. OGC Web Processing Service) are tested and validated in terms of their usability*

*SUDPLAN will collect experience in using existing SOA standards.*

**REQ-DOW-8.4: Validate existing standards**

*SUDPLAN shall extend the state-of-the-art in the field of service-oriented infrastructures by taking up existing developments, validating and improving them*

*Rationale: SUDPLAN will use and where necessary improve existing standards*

**REQ-DOW-9.1: Improve existing SOA standards**

85 6/Q7a: Please name the standards that were tested / extended / validated for their usability / actually used in the SOA context by SUDPLAN). This includes service interfaces, data coding standards and more.

	Yes	No	Name (for Others)
OGC WMS	1	4	
OGC WFS	0	5	
OGC WCS	0	5	
OGC SOS	1	4	
OGC SPS	1	4	
OGC WPS	0	5	
Other 1			
Other 2			
Other 3			
Other 4			
Other 5			

*SUDPLAN shall contribute to the extension of the state-of-the-art in the area of model integration as existing standards (e.g. OGC Web Processing Service) are tested and validated in terms of their usability*

*SUDPLAN will collect experience in using existing SOA standards.*

**REQ-DOW-8.4: Validate existing standards**

*SUDPLAN shall extend the state-of-the-art in the field of service-oriented infrastructures by taking up existing developments, validating and improving them*

*Rationale: SUDPLAN will use and where necessary improve existing standards*

**REQ-DOW-9.1: Improve existing SOA standards**

86 6/Q7b: Please assess the usability of the standards named in the previous question (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
OGC WMS						1		
OGC WFS								
OGC WCS								
OGC SOS			1					
OGC SPS			1					
OGC WPS								
Other 1								
Other 2								
Other 3								
Other 4								
Other 5								

*SUDPLAN shall contribute to the extension of the state-of-the-art in the area of model integration as existing standards (e.g. OGC Web Processing Service) are tested and validated in terms of their usability*

*SUDPLAN will collect experience in using existing SOA standards.*

**REQ-DOW-8.4: Validate existing standards**

*SUDPLAN shall extend the state-of-the-art in the field of service-oriented infrastructures by taking up existing developments, validating and improving them*

*Rationale: SUDPLAN will use and where necessary improve existing standards*

**REQ-DOW-9.1: Improve existing SOA standards**

87 6/Q7c: Please describe the key shortcomings of the above mentioned standards that were discovered in the pilot, and give suggestions for improvement.

SOS has too much overhead for big datasets. SOS and SPS are too complicated to use.

*The SUDPLAN product service interfaces, data and meta-information models shall be entirely based on open standards*

*The usage of open standards is needed to enable connections to other (existing and future) systems. For example, we need to access already existing city-local data and services which are not based on open standards. This should be done by providing standard based interfaces to this data storages and services.*

**REQ-DOW-2.1: Use open standards**

88 6/Q2a: Please indicate the proprietary solutions used in this pilot (if any) and explain why no open standard has been used (e.g. "existing system, replacing too costly", "no open standard exists").

	Solution	Reason
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

*The SUDPLAN product service interfaces, data and meta-information models shall be entirely based on open standards*

*The usage of open standards is needed to enable connections to other (existing and future) systems. For example, we need to access already existing city-local data and services which are not based on*

*open standards. This should be done by providing standard based interfaces to this data storages and services.*

**REQ-DOW-2.1: Use open standards**

89 6/Q2b: Please give a short textual explanation for the above marks, and suggestions for improvement.

## 1.8. 7 Open source software

*SUDPLAN shall be based on open source products, and will itself be an open source product  
Should enable simple extensibility, reuse and make the product easily available to all interested parties at minimal cost*

**REQ-DOW-2.3: Use and provide open source**

91 7/Q1a: Please name the software elements of SUDPLAN. This might include libraries, service implementations, GUI elements and so on.

	Solution
1	U.S. EPA SWMM as local WP7 model
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

*SUDPLAN shall be based on open source products, and will itself be an open source product  
Should enable simple extensibility, reuse and make the product easily available to all interested parties at minimal cost*

**REQ-DOW-2.3: Use and provide open source**

92 7/Q1b: Possible usage of the service instances and data sets named in the previous question.  
Please give the number of answers for each alternative.

	Pre-existing	SUDPLAN	New software	Available as open

	software	extension		source
1				
2				
3				
4				
5				
6...				

93 7/Q1c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement. Especially if some new developed software is not open source: please state why!

## 1.9. 8 Completeness of functionality

*Decisions based on the SUDPLAN applications may have great impact (e.g. financial impact on city planning). It is therefore important to adequately store all the facts and results leading to the decision, e.g. to allow a-posterior reconstruction of the decision making process and audits. Every piece of data within the internal repositories therefore has to be assessed with descriptions about the origin and processing of these data.*

### REQ-DOW-2.7

95 8/Q2a: Please list quality controlled data repositories used within SUDPLAN.

	Name
1	
2	
3	
4	
5	
6	
7...	

96 8/Q2b: Please indicate which aspects of the repository QA are covered.

	uncertainties of input/output data known and visualized	Data snapshot (input data, model results) used for decision making saved with scenario instance	Decision & reasoning/comments saved with scenario instance)

1			
2			
3			
4			
5			
6...			

97 8/Q2c: Please give a short textual explanation on the (dis)advantages of “quality controlled repositories” in SUDPLAN, and suggestions for improvement.

98 8/Q3a: Please describe at least one “worst case” scenario illustrating the need for “security” when using SUDPLAN.

No special security is need for the Linz pilot.

99 8/Q3b: Please indicate the worst case scenario consequences, in terms of the human or monetary losses, legal liabilities, etc (example: 100M€ on productivity loss in case of false alert).

A worst case scenario would be if the emitted pollution loads from sewage to receiving waters would increase dramatically causing an increase of fish mortality.

100 8/Q3c: Please give a short textual explanation on the (dis)advantages of “security” in SUDPLAN, and suggestions for improvement.

*Web publishing is becoming a main information source for large parts of the population. SUDPLAN does not intend to implement a full Content Management System functionality, but it should allow the export of results in proper formats to publish them in the WWW to inform the public.*

**REQ-DOW-2.9**

101 8/Q4a: Please assess the usability of the “result publication” on the web as offered by SUDPLAN (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Tables</b>					1			
<b>Graphic representations</b>					1			
<b>Animations</b>								
<b>Videos</b>					1			
<b>3D Material</b>					1			
<b>Complete reports</b>				1				

102 8/Q4c: Please give a short textual explanation on the (dis)advantages of “web publication” in SUDPLAN, and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of environmental decision support systems by offering to users the dynamic composition of scientific work flows  
Allow users to define their own workflows as needed*

**REQ-DOW-3.1:Provide dynamic composition of work flows**

103 8/Q5b: Please indicate the level of usability of the “dynamic workflow composition” offered by SUDPLAN as compared to the state of the art workflow solutions (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Dynamic workflow composition</b>								

104 8/Q5c: Please indicate the "state of the art" applications used to compare SUDPLAN with.

105 8/Q5d: Please give a short textual explanation for the above marks, key advantages of SUDPLAN wrt. to state of the art (if any), and suggestions for improvement.

*SUDPLAN shall extend the state-of-the-art in the field of environmental decision support systems by offering automation of model runs, analysis and reporting  
Simplify the use of modelling, analysis and reporting tools for end users*

**REQ-DOW-3.3**

106 8/Q6a: Please indicate the level of support for following functionality offered by SUDPLAN product (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Automated model runs</b>								
<b>Automated analysis</b>								
<b>Automated reporting</b>								

107 8/Q6c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN (if any), and suggestions for improvement.

*SUDPLAN shall offer a powerful tool for assessing environmental factors and their interaction with urban subsystems such as infrastructure, waste water and transport systems, in a climate change perspective to be used for city management.*

*Model based decision support applications are used to better understand the effects of city management decisions in a complex system.*

**REQ-DOW-4.1: Support city management**

108 8/Q7a: Please assess the usability of SUDPLAN in the city management scenario (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Compared to state of the art solutions</b>					1			
<b>Compared to SUDPLAN project objectives</b>				1				

1

109 8/Q7b: Please assess the usability of the SUDPLAN tool as the basis for city management applications product (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations).

Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Overall</b>					1			
<b>SMS (Scenario Management System)</b>					1			
<b>CS (Common Services)</b>					1			

110 8/Q7c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN (if any), and suggestions for improvement.

The SUDPLAN tool is a useful decision-support tool for city management in scenario comparison.

*SUDPLAN shall enhance the current state of the art in interactive visualization by allowing easy customization of the visualization and interaction by the user/planer, which can produce presentations tailored for different recipient groups*

*This is needed to present facts and document the reasons of decisions outside the interactive SUDPLAN environment.*

**REQ-DOW-10.3: Provide tools to create customizable presentation material**

*SUDPLAN shall support the users' efforts to produce accessible information products from the results of their analyses.*

*The value of an analysis can be greatly enhanced by producing information products which contain or reflect the results but which are also accessible to other stakeholders. Analysts will require system support to help them generate such information products.*

**REQ-USR-2.71: Creation of information products**

*SUDPLAN shall support the generation of reports.*

*Basic reports making the results of scenario execution accessible to non-analysts are necessary in order to communicate the results to the other stakeholders of the SUDPLAN application.*

**REQ-USR-2.7.2: Report generation**

*SUDPLAN shall support the publishing of its artefacts for use of other services.*

*SUDPLAN analysts may wish to make their data and other information available to other web-based services, and therefore need a mechanism for publishing this information to the Internet.*

**REQ-USR-2.9.1: Information publishing**

111 8/Q8a: Please assess the level of SUDPLAN's achievement while creating presentation material in the following categories (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Interactive visualization</b>					1			
<b>Customization for different recipient groups</b>				1				
<b>Exporting the results for further dissemination</b>				1				

112 8/Q8c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN wrt. to the state of the art (if any), and suggestions for improvement.

**REQ-USR-2.1: Information management (specific to analysts)**

SUDPLAN shall allow users to manage their information sources easily.

*An information-intensive application must facilitate the finding, storing, and utilization of information within the application in order to support user success and satisfaction.*

**REQ-USR-2.1.1: Information source management**

*SUDPLAN shall support users in the management of information related to their activities. Besides actual input data, there may be other information valuable to the analyst, and this information needs to be readily accessible to the users.*

**REQ-USR-2.1.2: Management of related knowledge**

*SUDPLAN shall allow users to find and utilize information sources distributed globally via the Internet. SUDPLAN applications will often rely on data from multiple external sources.*

**REQ-USR-2.1.3: Distributed information sources**

*SUDPLAN shall allow users to manage the results of analysis easily. SUDPLAN applications will produce results in a wide variety of forms. These data need to be easily accessible to and manipulated by the analysts.*

**REQ-USR-2.1.4: Output data management**

*SUDPLAN shall support processing of the results of users' analyses. Given the complexity of SUDPLAN applications, output data resulting from primary analytical techniques may need to be post-processed by the user, and system support for these activities is necessary.*

**REQ-USR-2.1.5: Result processing management**

*SUDPLAN shall support the management of information products. Information products produced by analysts must be stored and managed in an organized and accessible fashion.*

**REQ-USR-2.1.6: Information product management**

*SUDPLAN shall support spatial reference system conversion. Information products produced throughout the platform must be easily convertible to other spatial reference systems.*

**REQ-USR-2.1.7: Coordinate conversion**

*SUDPLAN shall support tracing of user actions. SUDPLAN shall provide support the tracing of user and system component interactions*

**REQ-USR-2.1.8: Tracing**

113 8/Q9a: Please assess the usability of SUDPLAN with respect to the information management requirements of analysts (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Information source management</b>								
<b>Management of related knowledge</b>								
<b>Distributed information sources</b>								
<b>Output data management</b>								
<b>Result processing management</b>								
<b>Information product management</b>								
<b>Coordinate conversion</b>								
<b>Tracing</b>								

114 8/Q9c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

**REQ-USR-2.2 Interactivity (Special to analysts)**

*The SUDPLAN user interface shall be highly interactive. SUDPLAN needs to support and encourage analysts who want to interact with the system by including design features which facilitate manipulation of elements of the modelled system (e.g. parameters, variables, and input data).*

**REQ-USR-2.2.1: General interactivity requirements**

*Where feasible, the SUDPLAN user interface shall respond immediately to changes in parameters. When the analyst has manipulated an input to the modelling system, the system needs to provide an immediate response to this change in situations where that makes sense and is possible.*

**REQ-USR-2.2.2: Responsiveness**

*Where feasible, the SUDPLAN system shall pre-fetch and cache data. Pre-fetching and caching data locally (on users' computers or on a fast LAN) can greatly improve the users' experience of interactive exploration of the data.*

**REQ-USR-2.2.3: Local data copy**

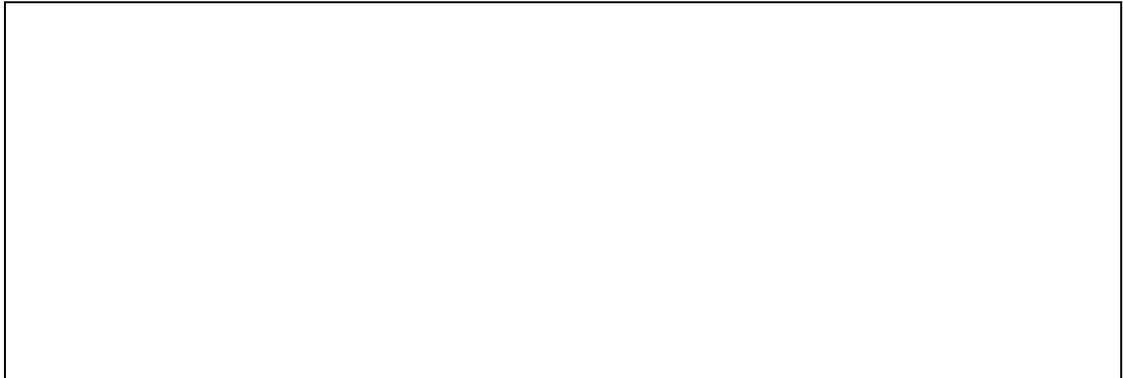
*Where feasible, the SUDPLAN system shall download only the part of the data that actually changed since the last request. Repeated fetching of data over a network is slow and inefficient.*

**REQ-USR-2.2.4: Differential data download**

115 8/Q10a: Please assess the usability of SUDPLAN with respect to the interactivity requirements of analysts (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>General interactivity requirements</b>								
<b>Responsiveness</b>								
<b>Local data copy</b>								
<b>Differential data download</b>								

116 8/Q10c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.



### **REQ-USR-2.3: Model management (specific to analysts)**

*SUDPLAN shall support users in choosing initial and boundary conditions.*

*Mathematical models generally require parameters describing initial and boundary conditions as constraints for internal variables in the model. It is essential that users be permitted, and assisted where possible, in choosing and establishing those conditions.*

#### **REQ-USR-2.3.1: Initial and boundary conditions**

*SUDPLAN shall support users in storing, managing and re-using sets of conditions.*

*Particular combinations of initial and boundary condition parameters can be stored as a set, and then reused in subsequent model runs.*

#### **REQ-USR-2.3.2: Condition sets**

*SUDPLAN shall support end users executing models synchronously.*

*Models which generally run to completion quickly can be run by users who choose to wait for completion.*

#### **REQ-USR-2.3.3: Synchronous model execution**

*SUDPLAN shall support users executing models asynchronously.*

*Since some models will take considerable time to complete, users may choose to run these models asynchronously.*

#### **REQ-USR-2.3.4: Asynchronous model execution**

*SUDPLAN shall permit users to instantiate repeated executions of models with a variation of conditions.*

*Extending the concept of asynchronous model execution, users can run multiple instances of the same model combination with varying sets of parameters, producing a "family" of results.*

#### **REQ-USR-2.3.5: Model set execution**

*SUDPLAN shall support users performing and/or using pre-calculated model executions.*

*For computationally intensive models limiting the number of times the model has to be executed, and using stored results from previous runs, can help model combinations which use these results to execute in a timely fashion, and can also reduce redundant use of computational resources.*

#### **REQ-USR-2.3.6: Pre-calculated model execution**

*SUDPLAN shall allow users to monitor model execution progress and shall notify users of changes in model status.*

*Computationally intensive models can take considerable time to execute, and during their execution analysts will need to be able to check their status and learn if a run has completed, failed, etc.*

#### **REQ-USR-2.3.7: Model run status**

### **REQ-USR-2.6 Result documentation/annotation**

*SUDPLAN shall support the documentation of an individual model run.  
The results of each model run need to be annotated before being stored in order to facilitate search and recovery.*

**REQ-USR-2.6.1 Documentation of a model run**

*SUDPLAN shall support the documentation of a scenario set execution  
In addition to storing annotations about individual model runs, analysts will need to annotate scenario sets as well.*

**REQ-USR-2.6.2 Documentation of scenario set execution**

117 8/Q11a: Please assess the usability of SUDPLAN with respect to the model management and result documentation requirements of analysts (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Initial and boundary conditions</b>								
<b>Condition sets</b>								
<b>Synchronous model execution</b>								
<b>Asynchronous model execution</b>								
<b>Model set execution</b>								
<b>Pre-calculated model execution</b>								
<b>Model run status</b>								
<b>Documentation of a model run</b>								
<b>Documentation of scenario set execution</b>								

118 8/Q11c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

**REQ-USR-2.7: Information products**

*SUDPLAN shall support the users' efforts to produce accessible information products from the results of their analyses.*

*The value of an analysis can be greatly enhanced by producing information products which contain or reflect the results but which are also accessible to other stakeholders. Analysts will require system support to help them generate such information products.*

**REQ-USR-2.7.1: Creation of information products**

*SUDPLAN shall support the generation of reports.*

*Basic reports making the results of scenario execution accessible to non-analysts are necessary in order to communicate the results to the other stakeholders of the SUDPLAN application.*

**REQ-USR-2.7.2: Report generation**

*SUDPLAN shall support the export of its artefacts to external formats.*

*In order to support the generation of information products beyond basic reports, the analyst will need to be able to export artefacts (such as model execution results or visualized data) to other formats so that they can use tools outside of SUDPLAN to develop more information products.*

**REQ-USR-2.7.3: Export**

**REQ-USR-2.8: Sharing**

*SUDPLAN shall support the sharing of information among different users.*

*Information regarding a SUDPLAN application, including but not limited to input data, should be readily shared between consenting analysts to facilitate collaboration and efficiency.*

**REQ-USR-2.8.1: Information sharing**

*SUDPLAN shall support the sharing of results among different users.*

*The results of model and scenario set execution can be useful for analysts working on the same or related applications, and should be readily shared along with their documentation annotations.*

**REQ-USR-2.8.2: Result sharing**

*SUDPLAN shall support the sharing of information products among different users.*

*Multiple analysts might be producing similar information products to communicate their results. Sharing of these products encourages efficiency and consistency.*

**REQ-USR-2.8.3: Information product sharing**

*SUDPLAN shall support the sharing of automation tasks among different users.*

*The configuration of automation tasks can become complex for some complicated modelling systems. Sharing these configurations for re-use brings increased efficiency and quality control.*

**REQ-USR-2.8.4: Automation sharing**

*SUDPLAN shall support the sharing of annotations among users.*

*Sharing of annotations among analysts working on the same data sets can increase their efficiency and support additional quality control.*

**REQ-USR-2.8.5: Annotation sharing**

**REQ-USR-2.9: Publishing**

*SUDPLAN shall support the publishing of its artefacts for use of other services.*

*SUDPLAN analysts may wish to make their data and other information available to other web-based services, and therefore need a mechanism for publishing this information to the Internet.*

**REQ-USR-2.9.1: Information publishing**

*SUDPLAN shall support the publishing of its artefacts as web content.*

*Other SUDPLAN application information, such as visualizations and information products, may also be shared with others as web content in order to enhance the value added by the application analyses.*

**REQ-USR-2.9.2: Web publishing**

*SUDPLAN shall use standards for the publishing of information content.*

*Adherence to standards will increase the availability of SUDPLAN application information to the wider community.*

**REQ-USR-2.9.3: Web publishing standards**

119 8/Q12a: Please assess the usability of SUDPLAN for the creation of reports, publications and data export with respect to the requirements of analysts (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Creation of information products</b>								
<b>Report generation</b>								
<b>Export</b>								
<b>Information sharing</b>								
<b>Result sharing</b>								
<b>Information product sharing</b>								
<b>Automation sharing</b>								
<b>Annotation sharing</b>								
<b>Information publishing</b>								
<b>Web publishing</b>								
<b>Web publishing standards</b>								

120 8/Q12c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

**REQ-USR-4.1: Platform management**

*SUDPLAN shall support system managers in managing users.*

*In order to manage access to a SUDPLAN application the system manager needs to be able to specify users and groups of users to the system.*

**REQ-USR-4.1.1: User management**

*SUDPLAN shall support system managers in managing system security and access rights.*

*System managers need to be able to specify which users are authorized to have what level of access to which parts of the application.*

**REQ-USR-4.1.2: Security and rights management**

**REQ-USR-4.2:**

*Integration SUDPLAN shall support system managers in integrating data sources.*

*A SUDPLAN application may use data from a variety of sources. The system manager needs to be able to integrate these data sources into the application for the system analyst.*

**REQ-USR-4.2.1: Data source integration**

*SUDPLAN shall support system managers in integrating sensor services. SUDPLAN applications may use sensor services that are either local to the application or that are distributed and accessible via the web.*

**REQ-USR-4.2.2: Sensor service integration**

*SUDPLAN shall support system managers in integrating arbitrary services. SUDPLAN applications may use other non-modelling services that are either local to the application or that are distributed and accessible via the web.*

**REQ-USR-4.2.3: Service integration**

121 8/Q13a: Please assess the usability of SUDPLAN with respect to the requirements of system managers (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>User management</b>								
<b>Security and rights management</b>								
<b>Data source integration</b>								
<b>Sensor service integration</b>								
<b>Service integration</b>								

122 8/Q13c: Please give a short textual explanation for the above marks, key advantages of SUDPLAN and suggestions for improvement.

## 1.10. 9 Conclusions

*Information about climate scenarios, downscaling of rain, air quality and hydrogogical conditions.*

123 9/Q4a: Have you had access to similar information as available from SUDPLAN before?

	Y	N	NA
<b>1</b>	1	4	
<b>2</b>			
<b>3...</b>			

124 9/Q4b: Compared to the earlier information SUDPLAN results are: (1 = not fulfilled at all, 4 = on par, 7 = fulfilled beyond expectations). Please give the number of answers for each alternative.

	1	2	3	4	5	6	7	NA
<b>Quality</b>			1					
<b>Usefulness</b>				1				

125 9/Q4c: Which information sources were used for comparison? Please describe the reasons for your judgement.

Rainfall data
---------------

126 9/Q4d: What is your impression of the SUDPLAN output?

	Not scientifically sound nor credible	Not possible to judge on quality	Scientifically sound and credible
<b>1</b>		3	1
<b>2</b>			
<b>3...</b>			

127 9/Q5a: Do you find the SUDPLAN output to be useful as a base for your planning? Choose one of the following answers.

	Not at all	To certain extent	Highly useful
<b>1</b>		4	1
<b>2</b>			
<b>3...</b>			

Please enter your comments here.

For a future assessment of the sewer behaviour when precipitation will be changed due to climate change (tool for scenario management and resulting conclusions).  The really positive thing about the SUDPLAN SMS is the integration of CS and local models and to have the possibility to compare different scenarios.  The output is useful for its purpose: a scenario management using future predicted scenarios.
---

128 9/Q6a: Did SUDPLAN provide you with the data output expected? Choose one of the following answers.

	<b>A lot of information missing</b>	<b>Most information given</b>	<b>All aspects covered</b>
<b>1</b>		5	
<b>2</b>			
<b>3...</b>			

Please enter your comments here.

"Help" button, rough description of implemented climate change scenarios, no possibility to generate automatic reports, export or a result file which can be import in other software.

All relevant outputs from the model runs are given, additional information on sensor data should be implemented in V3.

129 9/Q7a: How did you find the graphical presentation of the SUDPLAN results? Choose one of the following answers.

	<b>Not useful</b>	<b>Ordinary</b>	<b>Excellent and contributing to a better understanding</b>
<b>1</b>		5	
<b>2</b>			
<b>3...</b>			

Please enter your comments here.

Could be improved. The speed meter visualisation for the CSO eta values is not realized proper. Graphical presentation of the model structure is excellent; the model results presentation could still be improved.

130 9/Q8a: What is in your opinion the strength of SUDPLAN output?

Scenario management

To have a first comparison of the discharged outflows of CSO facilities.

Spatial aspects and comparability of results & scenarios.

131 9/Q9a: What is in your opinion the weakness of SUDPLAN output?

There is no result reporting functionality implemented at the moment.

Data export could be improved.

132 9/Q10a: Would you recommend the SUDPLAN tool to colleagues in other European cities?

Choose one of the following answers.

	No	Maybe for a few specific cases	Yes, would be useful for most cities
1		3	2
2			
3...			

Please enter your comments here.

Yes, but only for special tasks.

In its final implementation in V3 I think it will be useful for most cities.

133 9/Q1a: Please give a short summary of your impression of the SUDPLAN product.

Helpful tool for future scenario management to get information what should be changed in your sewer system (general).

It is an unfinished product which has the potential to make climate scenarios understandable for people, to make predictions of future events and to have a base for planning infrastructure, for example sewage plants.

The SUDPLAN product could make climate predictions easier to integrate in local scientific methods. So it could be a very helpful tool for city planning.

The first impression is quite good. A short tutorial could be useful to become familiar with the whole functionalities of the SMS.

Overall the SUDPLAN product is easy to use concerning the scenario management for model runs, model and result visualization. Visualization and usability are on a high level of quality.

134 9/Q2a: Please give some proposals for improvement of the SUDPLAN product.

Help menu and a tutorial for the product, to make it easier for not experienced users to handle the program. Reporting functionality to make presentations of the data. Export functionality for data in desired formats.

The ease of integration of local data sources and models could be improved. The help system could be improved. More information about the climate scenarios. Reporting functionality. Tutorials for the product Export functionality.

Add a short tutorial to become faster familiar with the whole functionalities of the SMS. Add context sensitive help functionality to explain for example the base and differences of different climate scenarios.

Implementation of additional climate scenarios in the CS.

135 9/Q3a: Please give some proposals for the optimization of this survey.

Generate better reports from all done surveys related to one pilot to compare and compile the different results for one aggregated pilot report.