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for Climate Change Adaptation

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(revised version after ATR2)

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1. Management Summary

This document D8.3.2 Product Validation Report V2 validates the usability of the SUDPLAN product from the Czech pilot's point of view. Validation against technical detail requirements is not in the scope of the validation process; this is done as part of the state-of-the-art software development.

This pilot validation was performed in two steps. The first was for WP leaders to encourage as many individuals as possible to fill in the LimeSurvey web questionnaire. The second step was 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 four types of professional profiles that may serve to validate the Czech pilot 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 include impressions from all four professional profiles, but one individual can only belong to one professional profile.

The complete results of the LimeSurvey questionnaire after project's second year (2011) are collected in Annex A of the D2.2.2 Validation and evaluation report V2 and also summarized in the present pilot deliverable. The following conclusions can be drawn based on the Czech product validation V2:

- A total of 10 persons worked out parts of the LimeSurvey questionnaire, representing SUDPLAN staff (6 persons), CHMI experts not working in the project (2 persons), representative of the Ministry of Environment and one CENIA environmental assessment expert not involved in the project. These four people represented the end-user group.
- According to their specialization, the people responded mainly to air quality and hydrological downscaling part (6 respectively 5 people) and pan-European visualization (4 people). One IT expert from CENIA evaluated technical aspects of Sudplan, especially graphical user interfaces; however, there were no answers to some group of questions (e.g. open source software). All people responded to the last part of the Survey dealing with general impressions about the SUDPLAN product.

- Comments and answers shown that SUDPLAN has the potential to give increased access to future climate and environmental scenarios of great use in all phases of urban planning and which today are difficult to get. To attract users, more scenarios must be accessible and user interface made more flexible (allow export, result comparisons etc.) and easy to handle.

- Ministry of the Environment (MoE) considers project results to be potentially useful for urban planning, however, unless having consolidated results of the Czech pilot it is hard to decide on the concrete application of the results in policy making processes. Better usability of project results according to the MoE can be expected on the regional level of public administration.
- Respondents proposed to include other areas to be dealt with within the territory of the Czech Republic by the Czech Pilot, namely for instance the Silesian region where the environmental issues are even more pressing compared to the Prague area. In conclusion, more flexible selection of the area covered by the downscaling model would be beneficial for the exploitation of the product.
- Sudplan modeling system is considered to be a powerful tool, but suitable only for experts. Graphical user interfaces cannot be used for SUDPLAN project results' presentation as it is too complicated for ordinary non-expert users. It is advisable to present the SUDPLAN resulting models in the simple way that users would be able to get the information and understand it. Self-explanatory application that can be presented to broad public should be developed in order to support dissemination of the SUDPLAN project outputs.
- There are very interesting results of the project that deserve communication to public. Not all the advanced features of Airviro or SMS are needed for broad public, focused presentation of selected data, substances, parameters or models together with good explanations should be prepared that everyone understands the basic trends calculated within the project. These are all the aims CENIA is planning to reach with the development of a new application that would present the SUDPLAN models calculated for the Czech Republic.
- The survey concluded that product development is still not completed, thus the final validation at the end of the project will provide more significant results from the user´s point of view.

2. Methodology

The common methodology for all V2-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.

2.1. Documents involved

D2.1 Validation Plan describes the methodology used for the deliverables D[5-8].3.2 Product Validation Report and the three versions of deliverable D2.2.x Validation and Evaluation Report.

The D8.3.2 Product Validation Report objective is to validate the usability of the SUDPLAN product from the Pilots point of view. There are three versions of the D5-8.3.x Product Validation Report for each of the four pilots. These are used as the main input for the three versions of the D2.2.2 Validation and Evaluation Report.

Each of the three versions of the D2.2.2 Validation and Evaluation Report summarizes the input from the four instances of D[5-8].3.2 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 D8.1.3 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 D2.2.2 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*
Define scenario:			*2*		*1*	*2*		

Execute scenario					*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*
Compared to state of the art solutions					*2*	*2*	*1*	
Compared to SUDPLAN project objectives					*1*	*4*		

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

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

4. Multiple choice questions, where a 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. 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 mock-ups and specifications.

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 of the D2.2.2 Validation and evaluation report V2.

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

Components and aspects evaluated:	**V2**	**V3**
Graphical User Interfaces	4	
Visualisation		
Common Services: Pan-European visualisation	5	
Common Services: Rainfall	2	
Common Services: Hydrology	5	
Common Services: Air Quality	6	
Local models	2	
External services		
SOA interfaces		
SOA services		
Usage of standards		
Open source software		
Completeness of functionality	2	
Conclusions	10	

4. Summary and conclusions

A complete list of all questions and answers in the LimeSurvey is available in Annex A of the D2.2.2 Validation and evaluation report V2. The group of respondents evaluated the Czech Pilot consisted of 5 SUDPLAN team members and three external experts. For this V2 validation WP8 tried to reach two types of external persons to support the validation. Two external experts from Czech Hydro meteorological Institute specialized in climate change and greenhouse gas modelling as well as air quality monitoring and assessment took part in this survey as well as one expert from CENIA who is in charge of environmental assessment and responsible for annual production of the Report on the Environment of the Czech Republic. However, despite being addressed by the SUDPLAN team the representatives of the Ministry of the Environment and Municipality of Prague did not participate, nevertheless, they promised to take part in the survey at the end of the project.

All participants of the survey have been provided with detailed description of project results achieved so far. All of them were invited and most of them participated in the WP8 meeting where the results were presented by the project team members.

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 of the D2.2.2 Validation and evaluation report V2.

Name	1: Ondrej Ledvinka 2: Jitka Brzakova 3: Rostislav Neveceral 4: Alena Markova 5: Jiri Kvapil 6: Jan Pokorny 7: Vaclav Novak 8: Jan Mertl 9: Tereza Suchankova 10: Radka Bezdekovska
E-mail address	1: ledvinka@chmi.c 2: brzakova@chmi.cz 3: neveceral@chmi.cz 4: alena.markova@mzp.cz 5: jiri.kvapil@cenia.cz 6: jan.pokorny@cenia.cz 7: vnvk@chmi.cz 8: jan.mertl@cenia.cz 9: tereza.suchankova@sysnet.cz

	10: bezdekovska@gmail.com
Organization	1: CHMI 2: CHMI 3: CHMI 4: Ministry of the Environment 5: CENIA 6: CENIA 7: CHMI 8: CENIA 9: Sysnet 10: Sysnet

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				
Dimensioning of sewage water systems				
Risks of flooding of rivers	1	1	1	
Hydrological conditions	1		1	
Air pollution	3	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	6	2	
Long term planning (>10 years) planning	4	5	

This report is based on persons that marked interest in the Stockholm pilot or, as one person did, the overall application.

Application	Y	N
Stockholm pilot	0	8
Wuppertal pilot	0	8
Linz pilot	0	8
Czech pilot	10	0
Overall application		

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

Type of user	Y	N
SUDPLAN team member	3	5
Analyst	2	6
Modeler	3	5
System manager	1	8
IT expert	1	7
Climate change expert	1	7
Have seen presentations and documentations	2	6
User of the SUDPLAN / model results	3	6
Working with the actual system	0	8

4.2. Summary for Graphical User Interfaces

A total of 4 people gave input to this aspect.

The whole system is a data modeling tool focused on expert users. It is not a tool for presenting the project outputs to broad public. For this purpose the user interface is adequate hence requiring quite frequent consultation of a user manual. SMS is written in Java and requires at least JRE to be installed on a user's computer. It can be run either directly from the website using Java Web Start or .jar file can be downloaded to the local computer and run as a standalone application. The standalone application version seems to be more likely to run as there might be some issues with Java plugins in different viewers on different platforms.

The interface is found complex, it is not evident at the first look how many possibilities the tool provides. The use of functionalities is not intuitive as it could be, some interactive help was asked for. The range of scales is inappropriate in comparison with the grid, It would be beneficial to have easier access to scaling.

The SMS - GUI was given high usability while using high resolution monitors, but much lower rating for laptop use as it is not suitable on small screen (lower resolution than 1024x768) and the number of windows in SUDPLAN is not really well arranged. Other aspects of usability was given disperse ratings (not conclusive).

In general the user friendliness of the product was given above average ratings, but the workflow could be made easier for people not familiar with the product.

4.3. Summary for Common Services: Pan-Eurpean visualisation

A total of 5 people validated this part.

The usability of climate scenario was given high ratings; with the exception of the availability of scenario documentation. A pan-European scope of the project was appreciated as well as time resolution and spatial and temporal coverage of visualisation.

The main added value of Sudplan results was attributed to the long term assessment while for the evaluation of current conditions other systems may have more extensive functionality.

Export of results is missing and would be very beneficial for an analytic work. Description of uncertainties of climate scenarios was found insufficient.

4.4. Summary for Common Services: Rainfall and hydrology

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

The usability and the ease of use of precipitation prediction in Sudplan in terms of temporal resolution, IDF curves and the identification of extreme precipitation event received higher ratings above state of the art, however, the upload of historical data to calibrate the results is regarded as being a bit more complicated.

The ability of the model to reproduce realistically hydrological conditions is dispersed – some catchments in the territory of the Czech Republic are described better by the model than others. The evaluation of impact of different climate scenarios, calculation of future run-off series and river flooding scenarios by the Sudplan tool received higher ratings. Other aspects was given disperse ratings.

Geographical layers should be corrected as some mistakes and inaccuracies occurred. In order to enhance the usability of the tool for water management planning a new functionality was suggested which displays the information about area of the basin.

4.5. Summary for Common Services: Air Quality

A total of 6 persons participated in the validation of this component.

Airviro user modeling interface is an expert tool for adjusting data models' parameters. There is an extensive amount of settings that need to be clicked through. It is not possible to use the system without a thorough reading of a manual, nevertheless this is not an issue as the system is not planned to be accessible to everyone. Quite bothering experience is the opening of each link from the upper bar in the new browser tab.

Combination of European and urban scale enables to include both climate effects and national (or regional) emission scenarios was appreciated. The limitations of CS air quality downscaling regarding spatial resolution (up to 1x1 km) have been pointed out so the identification of hot spots in cities is limited. Nevertheless, external local models can help overcame this problem.

Some mistakes in geographical layers are present. The air quality downscaling was considered state of the art and highly useful.

Capability of Sudplan CS AQ downscaling to reproduce air quality and high ambient temperature received very high ratings (5-7) in relation either to state of the art or Sudplan objectives. Long-term air quality downscaling was given particularly high ratings, as well as air quality and temperature simulations over entire Europe. According to the assessors Sudplan AQ downscaling provides significant added value in assessing the feasibility of fulfilling national air quality standards and environmental objectives in a climate change perspective.

4.6. Summary for Local models

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

Ability of Sudplan to be integrated with other regional models received high ratings between 5-7, furthermore, the possibility of running models from the GUI were also highly appreciated.

(Note by co-ordinator during revision: Likely the term "Local models" has been erroneously understood, instead I guess that the pilot evaluators have been thinking of Common Services downscaling models).

4.7. Summary for External services

None from the Czech Republic took part in the validation of this component so no results are available.

4.8. Summary for Open source software

None from the Czech Republic took part in the validation of this component so no results are available.

4.9. Summary for Conclusions

A total of 10 people participated in the validation of this component.

Sudplan provides pretty advanced modeling system which is unique in the Czech Republic because of its ability to take climate change background conditions into account; however, it is impossible to draw any conclusion about its usability at this stage of project implementation.

Sudplan project has produced very powerful tools, but they are only for experts. It cannot be used for SUDPLAN project results' presentation as it is far much too complicated for ordinary non-expert users. It is advisable to present the SUDPLAN resulting models the simple way that users are able to get the information and understand it. New presentation layer or simple user interface self-explanatory application that can be presented to broad public should be developed

in order to support dissemination of the SUDPLAN project outputs. There are very interesting results of the project that deserve communication to public. Not all the advanced features of Airviro or SMS are needed for broad public, focused presentation of selected data, substances, parameters or models together with good explanations should be prepared that everyone understands the basic trends calculated within the project. These are all the aims CENIA is planning to reach with the development of a new application that would present the SUDPLAN models calculated for the Czech Republic.

The selection of area to be dealt with by the downscaling model should be more flexible. For instance, in the Silesian region of the Czech Republic are environmental issues even more pressing compared to the Prague area.

75 % of respondents did not have access before to similar information as available from SUDPLAN.

Six persons (75 %) considered the SUDPLAN output to be scientifically sound and credible. Equally 6 persons (75 %) considered SUDPLAN to a certain extent useful as a basis for urban planning while for two people is highly useful.

Most information/output expected is given by SUDPLAN according to the survey; three people stated that all aspects were covered. The graphical presentation of SUDPLAN results were ordinary (4) or excellent (4). Six people out of 8 would recommend the SUDPLAN tool to colleagues in other European cities.

Further comments (positive):

- Pan-European character of the product represents a great advantage, as well as temporal coverage
- It is very innovative, useful tool with big potential for users, but only upon full completion of the system
- SUDPLAN product was found beneficial not only for urban planners for evaluation of impacts of future climate scenarios, but also for air quality and hydrology experts
- SUDPLAN brought climate change aspect to air quality assessment which is almost necessary to draw realistic long-term air quality scenarios

Further comments (negative):

- It is complicated to run the system for non-expert
- It takes a lot of time to find out how does the system work, it is not intuitive
- The system needs further refinement before being fully operational for example regarding map layers correctness, complementation with some easy guides of common tasks etc.

5. Conclusion

The following conclusions can be drawn based on the Czech product validation V2:

- A total of 10 persons worked out parts of the Lime Survey questionnaire, representing SUDPLAN staff (6 persons), CHMI experts not working in the project (2 persons), representative of the Ministry of Environment and one CENIA environmental assessment expert not involved in the project. These four people represented the end-user group.

- Comments and answers shown that SUDPLAN has the potential to give increased access to future climate and environmental scenarios of great use in all phases of urban planning and which today are difficult to get. To attract users, more scenarios must be accessible and user interface made more flexible (allow export, result comparisons etc.) and easy to handle.

- The pan-european character of Sudplan was highly acknowledged as the product can provide background conditions data for national/regional air quality model assessments. In addition, the downscaling results of SUDPLAN for the Prague area provide information not available up to now, data that will be useful not only for urban planners but also for air quality and hydrology experts as well.

- The only disadvantage identified within the survey relates to the complexity of the SUDPLAN system which is difficult to be operated and used by wider user community outside modellers and IT experts.

- Ministry of the Environment (MoE) considers project results to be potentially useful for urban planning, however, unless having consolidated results of the Czech pilot it is hard to decide on the concrete application of the results in policy making processes. Better usability of project results according to the MoE can be expected on the regional level of public administration.

- Respondents proposed to include other areas to be dealt with within the territory of the Czech Republic by the Czech Pilot, namely for instance the Silesian region where the environmental issues are even more pressing compared to the Prague area. In conclusion, more flexible selection of the area covered by the downscaling model would be beneficial for the exploitation of the product.

- The survey concluded that product development is still not completed, thus the final validation at the end of the project will provide more significant results from the user´s point of view.

The complete results of the LimeSurvey questionnaire after project's second year (2011) are collected in Annex A of the D2.2.2 Validation and evaluation report V2.

6. References

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

Document	Version
DoW	2009-12-01
D2.1 Validation Plan (revised after 1st ATR)	2011-06-15
D2.2.2 Validation and Evaluation Report V2	2011-
D3.1.2 Requirement Specification V2	2011-11-28
D3.3.1 Integrated Scenario Management System	2011-07-20
D8.2.2 Czech Pilot Report V2	2012-01-20

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/
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
CMIP5	Coupled Model Intercomparison Project, phase 5 (coordinated model exercise in support to AR5)
CS	Common Services (SUDPLAN functionality)
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	GreenHouse Gases
GTE	Georeferenced Time-series Editor
GIS	Geographic Information System
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
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
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)
PMC	Project Management Committee
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
Tbd	To be determined

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

Annex A – Lime Survey

For a complete list of answers, we refer to the Annex A in the project overall document D2.2.2 Validation and evaluation report V2.