



Final Report

2022/CAMS2_72NL__TNO - NCP

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PROGRAMME OF
THE EUROPEAN UNION



IMPLEMENTED BY
ECMWF

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1. Executive (publishable) summary

The overall objective of the proposed project is twofold. The first objective is to deliver (updated) downscaled CAMS regional air quality products at a spatial resolution of 1-2 km over the Netherlands. This includes air quality forecasts as well as source contributions making use of the CAMS European air quality service and policy support services.

The second objective is to stimulate the uptake and adaptation of CAMS global and European-scale products for feeding official national environmental information systems and services. Through this, the project leads to a better uptake of CAMS products in the Netherlands.

The project team consists of teams currently involved in several CAMS services, and involves the National Institute for Public Health and the Environment (RIVM institute as core prime user), bringing together the required expertise in downscaling and communication to perform the work.

This project had three key deliverables:

- **Downscaled Air Quality Forecasting Model:** An upgraded high-resolution national forecast model was delivered, improving air quality forecasting capabilities.
- **User Workshop:** A workshop was held to engage users and gather feedback, leading to a better understanding of user needs and requirements regarding downscaled source attribution service.
- **Downscaled Source Apportionment Service:** A roadmap to further update the downscaled source attribution operational service providing for the past 6 weeks the main source sectors and regions contributing to air pollution in the Netherlands at both official and citizen science observation sites, based on the feedback collected during the workshop.

The main achievements are:

- **Air Quality Forecasting:** The project delivered downscaled air quality forecasting models, including source apportionment, which were used by RIVM to understand the source contribution for a number of cases.
- **Workshops and User Engagement:** A workshop was organized to gather user feedback and identify needs for further development of the national source attribution service. The interaction with RIVM led to the use of more information from CAMS Services by RIVM for national air quality forecasts and smog warnings. Moreover, the interaction with RIVM has led to assess critical developments within the **downscaled** LOTOS-EUROS system (bi-daily forecast at Province level) that would provide additional information to RIVM for air quality forecast and informing the public.
- **Tooling and Data Integration:** The project improved the alignment of national air quality forecasting tools with the CAMS services, enhancing the quality and usability of air quality data.



The activities and discussions that took place as part of the CAMS2_72NL contract have intensified the collaboration between the three large national parties involved in Netherlands (RIVM, KNMI and TNO) when it concerns the provision of air pollution information.

During the first phase of CAMS NCP we discussed the different roles TNO, KNMI, and RIVM (as key user) have within the Air Quality domain within The Netherlands. For example, both KNMI and RIVM are governmental bodies that work together to serve society and inform the general public, albeit with different legal tasks. RIVM is the national authority to issue air quality forecasts and warnings to the general public, while KNMI is primarily responsible to issue weather warnings and further maintains the infrastructure to provide 24/7 operational weather forecast data. TNO is a research organisation with another role in society (to provide innovative research) than the two government institutions. TNO's main role in the air quality field is to deliver independent and innovative research on the origin and impact of air pollution to guide society towards clean air and better health.

Some challenges have been identified due to the different mandates and also due to the use of different tools by the project partners. Through regular discussions cooperation has been intensified between the partners, and the coordination between RIVM and KNMI on the downscaled air quality forecasting activities has improved. Important progress has been achieved in the consistency and use of tooling which is anticipated to increase visibility and use of CAMS products during the second phase of the CAMS2_72NL project.

Overall, the project helped to have a better understanding of the contribution to and use of CAMS Services by Dutch entities in the Air Quality domain. An overview of all CAMS contributions in the Netherlands (which projects are NL involved in, who is involved, what are the products and who are the contact persons) has been produced in the project, and the Dutch CAMS Community has been activated. The CAMS (downscaled) services are put in perspective to existing national tools and services to identify complementary value and increase visibility, understanding, and use of CAMS data. The requirements for these products have been established through a dedicated workshop on CAMS downscaled source apportionment and RIVM inputs on their needs with respect to (downscaled) air quality forecasts.



2. Summary of performance and main achievements

2.1 Summary

The overall objective of the proposed project was twofold. The first objective was to deliver (updated) downscaled CAMS regional air quality products at a spatial resolution of 1-2 km over the Netherlands. This includes air quality forecasts as well as source contributions making use of the CAMS European air quality service and policy support services.

The second objective was to stimulate the uptake and adaptation of CAMS global and European-scale products for feeding official national environmental information systems and services. Through this, the project lead to a better uptake of CAMS products in the Netherlands.

The project team consisted of teams currently involved in several CAMS services, and involved the National Institute for Public Health and the Environment (RIVM institute as core prime user), bringing together the required expertise in downscaling and communication to perform the work.

Our key deliverable was the downscaling of the air quality forecasting modelling suite, including source apportionment in the Netherlands. This is a feature needed for further uptake of CAMS products in the Netherlands. The other key deliverable was the organization of the workshop targeting existing and potential users of CAMS downscaled product and services in the Netherlands. Finally, the third key deliverable was a roadmap to further update the downscaled source attribution operational service based on the feedback collected during the workshop.

Regards the user requirements, we have collected feedback from the prime user RIVM during the regular exchanges. The downscaling of CAMS air quality forecast for the Netherlands will be tested by the prime user RIVM, to see if it produces better results than the current solution (data taken directly from the regional CAMS Service). This activity will take place in the second phase of the project.

The request from RIVM to produce air quality forecasts 2 times a day (once in the night, once before mid-day) is expected to improve the air quality services provided by RIVM to the Dutch population, most importantly in case of pollution events. Implementation will be proposed in phase 2 of the project.

Moreover, a dedicated workshop was organized by the team on 22 May 2024 at TNO in Utrecht to collect user feedback on the CAMS downscaled source apportionment service and identify the user needs for further developments. The CAMS downscaled source attribution service has been used by DCMR (the joint environmental agency of the Province of South Holland and thirteen municipalities in the Rijnmond region) in an analysis of woodsmoke contributions. This work was presented during the organized CAMS downscaled source apportionment workshop and in the magazine 'lucht'. The data was identified as useful for their specific interest. Also some additional user needs were formulated (e.g. having a specific woodsmoke label instead of the more general residential combustion label).

The tooling on which the service is based is also used offline with the city of Eindhoven and the provinces of Noord-Holland and Zuid-Holland within other projects. User requirements for adapting



the CAMS downscaled source attribution service to the needs of these users will be collected and considered for future updates in other projects.

2.2 Work Package 00

Work package #	CAMS_7200	Management and coordination
Performance of tasks	This work package was dedicated to the coordination of the CAMS_72 project, including organising progress meetings, quality assurance of deliverables, providing collaboration tools and reporting to ECMWF. TNO was the lead and the main contributor of this work package. Three main tasks were planned for this work package. • Task 7201 Coordination of the project and interaction with ECMWF: The coordination of the project involved setting up the subcontracting, ensuring all payments are made, day-to-day project management and interaction with ECMWF (through regular videoconferences and regular (2 per year) review meetings). • Task 7202 Organisation of meetings: Regular internal project meetings were organised to discuss progress in the tasks and towards upcoming deliverables. Once per year a dedicated project meeting was held and CAMS_72 actively participated in the CAMS general assemblies (annually). • Task 7203 Monitoring and reporting: Six monthly and annual reporting of progress within the project to ECMWF took place in a timely manner. All milestones and deliverables have been securely stored and checked for quality assurance. The key deliverables were the implementation plan, implementation reports, and the report on impact and sustainability analysis, and the report on user engagement activities. Due to delays in WP7230, the final report D72.0.3.8 (Final report) and the associated milestone M72.0.1.3-2024Q4 (Progress Review Meeting / Payment Milestone 3) were delayed of 3 months, as they could be submitted only after the delivery of all other deliverables. <u>Main problems encountered and mitigation measures:</u> The management costs were not well estimated at the start of the project. The administrative burden was higher than expected. This led to an overspent for TNO in the work package CAMS_7200, especially related to the task 7203 Monitoring and reporting. Indeed, the amount of deliverables and milestones for the work package CAMS_7200 was more than the deliverables and	



milestones of the two other work packages combined (respectively 18 and 12). Moreover, during the project lifetime, ECMWF changed the progress review process, from 1 meeting every 6 months for the entire project (duration: 1 hour), to 1 meeting every 6 months for each work package and together with the other NCP projects (duration of each meeting: 3 hours). This extended the time needed for attending the progress meetings.

As mitigation measure, it was decided during the Management meeting in Q3 2024 to scope down the involvement of TNO in the WP CAMS_7230 to compensate for the overspent in WP CAMS_7200, and that TNO would take a loss to cover the rest of the overspent. The total realized management costs for TNO are 50keuro (planned costs: 26.5keuro, so + 188%), and the loss for TNO is 17keuro (+20%).

KNMI didn't suffer any overspent.

Lessons learnt:

The administrative burden, especially related to reporting and monitoring, for the leading partner of a CAMS project should not be underestimated. As the projects are relatively time consuming on administration, TNO is looking into options to make this more efficient and keep an open dialogue with ECMWF to tailor administration needs to what is absolutely necessary.

Moreover, the amount of interactions with ECMWF should be fixed in advance and not evolve during the project.

Finally, the project manager could be supported by administrative personnel to lower the costs of the management tasks, for reporting and organization of meetings. When possible, the amount of reporting documents (reports, minutes, etc.) should be reduced, for both internal project meetings and interactions with ECMWF.



2.3 Work Package 30

Work package #	CAMS_7230	Air quality downscaling
Performance of tasks	Aim of the work package: • Upgrade and refine the existing national AQ forecasting capabilities by: aligning the characteristics of the LOTOS-EUROS modelling suite currently used for this purpose, to those used in the framework of CAMS European forecasts, and upgrading the model to a higher resolution. • Document the added value of the AQ downscaling over the Netherlands • Upgrade and align the national higher resolution source apportionment service to the regional source apportionment in the CAMS policy service. One of the key deliverables is D72.3.2.1 (Report on upgraded high-resolution national forecast model). It elaborates on the series of improvements on the legacy Dutch air quality forecasting system, in line with the goal of the national collaboration program. We have further expanded our investigation with two new upgraded high-resolution configurations of LOTOS-EUROS over the Netherlands. These consisted of a setup with increased native horizontal resolution of the model compared to that of the legacy forecasting system but also one using higher resolution emissions and a matching model resolution at around 1x1 km². Beyond these increases in resolution, we initially aimed to upgrade the legacy NL forecasting system by also using a bias-correction approach to correct the bias of the forecasts the way we had been using in the legacy system. Based on the evaluation of the aligned suite, we found no clear indication of a consistent additive or multiplicative bias in neither ozone or PM10 (the two species that were bias corrected in the legacy forecasting system), making the added value of such a bias correction redundant. In Figure 1 we present the analysis of the performance of the different configurations for NO₂ (Taylor plots where LE_CAMS2_40_EU denotes the European run, LE_Aligned and LE_Aligned-hires correspond to the aligned suite at legacy and high resolution, respectively, and LE_CAMS2_72_NL represents the high-resolution configuration with enhanced resolution emissions). We conclude that in relation to NO₂ all configurations perform comparably for the selected winter month, with “CAMS2_72_NL” exhibiting a small advantage based on both correlation coefficient and RMSE. The summer month however reveals a much clearer differentiation between the configurations, with “CAMS2_72_NL” showing a considerable improvement in all the metrics described in the Taylor plot, namely standard deviation, RMSE and correlation coefficient, compared to the rest of the configurations. This is an important result in our investigation, as NO₂ is the most important pollutant for which we were expecting to see improvement from simulating at higher horizontal resolution using high-resolution emissions, as it is a species with relatively short lifetime in the boundary layer and with concentration gradients which are sharper than most of the other species.	

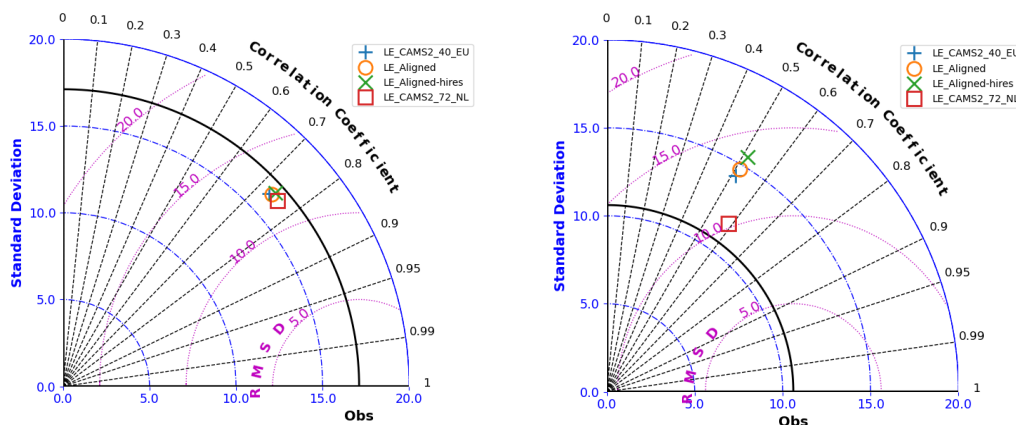


Figure 1: Taylor plots for NO₂ for all examined setups, for the winter (left) and summer (right) period.

Task 7235 on “Preparation of (Pre-)Operational Dissemination of Upgraded Air Quality Forecast Model Output” and milestone M72.3.5.1 ((Pre-)Operational Provision of Downscaled Air Quality Forecast Products via the KNMI Data Platform), both assumed the continued operation of the legacy NL forecasting system. However, the legacy NL forecasting system has been decommissioned in January 2024 as a joint decision of RIVM and KNMI outside of the influence of this project. Consequently, the milestone M72.3.5.1 cannot be reached. Indeed, it was out of scope to build it up again within the framework of this project. Preparation steps, such as setting up the API and metadata templates, have been completed, to anticipate the potential dissemination of the forecast model in the next phase of the project.

The second key deliverable is D72.3.6.1 (Report on downscaled source attribution service over the Netherlands). Based on feedback collected during M72.6.3.1 (Workshop for existing users and other stakeholders), we have investigated possible alterations or required developments for increased usability by the national stakeholders. We have updated the model system for the Netherlands to be more consistent with the system applied within the CAMS regional AQ service and the CAMS Policy support service. We have also implemented the update of the emissions to the newest Dutch inventory to take into account changes in emissions. The previous emissions were dated from 2018. The downscaled source attribution service had to be updated in after the release of CAMS v8, which happened in January 2025. In addition, due to some changes in source definitions, the preparation of the emissions for insertion in the model - including the merging of the emissions with the newest CAMS regional emissions - required more time. This caused a delay of 6 months in the online release of the service.

Main problems encountered and mitigation measures:

Within this WP, several delays and scope changes occurred. Reasons for this were:



- Due to an overspent in WP7200, the decision was made to scope down the involvement of TNO in WP7230 to compensate the budget overspent and limit the loss TNO would take on the project. This mainly had impact on task 7236, with milestone M72.3.6.1 ((Pre)operational provision of downscaled source attribution results over the Netherlands through web interface) and deliverable D72.3.6.1 (Report on downscaled source attribution service over the Netherlands) being delivered with a delay of six months.
- Milestone M72.3.5.1 ((Pre-)operational provision of downscaled air quality forecast products through the KNMI Data Platform) was cancelled due to the decommissioning of the (then) current legacy NL modelling suite from KNMI.
- Deliverable D72.3.2.1 (Report on upgraded high-resolution national forecast model) from task 7233 was scoped down as it was found that a bias correction approach was redundant.

Lessons learnt:

Over the course of the project, it is important to stay flexible when certain pre-identified information turns out to be different (e.g. the decommissioning of legacy NL forecasting system). In this case, it was best to cancel the deliverable as a whole, although that is quite an impactful decision. Therefore, the team should remain flexible.

Furthermore, some deliverables were depending on each other. This was the case of the M72.3.6.1 ((Pre)operational provision of downscaled source attribution results over the Netherlands through web interface): it was dependant on other projects as TNO had the objective to update the system in a coordinated way. Although these dependencies can not always be taken away, it is important to be aware of the dependencies, such that they can be communicated early on and the planning can be adjusted.



2.4 Work Package 60

Work package #	CAMS_7260	Communication
Performance of tasks	For the WP Communication, most effort has gone into organisation of the user workshop. This user workshop has taken place on the 22nd of May 2024 and it focused on source apportionment. It aimed to raise awareness and increase the use of CAMS Downscaled Source Apportionment Services, and to learn about wishes of potential/current users. A relatively small audience has been chosen, enabling the focus on interactivity and learning together. We invited several colleagues from RIVM, our prime user in the project, as well as other current or potential users. Through the workshop on the downscaled source apportionment we connected to DCMR. Their work has been presented within the national magazine 'Lucht'. The workshop furthermore led to a long list of user requirements that helped shaping the work plans of phase 2 of the CAMS2_72NL.  The invitation is a green and white flyer. At the top, it says 'TNO innovation for life' and 'Rijksoverheid'. The main title is 'Where does air pollution come from?'. Below this, it says 'In our work, we continuously search for the best ways to monitor and improve air quality. Within the CAMS National Collaboration Program, we collectively focus on this issue.' It then mentions 'Source Apportionment' and offers possibilities to learn more. The program includes: 9:00-9:30 Registration and walk-in, 9:30-10:00 What is CAMS?, 10:00-11:00 Where does air pollution come from? Introduction to 'Brontoekenning', 11:00-12:00 Exchange and discussions, and 12:30-13:30 Wrap-up and lunch. The location is TNO Utrecht, Princetonlaan 6, 3548 CB Utrecht. Contact is via sophie.vanmil@tno.nl. It notes that attendance is only possible in person, not online. Logos for the European Union, Copernicus, and ECMWF are at the bottom.	
	Figure 2: Workshop Invite sent to target audience. This invitation was sent (both in English and in Dutch) to the attendees of the Source Apportionment Workshop. The second main deliverable was an infographic on downscaled source apportionment.	

**Main problems encountered and mitigation measures:**

The organization of the workshop (task 7263) was mostly done by TNO, due to the topic of the workshop (source apportionment). At the time of the project proposal, the topic of the workshop was not known, and the partners made the hypothesis that KNMI would contribute more than TNO to the work package CAMS_7260 Communication. This led to an overspend on the side of TNO, as it was not possible to transfer the budget from KNMI to TNO to take into account of the change of effort repartition.

As mitigation measure, it was decided during the Management meeting in Q3 2024 to transfer the deliverable D72.6.4.1 to KNMI (as it was originally the responsibility of TNO) which would limit the further spending of TNO related to CAMS_7260, and that TNO would take a loss to cover the rest of the overspend.

Next to this, the D72.6.4.1 (Communication Strategy) was delayed with 4 months, such that it could be aligned with the next phase of CAMS NCP.

Lessons learnt:

During the proposal phase it is already important to define how much budget is needed per institute for the communication WP, and to stick to the decision. Next to this, the deliverables of the WP could have been altered such that it reflected the budget split better.

RIVM should be more involved and receive more budget during the next phase, as it appeared, during the session on feedback and lessons learned for the project, to be important to involve the prime user more. This will also enhance the impact of the project regarding user engagement.



3. Summary of Key Performance Indicators (KPI)

KPI	KPI title	Performance target as specified in contract	Status at end of SC1		Status at end of SC2		Status at end of SC3 (if applicable)		Comments trend
			Achieved performance	Reached Yes / No	Achieved performance	Reached Yes / No	Achieved performance	Reached Yes / No	
1	On-time delivery rate	N/A	70%	N/A					
2	Project completion rate	N/A	90%	N/A					
3	Team satisfaction	N/A	Good	N/A					See explanation below

In the implementation plan of this project, no KPI's were defined. However, the proposal of phase 2 has defined some potential KPI's. In this report, some of those will be used to measure the achieved performance.

1. On-time delivery rate: the percentage of project milestones/deliverables completed on or before their scheduled due date.
2. Project completion rate: the percentage of work completed compared to project's overall scope.
3. Team satisfaction: An evaluation of the motivation and engagement of the team

In order to assess the performance of the first two KPI's, the tables below are used.

Deliverables					Status
#	Responsible	Nature	Title	Due	
D72.0.3.1-2023	TNO	Report	Implementation plan 2023-2024	31-7-2023	Delivered on time
D72.6.2.1	TNO	Report	Report of existing and potential users of CAMS products	31-10-2023	Delivered on time
D72.3.1.1	KNMI	Report	Report on the national forecast model harmonized to CAMS2_40	31-12-2023	Delivered on time



D72.0.3.2-2023Q3Q4	TNO	Report	Six monthly Implementation Report	15-1-2024	Delivered on time
D72.6.3.1	TNO	Report	Workshop report	28-2-2024	Delivered with a delay
D72.0.3.3-2023	TNO	Report	Copy of prime contractor's general financial statements and audit report 2023	30-6-2024	Delivered on time
D72.0.3.4	TNO	Report	Draft report on impact and sustainability analysis	30-6-2024	Delivered on time
D72.0.3.2-2024Q1Q2	TNO	Report	Six monthly Implementation Report	15-7-2024	Delivered on time
D72.6.4.1	TNO	Report	Development communication strategy plan	31-8-2024	Delivered with a delay
D72.0.3.5	TNO	Report	Potential plans for 2025	1-9-2024	Delivered on time
D72.0.3.6	TNO	Report	Final report on impact and sustainability analysis	31-12-2024	Delivered on time
D72.0.3.7	TNO	Report	Report on user engagement activities	31-12-2024	Delivered on time
D72.0.3.8	TNO	Report	Final report	31-12-2024	Delivered with a delay
D72.3.2.1	KNMI	Report	Report on upgraded high-resolution national forecast model including bias corrections and validation	31-12-2024	Delivered with scope down
D72.3.6.1	KNMI	Report	Report on downscaled source attribution service over the Netherlands	31-12-2024	Delivered with a delay and



					with scope down
D72.0.3.2-2024Q3Q4	TNO	Report	Six monthly Implementation Report	15-1-2025	Delivered with a delay

Milestones					
#	Responsible	Title	Means of verification	Due	Status
M72.0.1.1	TNO	Kick-off meeting - Presentation and Minutes of meeting	Minutes of meeting	15-7-2023	Delivered on time
M72.0.1.2-2023	TNO	Regular internal consortium meetings	Minutes of meeting	15-7-2023	Delivered on time
M72.6.2-2023S1	TNO	Six-monthly meeting with prime user RIVM (minutes)	Minutes of meeting	30-7-2023	Delivered on time
M72.6.2-2023S2	TNO	Six-monthly meeting with prime user RIVM (minutes)	Minutes of meeting	31-12-2023	Delivered on time
M72.0.1.3-2023Q4	TNO	Progress Review Meeting / Payment Milestone 1 - Minutes of meeting	Minutes of meeting	1-1-2024	Delivered on time
M72.6.3.1	TNO	Workshop for existing users and other stakeholders	Minutes of meeting	01-04-2024	Delivered with a delay
M72.0.1.5	TNO	Updated risks management table after review with ECMWF	Updated table	1-6-2024	Delivered on time
M72.0.1.3-2024Q2	TNO	Progress Review Meeting / Payment Milestone 2 - Minutes of meeting	Minutes of meeting	30-6-2024	Delivered on time



M72.6.2-2024S1	TNO	Six-monthly meeting with prime user RIVM (minutes)	Minutes of meeting	30-6-2024	Delivered on time
M72.0.1.4-2024	TNO	Annual General Assembly attendance	final date to be determined	1-7-2024	Delivered on time
M72.0.1.2-2024	TNO	Regular internal consortium meetings	Minutes of meeting	15-7-2024	Delivered on time
M72.0.1.3-2024Q4	TNO	Progress Review Meeting / Payment Milestone 3 - Minutes of meeting	Minutes of meeting	31-12-2024	Delivered with a delay
M72.3.5.1	KNMI	(Pre-)operational provision of downscaled air quality forecast products through the KNMI Data Platform	Timely delivery	31-12-2024	Cancelled
M72.3.6.1	KNMI	(Pre)operational provision of downscaled source attribution results over the Netherlands through web interface	Timely delivery	31-12-2024	Delivered with a delay and scope down

The third KPI is not measured quantitatively. However, overall the team was satisfied with the team spirit and the work done. Some positive feedback (gathered during the session on feedback and lessons learned for the project): smooth communication, a high engagement of all team members, the incorporation of RIVM and the trust in the management team. Some things that could be improved are the split of budget (as also mentioned in the lessons learnt), a bigger role for NSO (as will be implemented in phase 2 of this project) and more targeted update meetings.



4. Risks

A few risks have occurred during the contract, but they had minor impact of the project.

The risk “Unexpected unavailability of key personnel” has occurred. One of the key personnel is not available to perform the tasks in work package 7230 Downscaling from TNO. This was due to high work load from the team, and had impact on a couple of projects including CAMS_72NL. This has been identified early in the project, a recruitment took place and the availability of personal could be mitigated. This risk had little to no impact on the project thanks to the mitigation measure put in place during the set-up of the project: “Involvement of more than one person on each task. The work will be done by permanent staff. Backup staff members are identified for each task.” The work could start and continue without interruption.

The risk “Poor quality of input data” has also occurred in the work package 7230 Downscaling. As mitigation measure, we have decided to accept this risk: “Most of the necessary input data to be used in the project have already been carefully checked by the groups who have developed them. If some issues are found, these groups will be contacted, and corrections will be applied. Even if input data are not optimal the downscaling method can be developed and be used whenever optimal data come available.” The realised risk was about the use of latest Emission Registration dataset (Dutch Emission Inventory) for the Downscaling source apportionment. It was requested by users to provide the woodsmoke contributions as a separate contribution, and we decided to uptake this request with the hypothesis that this contribution was specified in the new Emission Registration dataset. However, since the Dutch emission inventory does not explicitly specify this source, further developments are needed to allow the uptake of this user requirement.

One risk has not been identified but happened: the work repartition between the partners has led to over consumption of budget from one partner (TNO), and under consumption of budget from the other partner (KNMI). This happened in the 7260 Communication work package. This is due to the focus of the workshop, that put one partner more in the lead, thus spending more budget and initially anticipated. As mitigation measure, it was decided that KNMI will take over the responsibility of one deliverable from TNO, and that TNO will scope down its involvement in the work package 7230 Downscaling to compensate for the over spent. Moreover, due to overspent in the work package 7200 Management, TNO will take a loss.

5. Financial reporting

There was no occurrence of non-compliance events, as all necessary reporting was done and the status of the deliverables were communicated in due time to ECMWF.

6. Checks and audits

No specific checks or audits were performed as the cooperation and financial arrangements



between the contractor and its subcontractors have functioned as planned.

7. Exceptions and Compliance

No exceptions nor Non-compliance issues occurred during the project lifetime.

Any delays in the submission of Deliverables was communicated well ahead including the origin and explanation of the delays.

8. Contractor Declaration

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

In respect to the Final Report, the Final Report Financial Tables and any attached annexes.

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 objective 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

Diane Petillon
Name

Project manager of CAMS NCP
Title



ECMWF - Robert-Schuman-Platz 3, 53175 Bonn, Germany

Contact: <https://support.ecmwf.int/>