



Copernicus Atmosphere Monitoring Service



Annual report 2015

CAMS_84 / Validation

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Summary Description of the Performance of the Contract over the Annual Reporting Period

Introduction to the CAMS-84 (validation) service contract

The main purpose of the CAMS-84 contract is the validations of the CAMS service products. For a mature service it is crucial that detailed quantitative information is provided to the users on the uncertainty of the products. This includes uncertainty information on reactive gases such as ozone, CO and NO₂, aerosol (optical) properties and greenhouse gas concentrations (CO₂, CH₄). Average quantities are provided (mean bias and spread) but also the more extreme events and their predictability are studied with special attention. The service products include the global real-time analyses and forecasts, new updates of the global model, the global reanalysis, the consistency between global and regional models, and the vertical profiles of the regional models.

The CAMS-84 consortium establishes strong links to all major providers of observations, which are essential for validation and (in some cases) data assimilation. The observations include atmospheric composition observations from surface in-situ stations, surface remote sensing stations, balloon data (e.g. ozone sondes), aircraft (IAGOS, campaigns), and satellite datasets not used in the assimilation.

CAMS-84 provides up-to-date information about the service products. This is achieved by means of a series of validation reports, updated every three months, and by providing routine verification plots through a number of verification web pages which are part of the CAMS website.

CAMS-84 is contributing to the service evolution by extending the work of the VAL subproject in MACC. In particular, new Arctic and Mediterranean themes are introduced, an evaluation of the greenhouse gas forecasts and analyses is explicitly included, and also the regional service products (CAMS-50) are evaluated.

CAMS-84 is also contributing to the service evolution by 1: characterizing and developing the observations and intercomparison methods used, and 2: improving the scoring approaches and by focusing on skill scores which are directly meaningful to the users of the products.

Main objectives of the reporting period

CAMS-84 has 1 October 2015 as starting date. The contract with ECMWF was signed in the first days of November. In the same week we held our kick-off meeting and all activities were commenced. The focus of the first few months were:

- To provide *full continuity from MACC*. In particular a first major release of the validation report for the global real-time service was planned for month 2 of the project, and was delivered on 11 December. This is the main highlight for the first three months, and is based on an evaluation of the model fields with the same set of observations used in MACC-III. The availability of this report is one of the KPI's.

- To prepare the *activities which are new compared to MACC-III*. In particular these are the new Arctic and Mediterranean themes, the evaluation of the high resolution forecasts for the greenhouse gases, and the evaluation of the regional models. A separate meeting was organised to discuss the extent of, and planning for, these activities, with presentations from all partners involved. The preparations (consisting of setting up downloads of the model results, collection/selection of the measurements, and plotting scripts for the validation) and first evaluations are on schedule.
- *Initial management tasks*. These consisted of setting up an internal project website, organising meetings, and discussing all tasks and planning in detail with the individual partners involved. The internal site is based on RedMine, which provides a repository of all documents, project planning and action tracking tools, and a discussion forum. Three project-wide meetings were organised.
- *Subcontracts* with all the partners. These subcontracts were prepared before the start of the project, but iterations of the contract text continued after the signature of the contract with ECMWF. About half of the contracts were signed in the first three months.

Staff. The majority of the partners were able to start the activities in early November, or even before, and the persons doing the actual work were already hired. Two partners did not have personnel in place at the start. In these cases the work in the first months was done by the permanent "backup" staff.

Work performed for each of the work packages

An overview of the activities by work package is provided below

- Work package 1 deals with the evaluation of the global service. According to schedule, the first validation report (87 pp) was delivered in month 2.
- The verification web pages are topic of WP 2. For the first months the focus is on the continuity from MACC-III, and keeping the content of the existing pages up-to-date. First preparations have been made to adjust the lay-out and design of the pages to be consistent with the new CAMS website (due at the end of February).
- The new Arctic and Mediterranean themes are the topic of WP 4. The content of this work and planning was discussed in detail, and preparations were made by the partners involved. The validation results will be included in the second validation report of WP1, due 1 March 2016, and later reports.
- The evaluation of the regional models is the topic of WP 5 and WP 6. First preparations for this work have been made in the first quarter. (The activities were discussed in detail with the partners involved and with the CAMS-50 management in January-February 2016.)
- Detailed background / traceability information will be provided in WP8, with the observation characterisation document and the scoring methods document. A first version of these two documents was delivered at the end of the first quarter, based on material from MACC-III. These documents will be reviewed in the first months of 2016 and will be made publicly available after that.
- WP 3, WP 6, WP 7: No activities in first 3 months.

Connections and interactions with other parts of CAMS

The validation sub-project of CAMS (CAMS-84) has extended interactions with the other parts of CAMS:

- CAMS-84 has a direct interaction with the global service provider ECMWF (CAMS-30). Apart from evaluating the deliverables, ECMWF is directly involved in the meetings of CAMS-84, providing information on the models and planning of model upgrades and reanalysis. Before publishing the validation reports, a draft version is sent to the global modelling teams for feedback and for interaction on possible model improvements (CAMS-30, CAMS-41, CAMS-42, CAMS-43, CAMS-44).
- CAMS-84 has a direct interaction with the regional service providers in CAMS-50. The work done in WP 5 and WP 6 is defined together with the CAMS-50 management. Before publishing the regional validation reports, a draft version will be sent to the regional modelling teams (CAMS-50, CAMS-61, CAMS-62, CAMS-63) for feedback and for interaction on possible model deficiencies.
- After the start of the model development subprojects (CAMS-41, CAMS-42, CAMS-43, CAMS-44, CAMS-61, CAMS-62, CAMS-63) the CAMS-84 teams will contact these sub-projects to see if, and how, the validation teams can contribute to the evaluation of new model versions (note that no budget is reserved for this at this moment)
- CAMS-84 will closely interact with CAMS-94 on user interaction. The KPI on user satisfaction will be defined/measured together with CAMS-94. Interaction with users on the validation results will be organised together.
- CAMS-84 participates in the monthly CAMS board meetings, which is the platform to discuss interaction between the sub-projects.

Work Package Summary

Work package #	CAMS_84.1	Validation of CAMS Near-Real-Time Global Products
Performance of tasks	<p>Tasks, repeated every 3 months:</p> <ul style="list-style-type: none"> • Retrieve forecast and analyses fields from the global service provider. Retrieve information on model and assimilation (datasets) upgrades and evolution, information on availability. • Generate a set of routine validation plots for a core set of validation observations. • Generate specific validation plots for all observational datasets and plots to be included in the validation reports by individual partners. KNMI is responsible for the general sections and the final editing. • Discuss the results and conclusions with all CAMS-84 colleagues involved. • Assemble the draft validation report. • Incorporate feedback and publish final report. <p>Achieved during Oct-Dec 2015:</p> <ul style="list-style-type: none"> • All the above tasks were achieved. The report is publicly available at http://atmosphere.copernicus.eu/quarterly_validation_reports. • The content for the first report is limited to all datasets which were also included at the end of MACC-III. • For the new themes (Arctic, Mediterranean, Greenhouse gases) the corresponding partners have worked on the preparations. The first results will be included in the second report. These new contributions were discussed in detail during a telecon (9 Dec) and the content/preparations for these new aspects are available as a set of presentations. These presentations are delivered to ECMWF. • The project started one month late. As a result, the final delivery of the report was late by 11 days, as agreed with ECMWF at the start of the project. 	
Deliverables	<ul style="list-style-type: none"> • D84.1.1: (M2) Validation report of the MACC near-real time global atmospheric composition service; delivered 	
Milestones	<ul style="list-style-type: none"> • M84.1.1: (M2) Availability of draft validation report two weeks before publishing; delivered 	

Work package #	CAMS_84.2	Verification of CAMS Near-Real-Time Global Products through provision of routine validation graphics
Performance of tasks	<p>Tasks:</p> <ul style="list-style-type: none"> • Continuous: maintain the validation websites available in the MACC-III validation subproject with up-to-date content, and include development activities from WP 2 and 8 when they become available. Websites are reviewed every 3 months. • Development (led by S&T): The development of an improved processing chain for verification/validation plots, including acquisition of the model fields and the measurements. Improved presentation of verification plots on the websites. • At PM4: Delivery of the Specification & Design document, including a development plan for the first development phase. <p>Achieved during Oct-Dec 2015:</p> <ul style="list-style-type: none"> • The MACC-III websites are continued and kept up-to-date. • Preparations have been made to monitor the up-time of the websites, as KPI to be reported monthly (3-monthly). • A template for the new CAMS website was received from ECMWF early December. Feedback was provided to ECMWF and the final template was available after a few iterations. It is agreed that all websites should have implemented these CAMS templates by the end of February 2016. • A series of interviews are conducted by S&T with all partners during December and January. This will result in an inventory of requirements and practices of the individual partners. 	
Deliverables	<ul style="list-style-type: none"> • D84.2.1: (M2) Initial set of verification websites with up-to-date content (continuity from MACC-III); delivered • D84.2.2: (M3) Up-to-date websites (based on new CAMS template). It was agreed to delay this deliverable to February 2016. 	
Milestones	<ul style="list-style-type: none"> • M84.2.1: (M3) Review of content of the websites; done 	

Work package #	CAMS_84.3	Validation and assessment of upgrades of the CAMS global production system
Performance of tasks	This work-package involves the assessment of model upgrades, or the "e-suite" Tasks: <ul style="list-style-type: none"> • No tasks in the first three months (there is no upgrade initialised in the first three months of CAMS) 	
Deliverables	<ul style="list-style-type: none"> • (none) 	
Milestones	<ul style="list-style-type: none"> • (none) 	

Work package #	CAMS_84.4	Specific validation of CAMS Near-Real-Time Global Products for the Arctic and Mediterranean areas
Performance of tasks	<p>Task 1: Arctic (Partner: AU)</p> <ul style="list-style-type: none"> To collect and prepare data from IASOA, AMAP and other datasets mentioned in WP 84.1 and 84.7. To use results from the DEHM model for evaluation. To deliver sections for the reports of WP 84.1, 84.3 and 84.7. To act as contact point for the IASOA and AMAP communities. <p>Task 2: Mediterranean (Partners: BSC/AEMET and AA)</p> <ul style="list-style-type: none"> NRT validation of aerosols, PM10 and AOD (Task 2.1) NRT validation of reactive gases, O3, CO, NOx, HCHO (Task 2.2) Case studies and extreme events (Task 2.3) Delivery of sections for the reports of WP 84.1 and 84.7. <p>Achieved during months 1-3: In the first two months the contribution to the WP 1 report consists of a continuation of the MACC-III activity, and no separate sections are introduced in the report for these two themes, but arctic and mediterranean measurements are included. These two new contributions (tasks 1 & 2) were discussed in detail during a telecon (9 Dec) and the content and preparations for these new aspects are listed (to ECMWF) in a set of 8 presentations, made available to ECMWF. Separate sections on these themes will be introduced in the second NRT report.</p>	
Deliverables	<ul style="list-style-type: none"> D84.4.1: (M2) Validation results for the Arctic and Mediterranean, in the form of sections to be included in the validation reports of WP 84.1; delivered (note that the WP 4 contribution is limited, as explained above, focussing on continuity) 	
Milestones	<ul style="list-style-type: none"> M84.1.1: (M2) Availability of draft validation report two weeks before publishing. delivered 	

Work package #	CAMS_84.5	Validation of CAMS Regional Products above the surface
Performance of tasks	<p>Tasks for first 3 months:</p> <ul style="list-style-type: none">• Update the discussion note developed during MACC-II.• Organise a meeting with CAMS-50 to find an optimal compromise between the output requested and the extra output that can be delivered by all models, and to discuss data transfer/storage. <p>Due to the late contract signature for both CAMS-50 and CAMS-84, this task is somewhat delayed. It has been agreed to have a meeting between the two subprojects in Paris, which will take place on 2 February 2016. Before the meeting an updated plan will be written, to be used as input for the meeting. The validation plan (D84.5.1) will incorporate the agreements resulting from the meeting, and will be made available before the end of February.</p> <p>Work has been performed by IUP-UB and KNMI on the comparison of the regional models with MAX-DOAS measurements.</p>	
Deliverables	<ul style="list-style-type: none">• D84.5.1: (M2) Validation plan for the regional services; some delay (about 2 months).	
Milestones	<ul style="list-style-type: none">• (none)	

Work package #	CAMS_84.6	Validation of the interface between CAMS global and regional production systems
Performance of tasks	<p>Task 1. Comparison of CAMS regional and global model products.</p> <ul style="list-style-type: none"> • Model-to-model comparisons for O3, CO and aerosol. • Analysis of major events (dust, fire, and photochemical pollution events). • Evaluation of long-range transport. <p>Task 2. Evaluation of CAMS global and regional products.</p> <ul style="list-style-type: none"> • Comparison of regional and global products with observations, using results from WP 84.1 and WP 84.5. <p>The "consistency reports" will be issued yearly. However, the WP will also contribute the 3- monthly reports of WP 84.5 with short summary and list of possible major inconsistencies.</p> <p>Achievements in the first months (partner AUTH): This is a new contribution which needs to be developed. It was discussed in detail during a telecon (9 Dec) and the content and preparations for this new aspects is provided in a presentation by AUTH, available on the CAMS-84 internal Redmine page (available to ECMWF). Three-monthly contributions will be available from M5 onwards. Preparations consist of getting access to the Meteo-France dissemination of regional models results (done), and setting up processing scripts to compare the global and regional model outputs.</p>	
Deliverables	<ul style="list-style-type: none"> • (none before 1 Jan 2016) 	
Milestones	<ul style="list-style-type: none"> • (none) 	

Work package #	CAMS_84.7	Validation of CAMS Global Reanalysis Products
Performance of tasks	<p>This work-package involves the validation of the CAMS global reanalysis products delivered by the global data provider ECMWF.</p> <p>Tasks:</p> <ul style="list-style-type: none"> • No tasks in the first three months (there is no reanalysis data available at this moment; start of the reanalysis is planned for Summer 2016) 	
Deliverables	<ul style="list-style-type: none"> • (none) 	
Milestones	<ul style="list-style-type: none"> • (none) 	

Work package #	CAMS_84.8	Improvement of validation methodology
Performance of tasks	<p>There are four objectives for this work package:</p> <ol style="list-style-type: none"> 1. Deliver a report to characterise the measurements used. 2. Develop scoring methods. 3. Report on "data mining" 4. Publish results. <p>Activities M0-M3:</p> <ul style="list-style-type: none"> - A first draft v0 of the "Observations characterisation document for validation" has been created based on material from MACC-III. - A first draft v0 of the "Validation Scoring Methods" document has been created based on material from MACC-III. <p>These documents are not intended to be published at this moment. They will be reviewed internally to discuss the subsections and content. These reviews will take place in February (after the draft validation report has been delivered) and a plan will be made to extend and improve the content.</p>	
Deliverables	<ul style="list-style-type: none"> • D84.8.1: (M3) Observations characterisation document for validation; delivered • D84.8.2: (M3) Validation scoring methods document; delivered 	
Milestones	<ul style="list-style-type: none"> • M84.8.2: (M3, M6, M9..) Review of draft document, updated work plan 	

Key Performance Indicators

KPI	Target end of contract	Status previous quarter (Q-1/Y)	Current status (Q4/2015)	Expected status (Q+1/Y)	Comments trend
KPI 1: Timeliness. Timeliness of the validation reports.		n.a.	According to schedule.	According to schedule.	The first NRT validation report was published on time and is available on the CAMS website. It is expected this will be the case for the next reports.
KPI 2: User Uptake. The number of downloads for each of the validation reports.		n.a.	Operational. This KPI is monitored by ECMWF. Results are reported to KNMI.	Operational.	Currently, only the CAMS website is monitored. In the next coming weeks the MACC website will be included in this monitor. The monitor will provide Total Downloads (the total number of times a document has been downloaded) as well as Unique Downloads (the amount of downloads per IP address). ECMWF will provide monitoring reports on a monthly basis. A first result is shown in the table on the next page.
KPI 3: User Satisfaction. Percentage /numbers of users that find sufficiently quantitative information in the validation reports for their area.		n.a.	Not implemented yet. This will be discussed with CAMS-94, Thomas Popp.	Expected not to be operational.	-
KPI 4: Verification Websites. Percentage of 'uptime' of the verification websites.		n.a.	A choice has been made to use 'Uptime Robot' for monitoring the uptime of websites. This is a free online monitoring service. Not operational yet.	Operational.	-

Results for KPI 2 “User Uptake”:

01.12.2015 - 31.12.2015		
Files	Total Downloads	Unique Downloads
Quarterly validation report December 2015	2	2
Quarterly validation report June 2015	2	2
Quarterly validation report September 2015	2	2

Annual Financial Summary

Use of Funds invoiced to ECMWF

				Duration	Amount (EUR)
Price Framework Contract				36 months	2 824 999.00
Price Service Contract 1				15 months	1 222 259.00
Invoices issued during quarter Q4/2015					
Payment number	Date request for payment	Period of activities /Milestone covered	Activities covered by payment	Amount (EUR)	
1	20/01/2016	Q4 2015	Upon acceptance by ECMWF of the deliverables due for WP 84.1, 84.4, 84.5, 84.6, and upon acceptance by ECMWF of the progress made for WP 84.2, WP 84.3, WP 84.7 and WP 84.8 (including deliverables)	218 750.00	
[]				[]	
				TOTAL	218 750.00
Remarks					

Summary of cost break-down for payments linked to **COST-REIMBURSEMENT activities*** incurred within reporting

WP	Service Contract	Name (sub-) contractor	Personnel costs (EUR) (incl. overhead)	Travel costs (EUR)	Computing costs (EUR)	Other costs (EUR) [specify]	Total Amount (EUR)	Deliverables and milestones
WP1							[]	
...								
WPn								
							TOTAL	[]

period:

* The selected payment procedures are specified in Annex 3C of the Service Contract. Details shall be in line with the Report on the Use of Resources as submitted for the Contract Performance Verification of the payment.

Not applicable for this annual report 2015.

List of entities receiving EU funds during the contract

Not applicable for this annual report 2015.

Name	Legal Name	Cumulative Costs Since T0 (EUR)
contractor		
sub-contractor a		
sub-contractor b		
Supplier - goods		
Supplier - services		
...		

Checks, audits and risk management

Checks and audits

According to section 4.7 “Control Mechanisms” of the CAMS-84 Financial Project Manual, which is part of all sub-contracts, twice per year costing details will be asked from two arbitrary sub-contractors.

Also, for every quarterly invoice from the sub-contractors KNMI will also ask for financial details.

Such regular checks/audits by the contractor KNMI have not been taken place yet.

Ex-post audits are not relevant yet considering the current phase of the CAMS-84 project.

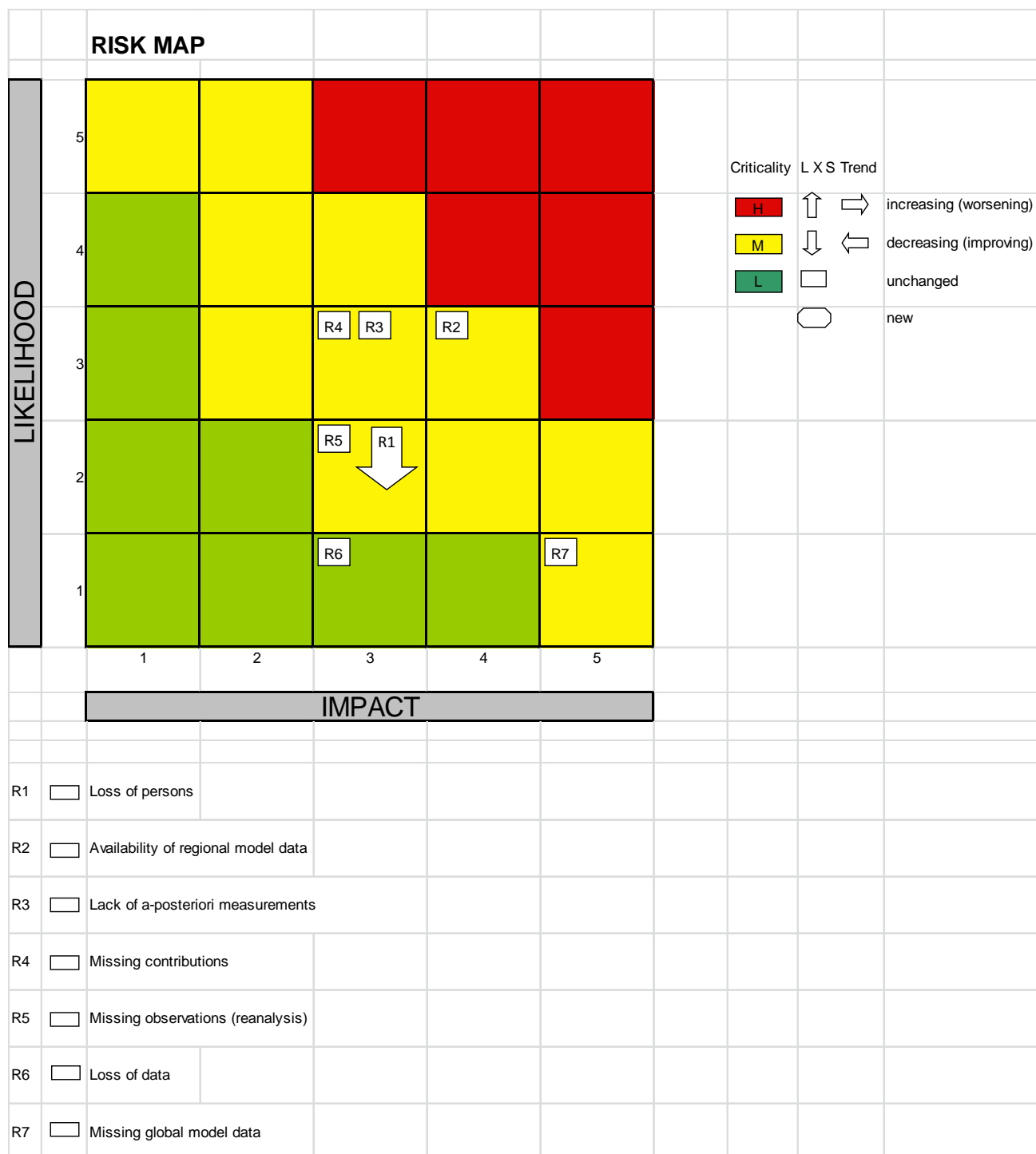
Update on the risk and mitigation plan

From the risks, identified in the risk table as contained in Table 5 of the Pricing Tables, only the risk “Loss of persons” shown below has been updated. With most contracts either being finalized or almost final, the likelihood of this risk has therefor been reduced from 3 to 2.

Risk Name	Description	Likelihood	Impact	Response Strategy
Loss of persons	Risk of non-availability of persons, due to illness, job mobility or other causes, that may result in missing inputs for the validation report	2	3	<p>Transfer/share: Most partners will have a team of persons involved, and will be able to take over the duties. If this fails, the consortium will check options to provide the contributions with the help of the other partners; Avoid: Delays are detected early, and appropriate measures will be taken to ensure that all contributions are in place before the deadline.</p> <p><u>The following mitigation action has been carried out:</u></p> <p>Due to contractual limitations of A. Wagner from DWD, her CAMS-84 work at DWD could not start. It has been proposed by KNMI to shift 75% of the DWD budget from DWD to MPG in Garching. This enables A. Wagner to start her CAMS-84 work at MPG instead of DWD. The official approval from DWD for this budget split is expected in week 4 of 2016. KNMI will approach the CAMS-84 board for the approval of the cost neutral transfer of funding. Then, the KNMI-DWD and KNMI-MPG sub-contracts will be updated to reflect this change.</p>

Note:

For the risk and mitigation plan in future reports, KNMI proposes to add a graphical presentation by means of a Risk Map containing a matrix. This provides “at a glance” a better insight in the current status of the identified risks.



Exceptions and Compliance

Summary of Compliance / Non-compliance

For this annual report 2015, there are no exceptions or non-compliance events.

Assets inventory – Summary

List of assets	Asset description	Part Number	Serial Number	Date of acquisition	Acquisition value	Contract reference	Location
Intellectual Property Rights (IPRs)							
NORS server SW	Software for browsing and viewing intercomparison reports that use remote sensing data.					Sub-contract KNMI-S&T	S&T
CODA SW	The Common Data Access toolbox (CODA) provides a set of interfaces for reading remote sensing data from earth observation data files.					Sub-contract KNMI-S&T	S&T
GECA SW	Generic Cal/Val Analysis Environment software					Sub-contract KNMI-S&T	S&T
HARP SW	Toolkit for ingesting, processing and inter-comparing satellite remote sensing data against correlative data.					Sub-contract KNMI-S&T	S&T
MUNINN SW	Generic 'product archive/catalogue' software solution for earth observation data products.					Sub-contract KNMI-S&T	S&T
DEHM	Chemical transport model.					Sub-contract KNMI-AU	AU
Other intangible assets							
None							

Fixed assets (equipment)							
None	According to Table 5 in the Pricing Table, fixed assets will only be acquired by sub-contractor MET-NO for an amount less than 7000 euro's. Therefore, details do not need to be provided here.						

Integrated Asset - Summary

Please specify any Integrated technologies developed within the reporting period. Whereby Integrated technologies are referred as: Technology which meets the first three conditions of being an Asset but which both Parties agree is indivisible from or impractical to use except in connection with one or more items of Pre-Existing Technology

Not applicable for this annual report 2015.

List of Technologies	Description of Technology	Development Date	Contract reference	Location

Contractor Declaration

Please provide a declaration from contract management confirming that, in the opinion of those in charge of the Contractor:

- A. The information is properly presented, complete and accurate;*
- B. the Funds were used for their intended purpose as defined in this Agreement and the objectives of the Copernicus Regulation; and*
- C. the control systems which the Contractor has in place give the necessary guarantees concerning the legality and regularity of the underlying transactions.*

SIGNED for and on behalf of the Contractor

.....
Signature

.....
Name

.....
Role in contract

