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Table of Contents

1. Management Summary 6
2. Methodology 8
2.1. Documents involved 8
2.2. Validation aspects 8
2.2.1 Fulfilment of the pilot goals 8
2.2.2 Professional profiles taking part in the pilot product validation 9
2.2.3 Interaction between WP3 and WP4 and usability of the SUDPLAN Product 9
2.2.4 Technical requirements of WP3 and WP4 9
2.3. Rating 10
3. Validated components and aspects of the pilot product 12
4. Summary and conclusions 13
4.1. Professional profiles and user categories of respondents to the simplified validation questionnaire 13
4.2. Summary for Graphical User Interfaces 15
4.3. Summary for Climate Scenarios 16
4.4. Summary for Common Services – Rainfall 16
4.5. Summary for Common Services – Air Quality 17
4.6. Summary for Common Services – Hydrology 17
4.7. Summary for Local models 17
4.8. Summary for Completeness of Functionality 18
4.9. Summary for Conclusions 18
5. Conclusion 21
6. References 23
7. Glossary 23
8. Acronyms and abbreviations 28
Annex A – Lime Survey 31
1.1. A – Personal Information (Type of Users) 31
1.2. B – Graphical User Interfaces 32
1.3. C – Climate Scenario Information 34
1.4. C2 – Common Services – Rainfall 34
1.5. C3 – Common Services – Air Quality 36
1.6. C4 – Common Services – Hydrology 37
1.7. D – Local Models 38
1.8. E – Completeness of Functionality 38
1.9. F – Conclusions 40

Table of Tables

Table 1: List of documents and software deliverables that has been referenced or used for this document 23

1. Management Summary

This document D7.3.3 Product Validation Report V3 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 Lime Survey 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 Lime Survey 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 Lime Survey questionnaire after project's third and last year (2012) 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 V3:

- A total of 7 persons worked out parts of the Lime Survey questionnaire, representing SUDPLAN staff (4 persons), one 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 and two external end-user from the city of Graz and Vienna.

- 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 (inclusion of contextual help, tutorials etc.).

- 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.

- The GUI is clearly structured and easy to navigate. Spatial data and measurement data is accessible and the result visualization as well as result comparison works well. The overall speed of time series visualization could be improved. 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).

- Defining and executing scenarios is fluid in the working process. Result visualization could in some parts be ameliorated.

- The rainfall downscaling functionality was assessed to be a great feature for downscaling historic rain time series to future predicted ones based on different climate change approaches. Better information about climate scenarios would be helpful in assessing the scientific soundness and credibility of rainfall downscaling. Overall the procedure for uploading rainfall data and performing the downscaling is easy to carry out and the results can be put directly to use in following model runs.

- The downscaling procedure for predicted rain time series needs some improvement in the context of the definition of future time periods. The already implemented rainfall downscaling functionality is unique and no comparable tool is known and available at the moment for this functionality. It allows the estimation of climate change in the context of combined sewer overflows (CSO).

- The possibility to compare different scenarios regarding the CSO behaviour in the context of possible climate change or a changed land use in the catchment area in one SMS platform is unique, well done and facilitates the development of proper mitigation strategies by responsible urban drainage managers in time. For a regular application some improvements should be done concerning the visualization and reporting functionality.

- Particularly useful functionalities in the SUDPLAN WP7 SMS are

    - The integration and visualization of rainfall time series, on-line measurement data, climate scenarios and local model runs.
    - The integration of data and models for different scenarios in one platform.
    - The ease of use in the process involving different services (upload - downscaling - model run - result visualisation).

- Uncertainties can currently only be estimated by scenario comparison, a specific visualization of the uncertainties from several scenarios would be appreciated.

- Contextual help functionality, a small tutorial to get a quick overview about the SMS and reporting functionalities are requested especially for secondary end-users.

All validations could be done on a fully implemented and running WP7 SMS. The external feedback was overall very positive and gave vital input for the final SUDPLAN product.

2. Methodology

The common methodology for all V3 Product Validation Reports is described in detail in D2.1 Product Validation Plan (revised after 1st ATR) document dated June 15, 2011; hereafter only referred to as D2.1 Product Validation Plan. The validation procedure is summarised here below. All technical developing staff members participating in the pilot work have contributed to the validation by filling in a questionnaire to cover purely technical aspects.

With the purpose to increase the number of external end-users participating in the validation procedure, the third and final validation of the SUDPLAN project includes simplified version of the full validation questionnaire. This simplified version contains only questions which can be answered by a person that has participated in a seminar and/or demonstration of the SUDPLAN tool. Also the pilot staff members characterized as end-users have used the simplified validation survey.

2.1. Documents involved

D2.1 Validation Plan describes the methodology used to produce the four pilots deliverables D[5-8].3.3 Product Validation Report and the project overall validation of deliverable D2.2.3 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.

The objective of the D7.3.3 Linz Product Validation Report is to validate the usability of the SUDPLAN product from the Linz Pilot point of view.

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 lifetime of the project and for an arbitrary city in Europe which means that the comments given by external end-users are especially important. 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 Chapter 6 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 (instead given in D7.2.3 Linz Pilot report).

2.2.2 Professional profiles taking part in the pilot product validation

The pilot validations are performed in two steps. The first is for pilot WP leaders to assure that all pilot staff members fill in the pilot validation and to encourage as many external end-users as possible to fill in the simplified Lime Survey 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 are 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 Lime Survey questionnaire includes impressions from all four professional profiles, however in the context of the validation procedure 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 D2.2.3 Validation and Evaluation report. That document also draws conclusions on the pilot validations to provide feedback to WP3 and WP4. It is essential for WP3 and WP4 to know whether they are on track and where improvements or even changes have to be implemented to allow an ex-project use and exploitation. 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 are 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). The question should be answered rather with NA than leaving it open in the case that one is unable to answer the question for any reason. The total number of answers is given herein for each alternative. ***Example where 5 persons related to this pilot have filled in the questionnaire:***

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Define scenario:			*2*		*1*	*2*		
Execute scenario					*1*	*3*		*1*

2. Rating from 1 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. The total number of answers is given herein for each alternative. ***Example where 5 persons related to this pilot have filled in the questionnaire::***

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Compared to state of the art solutions					*2*	*2*	*1*	
Compared to SUDPLAN project objectives					*1*	*4*		

3. Yes|No|NA type of questions. The total number of answers is given herein for each alternative. ***Example:***

Dynamic workflow composition supported by	**Y**	**N**	**NA**
Pilot application:		5	
SUDPLAN product:	4		1

4. Multiple choice questions are used to confirm that specific requirements are met. This type of questions are normally responded to by persons involved in SUDPLAN development. Each single question can have only a limited number of answers (with or without NA).
   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):

Service interface	**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, giving the evaluator 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 development after project end”)

Note: 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.

3. Validated components and aspects of the pilot product

The following table indicate which components and aspects have been validated during the V3 period, as well as how many individuals have given their opinion. The Linz pilot is, for the V3 validation, only using the simplified version of the online questionnaire (in V2 we used the full version). The complete list of the simplified validation questions is given in Annex A. The following table gives the number of persons that has participated in the different parts of the V3 validation.

Components and aspects evaluated in the simplified validation:	**V3**
Graphical User Interfaces	7
Climate Scenario Information	7
Common Services – Rainfall	7
Common Services – Air Quality	1
Common Services – Hydrology	1
Local Models	7
Completeness of Functionality	7
Conclusions	7

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

4. Summary and conclusions

A complete list of questions and answers in the Lime Survey is available in Annex A. For this V3 validation, WP7 involved two types of persons to support the validation. The most important objective in V3 to reach external end users has been achieved by the involvement of three external end user linked directly to Linz, Graz and Vienna urban (sewerage) planning which are also the 3 largest Austrian cities and thus particularly important for WP7 as an Austrian case study. The three external persons are directly involved and members of the sewerage designing group within these cities. They are not direct SUDPLAN team participants but typical primary end user with a strong modelling background and who are very interesting in using the SMS for different future scenarios in practise. The other group involved in this validation process consists entirely 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.

The filled in Lime Survey is based on an fully implemented and running WP7 SMS were all pre-defined functionalities have been integrated.

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 to the simplified validation questionnaire

The following table summarises the professional profiles of the persons that completed the Lime Survey questionnaire (Annex A).

Name	1: Werner Sprung 2: Friedrich Hochegger 3: Thilo Lehmann 4: David Steffelbauer 5: David Camhy 6: Valentin Gamerith 7: Guenter Gruber
E-mail address	1: Werner.Sprung@holding-graz.at 2: f.hochegger@linzag.at2: david.steffelbauer@tugraz.at 3: thilo.lehmann@wien.gv.at 4: steffelbauer@sww.tugraz.at 5: camhy@sww.tugraz.at 6: gamerith@sww.tugraz.at 7: gruber@sww.tugraz.at
Organization	1: Holding Graz Services 2: LINZ AG 3: Wien Kanal 4: TU Graz

	5: TU Graz 6: TU Graz 7: 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		3	3	1
Dimensioning of sewage water systems		3	4	1
Risks of flooding of rivers	1			
Hydrological conditions	1			
Air pollution				
Other				

SUDPLAN deals with both long term and short term planning. Apparently not the entire group of 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	4	3	
Long term planning (>10 years) planning	7		

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

Application	Y	N
Stockholm pilot		
Wuppertal pilot		
Linz pilot	7	
Czech pilot		
Overall application		

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

Type of user	Y	N
SUDPLAN team member	4	3
Analyst	3	4
Modeller	3	4
System manager	0	7
IT expert	1	6
Climate change expert	0	7

Have seen presentations and documentations	0	7
User of the SUDPLAN / model results	3	4
Working with the actual system	4	3
Participating in a SUDPLAN workshop	6	1

4.2. Summary for Graphical User Interfaces

A total of 7 persons gave input to this aspect.

The overall visualization is well done. Some refinements in detailed visualization can still be done when the results will be commercialized after the project. 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 and should be considered for the commercial product.

The concept to define, execute and analyse a scenario was appreciated and data and result export functionality is implemented now.

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

Especially, the result visualization could be improved, e.g. resulting CSO overflow volumes could be drawn in a proportional scale in the geo-referenced map or historic and downscaled rain time series could be visualized with identical y-axis scales which would make the comparison easier.

Defining and executing scenarios is fluid in the working process. Result visualization could in some parts be enhanced as mentioned above. Currently, uncertainties can be estimated by scenario comparison only, a specific visualization of the uncertainties from several scenarios would be appreciated. For scientific data based work uncertainty analysis is a must have and thus should be considered a major enhancement for the commercialized product.

Because of the number of control elements in SUDPLAN a light version, optimized for for small laptops or mobile devices should be considered.

Usability of any modelling environment is much better on larger displays.

Currently in the Linz Pilot no 3D visualizations are implemented as this was not part of the requirements of the pilot case study. The data set and geo-referenced data are well presented.

For a inexperienced end user too many buttons are on the screen. This should be addressed if further usability enhancements are implemented in the course of the commercialization of the product.

The GUI is well thought out. Display of spatial information and model results is very good. A more sophisticated help system (contextual help) would be appreciated. The GUI is clearly structured and easy to navigate. Spatial data and measurement data are accessible and the result

visualization as well as result comparison works well. The overall performance of time series visualization could be improved.

All objectives of the pilot application are nearly fulfilled beyond expectations. Contextual help, other help functionality or written tutorials are still missing, although some small video clips are available in meantime, which demonstrate some basic functionality. Usability needs some improvements. A comprehensive reporting functionality would be appreciated especially for secondary end users.

4.3. Summary for Climate Scenarios

A total of 7 persons participated in the validation of this component.

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

The implemented number of different climate scenarios, the area of interest in Europe and the available future time range seem to be sufficient for the involved end users.

A more detailed documentation of the integrated climate scenarios would be appreciated.

4.4. Summary for Common Services – Rainfall

A total of 7 persons participated in the validation of this component.

Only the rainfall downscaling component for the regional downscaling of long rain time series was validated since there is no need for IDF downscaling in the Linz pilot.

The rainfall downscaling functionality was assessed to be a great feature to obtain future predictions of downscaled precipitation time series based on different climate change scenarios.

Better information about the available climate scenarios would be helpful in assessing the scientific soundness and credibility of rainfall downscaling.

Overall, the procedure for uploading rainfall data and performing the downscaling is easy to carry out and the results can be put directly to use in subsequent model runs.

The downscaling procedure for predicted rain time series should consider improvement in the context of the definition of future time periods. The currently implemented rainfall downscaling functionality is unique and no comparable tool is known and available at the moment for this functionality. It allows the estimation of climate change in the context of combined sewer overflows (CSO). Regarding the usability there is still some room for improvements especially concerning the background information and the contextual help regarding the already implemented climate scenarios, but also for the visualization and the report functionality.

4.5. Summary for Common Services – Air Quality

Only one person validated this part who took part at the Wuppertal workshop in October 2012, because this functionality is out of scope of the Linz Pilot application. His overall validation was positive.

4.6. Summary for Common Services – Hydrology

Only one person validated this part who took part at the Wuppertal workshop in October 2012, because this functionality is out of scope of the Linz Pilot application. His overall validation was positive.

4.7. Summary for Local models

A total of 7 persons participated in the validation of this component.

The local WP7 model (U.S. EPA SWMM) is made accessible through the SMS. The SUDPLAN SMS allows the execution and comparison of different model input files using different climate scenarios.

Specification of parameters for the model runs was improved since V2. 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 because tools for these tasks already existed at the start of the project.

4.8. Summary for Completeness of Functionality

A total of 7 person participated in the validation of this component.

Particularly useful functionalities in the SUDPLAN SMS are

- The integration and visualization of rainfall time series, measurement data, climate scenarios and local model runs.
- The integration of data and models for different scenarios in one platform.
- The ease of use in the process involving different services (upload - downscaling - model run - result visualisation).

The model and on-line data integration was done beyond our expectations.

Better reporting possibilities are still required. No context help available. Help system missing. Better information about the climate scenarios requested.

A 'How to Start' guide might help the users not familiar with SUDPLAN to find faster into the full system functionality.

SUDPLAN is a sophisticated approach for an all in one scenario management system which allows to take into account future aspects for the planning process of sewerage and CSO design (climate change, land use etc.).

The main advantage of using SUDPLAN in city management scenarios and urban planning is the integration of climate scenario information in local models.

The ease of use of the system and the comparability of results from different scenarios can help the planner to compare and decide.

The visualisation allows to easily present the results to stakeholders that are not involved in detail in the planning process.

The possibility to compare different scenarios regarding the CSO behaviour in the context of possible climate change or a changed land use in the catchment area in one SMS platform is unique, well done and facilitates the development of proper mitigation strategies by responsible urban drainage managers in time. For a commercial application some improvements should be done concerning the visualization and reporting functionality.

4.9. Summary for Conclusions

A total of 7 persons participated in the validation of this component.

Most persons stated the SUDPLAN output to be useful as a base for planning regarding the consideration of climate change effects.

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.

Most information expected by the end users is given by the current SMS WP7 Pilot Application.

All relevant outputs from the model runs are given; additional information on sensor data should be given.

The graphical presentation of SUDPLAN results is excellent for four persons and ordinary for one person.

Graphical presentation of the model structure is excellent; the model results presentation could still be improved by more detailed reports especially for secondary end users.

The strength of SUDPLAN output is

- Scenario/Model Experiment management
- To have a first comparison of the discharged outflows of CSO facilities
- Spatial aspects and comparability of results & scenarios
- The integration of data sources, services and models in one platform combined with the ease of use and the result & scenario comparison possibilities.
- The integration of different services in one unique platform which is running on nearly each IT platform.

The weakness of the current SUDPLAN output is

- Currently there is no result reporting functionality for secondary end-users implemented. This was not required in the pilot definition plans but should be considered for the commercial product.
- Data export could be improved regarding more data formats and better usability. Especially the data export from long time series is not very intuitive since you have to activate firstly the original time series, secondly selecting it on the screen and thirdly you are finally able to export it. Particularly the first two steps need a while that an action takes place in the system.
- In the long term more information about the actuality of the input data and the climate model approaches should be provided.
- More information about the implemented climate scenarios.
- For the commercial version more detailed documentation is required.
- Full internet connection is necessary to apply the whole functionality of the SMS SUDPLAN system.

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 a 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.
- Useful tool in the context of climate change aspects for sewage planning.
- SUDPLAN is a well thought out product, which is useful for end-users to get a deeper understanding of scientific results. The integration of climate scenario information in local models helps to get a better understanding of future challenges.
- The SUDPLAN product is overall very well presented and impressed both users and stakeholders. The results combining historic measurement data, climate change scenarios and local models and their comparison allow a sound assessment of possible future changes within one platform. The outputs are useful also for presentation to stakeholders not involved directly in the planning process.
- A great tool to take into account climate changes and other future aspects (land use, population, etc.) for future city planning.

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 especially for secondary end users.
- 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.

5. Conclusion

The following conclusions can be summarised based on the Linz product validation V3:

- A total of 7 persons worked out parts of the Lime Survey questionnaire, representing SUDPLAN staff (4 persons) and 3 external primary end-users from Linz, Graz and Vienna with a strong modelling background and who are also members of the sewerage designing team in their cities.

- Comments and answers show that SUDPLAN has the potential to give access to future climate and environmental scenarios of great use especially in the field of urban sewerage planning and which today are difficult (but not impossible) to get. To attract users, more scenarios should be made accessible and user interface made more flexible and powerful (allow reports, result comparisons etc.) and easy to handle (inclusion of contextual help, tutorials etc.).

- 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 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 enhanced.

- The rainfall downscaling functionality was assessed to be a great feature for downscaling historic rain time series to future predicted ones based on different climate change approaches. Better information about climate scenarios would be helpful in assessing the scientific soundness and credibility of rainfall downscaling. Overall the procedure for uploading rainfall data and performing the downscaling is easy to carry out and the results can be put directly to use in following model runs.

- The downscaling procedure for predicted rain time series needs some improvement in the context of the definition of future time periods. However, the already implemented rainfall downscaling functionality is unique and no comparable tool is known and available at the moment for this functionality. It allows the estimation of climate change in the context of combined sewer overflows (CSO).

- The possibility to compare different scenarios regarding the CSO behaviour in the context of possible climate change or a changed land use in the catchment area in one SMS platform is unique, well done and facilitates the development of proper mitigation strategies by responsible urban drainage managers in time. For a regular and final commercial application some improvements should be done concerning the visualization and reporting functionality especially for secondary end users.

- 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 reporting functionalities are requested especially for secondary end-users.

- All validations could be done on a fully implemented and running WP7 Pilot Application. The external feedback was overall very positive and gave vital feedback for the final SUDPLAN product.

6. References

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

Document	Version
DoW	2012-06-20
D2.1 Validation Plan (revised after 1st ATR)	2011-06-15
D3.1.2 Requirement Specification V2	2011-11-28
D3.3.3 Integrated Scenario Management System	2012-07-13
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 http://www.Airviro.smhi.se/
Climate scenario	*Climate scenarios* 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	*Common Services* 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	*Common Services* models will be executed at a SMHI server, accessible through OGC communication.
Emission scenario	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.
- *IPCC emission scenarios*	*IPCC emission scenarios* 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 climates scenarios based on SRES (Special Report on Emission Scenarios) A1B scenario from the 4th 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 5th assessment RCP (Representative Concentration Pathways) emissions scenarios will also be used within the SUDPLAN project. They include emissions of air pollutants.
- *European tracer gas emissions (air pollutants)*	*European tracer gas emissions (air pollutants)* 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.
- *Local emission scenarios*	*Local emission scenarios* (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.

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 *information product* refers to such an entity.
Mockup	A model of a design used for demonstrating the functionality of a system.
Model	A *model* 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_{10}	'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;
$PM_{2.5}$	'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 *profile* 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 *report* 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	A *scenario* 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. 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).
Scenario Management System	*Scenario Management System* is synonymous with SUDPLAN platform
Scenario Management System Framework	The *Scenario Management System Framework* 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 *Building Blocks*: 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 *SUDPLAN application* 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 *SUDPLAN platform* is an ensemble of software components which support the development of SUDPLAN applications.
SUDPLAN system	*SUDPLAN system* is synonymous with SUDPLAN application

Urban downscaling	This refers to further downscaling of the regional climate scenarios for Europe to the urban scale within SUDPLAN. This will be possible for a) *rainfall/precipitation* 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. b) *hydrological variables (river runoff, soil moisture etc.*) 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^2. *c) air quality (PM, NO2/NOx, SO2, O3, CO).* The temporal resolution will be hourly for gridded output fields and the spatial resolution typically 1x1 kilometres.
User	The term *user* 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.
Web-based	Computer applications are said to be *web-based* if they rely on or take advantage of data and/or services which are accessible via the World Wide Web using the Internet.

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 http://www.airviro.smhi.se/
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 co-ordinating 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	Green House Gases
GTE	Geo-referenced 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	Rossby Centre, climate research unit at SMHI
RCA	Rossby 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^2.
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. A – Personal Information (Type of Users)

Name	1: Werner Sprung 2: Friedrich Hochegger 3: Thilo Lehmann 4: David Steffelbauer 5: David Camhy 6: Valentin Gamerith 7: Guenter Gruber
E-mail address	1: Werner.Sprung@holding-graz.at 2: f.hochegger@linzag.at2: david.steffelbauer@tugraz.at 3: thilo.lehmann@wien.gv.at 4: steffelbauer@sww.tugraz.at 5: camhy@sww.tugraz.at 6: gamerith@sww.tugraz.at 7: gruber@sww.tugraz.at
Organization	1: Holding Graz Services 2: LINZ AG 3: Wien Kanal 4: TU Graz 5: TU Graz 6: TU Graz 7: TU Graz

7 [A_6]: Please describe your knowledge with respect to the SUDPLAN product. Check any that apply:

Type of user	Y	N
SUDPLAN team member	4	3
Urban / regional planner	3	4
Modeller	3	4
System manager	0	7
IT expert	1	6
Climate change expert	0	7
Have seen presentations and documentations	0	7
User of the SUDPLAN / model results	3	4
Working with the actual system	4	3
Participating in a SUDPLAN workshop	6	1

SUDPLAN team member: You were developing SUDPLAN.

Urban / regional planners 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.

Modellers are those people who develop, integrate, and/or configure mathematical models to be used within SUDPLAN applications.

System Managers are those people who install and maintain SUDPLAN applications and carry out general system administration tasks.

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.

8 [A_7]: Please indicate in which context did you test the SUDPLAN output Check any that apply:

Urban stormwater flooding during intense rainfall	3
Management of sewage water systems	7
Risks of flooding of rivers	0
Hydrological conditions	0
Air pollution	0
Other	0

9 [A_8]: Which temporal horizon is relevant for your planning? Check any that apply:

Temporal planning interest	**Y**	**N**	**NA**
Present conditions and short term (<10 years) planning	4	3	
Long-term planning (>10 years)	7	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	7	0
Czech pilot		
Overall application		

1.2. B – Graphical User Interfaces

This question group is about the usability and functionality of the graphical user interface.

10 [B_1]: Please indicate the importance of key concepts used in SUDPLAN to assure the GUI ergonomics

Key concepts	*Very important*	*Important*	*Not relevant*	*NA*
Task-Oriented Menu structure	*4*	*2*		*1*
Contextual help system	*4*	*2*		*1*
Alerts when processing finished	*5*	*1*		*1*
Panning/browsing through results (in time)	*4*	*2*		*1*
Panning/browsing through results (in space)	*4*	*2*		*1*
Highlighting recently changed data	*3*	*3*		*1*
Comparing two result sets	*5*	*1*		*1*

11 [B_2] Please assess the ease of use and profiling of the SUDPLAN application

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Customization of the user interface				*1*	*1*	*3*	*1*	*1*
Define a scenario					*1*	*4*	*1*	*1*
Execute scenario with parameters				*1*		*1*	*4*	*1*
Save results					*1*	*3*	*1*	*2*
Share results with others		*2*		*1*	*1*	*1*		*2*
Visualize results					*4*	*2*		*1*
Visualize uncertainties	*3*				*1*			*3*
Compare the results of various scenarios				*1*	*3*	*1*	*1*	*1*
Export results in different formats				*2*	*1*	*1*	*1*	*2*

12 [B_3] Please assess the usability of SUDPLAN

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
With various output devices				*2*	*2*			*3*
Spatial visualization				*1*	*1*	*2*		*3*
Temporal visualization				*2*	*1*	*2*		*2*
Spatio-temporal visualization				*1*	*2*	*1*		*3*
Contextual help	*2*	*1*	*1*	*1*				*2*
Ease of learning			*2*	*2*		*2*		*1*
Memorability				*1*	*1*	*3*	*1*	*1*
Geo-referenced data				*2*	*1*	*1*	*2*	*1*
Transparency					*2*	*2*		*3*
3D data, geo-referenced, on a map				*2*	*2*	*1*		*2*

13 [B_4] Please assess the capabilities of the SUDPLAN 3D/4D visualization framework

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Overall impression						*3*		*4*
3D GUI interaction					*1*	*1*		*5*
Information visualization				*1*	*1*		*1*	*4*

Presenting of the scenarios				*2*		*1*		*4*
Comparing of the scenarios				*1*	*1*		*1*	*4*
Analysing of the scenarios				*2*		*1*		*4*

14 [B_5] Please give a short textual explanation on your experience with the capability, usability and ease of use of SUDPLAN GUI, and suggestions for improvement.

Too many buttons. Absolute useful tool in the context of sewage planning. Some improvements regarding visualization. GUI is well thought out. Display of spatial information and model results is very good. Better help system would be great. The GUI is clearly structured and easy to navigate. Spatial data and measurement data is accessible and the result visualization as well as result comparison works well. The overall speed of time series visualization of could be improved. The capability is nearly fulfilled beyond the expectation. Contextual help is missing. Tutorials are missing in written form at all but are at least available as small video clips. Usability need some improvements. Reporting functionality is missing.

1.3. C – Climate Scenario Information

Climate scenario information is provided only "as is" for information about existing climate scenarios. This information can also be used for training purposes.

15 [C1_1] Please indicate the usability of the provided climate scenario information.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Available number of different climate scenarios					*1*	*4*	*1*	*1*
Within area of your interest over Europe						*4*	*2*	*1*
Available time range						*5*	*1*	*1*
Available scenario documentation			*2*	*2*	*1*			*2*
Possibility for changing temporal resolution for data export				*1*		*2*		*4*

1.4. C2 – Common Services – Rainfall

The rainfall services provide prediction of

- *rain time series*
- *IDF curves*

16 [C2_1] Please assess the usability of the SUDPLAN short-term rainfall downscaling.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Overall					*1*	*3*		*3*
Upload of historical/local data to improve the				*1*		*2*	*1*	*3*

results								
Downscaling						*3*	*1*	*3*
Visualisation of the results					*1*	*3*		*3*

17 [C2_2a] Please assess the functionality and ease of use of the SUDPLAN downscaled continuous rainfall time series:

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Upload of historical data			*1*			*3*	*2*	*1*
Downscaling procedure						*4*	*2*	*1*
Results visualisation and download					*1*	*4*	*1*	*1*

18 [C2_2b] Please assess the functionality and ease of use of the SUDPLAN downscaled IDF-curves:

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Upload of historical IDF curve								*7*
Downscaling procedure								*7*
Results visualisation and download								*7*

19 [C2_3a] Please assess the scientific soundness and credibility of different aspects of the downscaled continuous rainfall time series from SUDPLAN:

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Downscaled continuous rainfall time series: General performance					*1*	*5*		*1*
Downscaled continuous rainfall time series: Long-term (annual, seasonal) volumes					*1*	*3*	*2*	*1*
Downscaled continuous rainfall time series: High and low intensities				*1*	*1*	*3*		*2*
Downscaled IDF-curves: General performance								*7*
Downscaled IDF-curves: Dependency on duration								*7*
Downscaled IDF-curves: Dependency on return period								*7*

20 [C2_3b] Please assess the scientific soundness and credibility of different aspects of the downscaled IDF-curves from SUDPLAN:

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
General performance								*7*
Dependency on duration								*7*
Dependency on return period								*7*

21 [C2_4] Please give a short textual explanation on your experience with the usability of SUDPLANs results in the rainfall domain, and suggestions for improvement. Please state also which state-of-the-art product was used for comparison.

IDF-curves not relevant for Linz Pilot

Great feature to have the possibility to downscale historic rain time series to future predicted ones based on different climate change approaches.

Better information about climate scenarios would be helpful in assessing the scientific soundness and credibility of rainfall downscaling.

I did not check the IDF-curve functionality in detail so I gave no answer to the related questions. Overall the procedure for uploading rainfall data and performing the downscaling is easy to carry out and the results can be put directly to use in following model runs.

Linz Pilot is only dealing with long term rain time series. Therefore I have no experience and no need with applying the IDF curve SUDPLAN functionality so far. The downscaling procedure for predicted rain time series needs some improvement in the context of the definition of future time periods. The already implemented rainfall downscaling functionality is unique and no comparable tool is known at the moment for this functionality. It allows the estimation of climate change in the context of combined sewer overflows (CSO). Regarding the usability there is still some place for improvements especially concerning the background information and the contextual help regarding the already implemented climate scenarios, but also for the visualization and the report functionality.

1.5. C3 – Common Services – Air Quality

This includes projections of air pollution influenced by climate change and changes in Europe air pollutant emissions.

22 [C3_1] Please assess the usability of the SUDPLAN tool as the basis for assessment of the future air pollution:

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Overall						*1*		*6*
Upload local emission data						*1*		*6*
Downscaling						*1*		*6*
Visualisation of the results						*1*		*6*

23 [C3_2] Please indicate the level of support for following functionality to assess the risk of air pollution:

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Prediction of long-term air quality and temperature simulations over entire Europe						*1*		*6*
Trends in air quality						*1*		*6*
Year-long downscaling air quality simulations						*1*		*6*
Impact of local sources, activities and land use on future air quality in particular European cities						*1*		*6*
Use of the downscaled air quality grids in local planning scenarios						*7*		*6*
Use of SUDPLAN air quality results as input to local dispersion models						*1*		*6*
Estimate the importance of local sources of pollutants vs. long-range pollution transport for the local air quality						*1*		*6*

24 [C3_3] Please indicate the usability of SUDPLANs air quality results:

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

25 [C3_4] Please give a short textual explanation on your experience with the usability of SUDPLANs results in the air quality domain, and suggestions for improvement. Please state also which state-of-the art product was used for comparison.

Not relevant for Linz Pilot

I did not use the SUDPLAN platform for air pollution assessment.

I am not involved in air pollution and I am therefore not familiar with this topic.

1.6. C4 – Common Services – Hydrology

Questions about prediction of river runoff

26 [C4_1] Please assess the usability of the SUDPLAN tool as the basis for river flooding assessment applications

	1	2	3	4	5	6	7	NA
Overall						1		6
Upload of local river discharge time series						1		6
Local calibration						1		6
Presentation of the results from local calibration						1		6
Presentation of the results from simulation						1		6

27 [C4_2] Please assess the usability of SUDPLAN hydrological application

	1	2	3	4	5	6	7	NA
Preparation and staring a local calibration					1			6
Starting a local climate simulation						1		6
Download and further exploration and use of the results						1		6

28 [C4_3] Please indicate the usability of SUDPLAN hydrological results for assessing

	1	2	3	4	5	6	7	NA

Changes in river discharge							*1*	*6*
Changes in soil moisture							*1*	*6*
Changes in available ground water levels							*1*	*6*

29 [C4_4] Please give a short textual explanation on your experience with the usability of SUDPLANs results in the hydrological domain, and suggestions for improvement. Please state also which state-of-the art product was used for comparison.

Not relevant for Linz Pilot

I did not use the hydrology services.

I was not involved in these topics and therefore I have not tested the implemented functionality.

1.7. D – Local Models

Questions about the usage of local models. Local means the model is typically pre-existing and developed outside SUDPLAN. This model is now integrated to be used from within the SUDPLAN GUI. These models are typically not usable outside the context of this specific city.

30 [D_1] Please assess the ability of SUDPLAN in the field of model integration

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

1.8. E – Completeness of Functionality

31 [E_1] Please assess the usability of SUDPLAN for the creation of reports, publications and data export with respect to the requirements of planners

	1	*2*	*3*	*4*	*5*	*6*	*7*	*NA*
Creation of information products			*1*	*3*	*1*	*1*		*1*
Report generation		*2*	*1*	*2*		*1*		*1*
Coordinate conversion		*1*			*2*	*1*		*3*
Export				*2*	*1*	*3*		*1*
Information/result sharing			*2*	*1*	*1*	*1*		*2*

32 [E_2] Please assess the usability of SUDPLAN with respect to the requirements of system managers

	1	2	3	4	5	6	7	NA
User management		1		1		1		4
Security and rights management				2		1		4
Data source integration						3		4
Sensor service integration						3		4
Model integration						3		4

33 [E_3] Please indicate the functionalities you find in SUDPLAN, that are particularly useful

Integration and visualization of data time series.

Integration of measurement data, climate scenario information and local model runs.

The integration of data and models for different scenarios in one platform The ease of use in the process involving different services (upload - downscaling - model run - result visualisation).

The model and on-line data integration was done nearly beyond our expectations.

34 [E_4] Please indicate the functionalities you miss in SUDPLAN, that might be particularly useful

Better reporting possibilities No context help available.

Help system, better information about the climate scenarios.

A 'how to start' guide might help the users not familiar with SUDPLAN to find faster into the full system functionality.

Report functionality for other end user categories is missing.

35 [E_5] Please give a short textual explanation about key advantages of SUDPLAN functionality, usability in the city management scenarios and urban planning, and give suggestions for improvement.

All in one scenario management system Possibilities to use future aspects for sewage design (climate change, land use etc.).

I think the main advantage of using SUDPLAN in city management scenarios and urban planning is the integration of climate scenario information in local models.

The ease of use of the system and the comparability of results from different scenarios can help the planner to compare and decide.
The visualisation allows to easily present the results to stakeholders that are not involved in detail in the planning process.

The possibility to compare different scenarios regarding the CSO behaviour in the context of possible climate change or a changed land use in one platform is unique, well done and facilitates the development of proper mitigation strategies by responsible urban drainage managers in time. For a regular application some improvements should be done concerning the visualization and reporting functionality.

1.9. F – Conclusions

Please, give your final impression on SUDPLAN!

36 [F_1] Compared with the previous available information, SUDPLAN results are:

	Y	N	Can not assess	NA
New	5			2
Better quality	5			2
More useful	5			2

37 [F_2] Would you use the SUDPLAN output as a base for your future city planning? Check any that apply:

	Yes	No	NA	Comments
Yes, I would	4	3	-	-
Yes, it is useful for most cities	2	5	-	-
Yes, to certain extent	2	5	-	-
Yes, but I still miss some information	1	6	-	-
Maybe for a few specific cases	-	7	-	-
I would recommend to my colleagues in other European cities	3	4	-	-
No, I would not use it at all.	-	7	-	-

38 [F_3] How did you find the graphical presentation of the SUDPLAN results? Choose one of the following answers:

Excellent and contributing to a better understanding	Ordinary	Not useful	NA
4	1	-	2

Please enter your comments here:

39 [F_4] What is in your opinion the strength of SUDPLAN product?

To take climate aspects into account for sewage design.

The presentation of scientific results for end users.

The integration of data sources, services and models in one platform combined with the ease of use and the result & scenario comparison possibilities.

The integration of different services in one unique platform which is running on nearly each IT platform.

40 [F_5] What is in your opinion the weakness of SUDPLAN product? What should be improved?

In long term sense: actuality of input data, climate model approaches, ...

Better information about the climate scenarios.

Some minor points as a more detailed documentation or help system could be added.

All implemented services must be alive and full internet connection is necessary to apply the whole functionality of the SMS SUDPLAN system.

41 [F_6] Please give a short summary of your impression of the SUDPLAN product:

Useful tool in the context of climate change aspects for sewage planning.

I think SUDPLAN is a well thought out product, which is useful for end-users to get a deeper understanding of scientific results. The integration of climate scenario information in local models helps to get a better understanding of future challenges.

The SUDPLAN product is overall very well presented and impressed both users and stakeholders. The results combining historic measurement data, climate change scenarios and local models and their comparison allow a sound assessment of possible future changes within one platform. The outputs are useful also for presentation to stakeholders not involved directly in the planning process.

A great tool to take into account climate changes and other future aspects (land use, population, etc.) for future city planning.