



Assessment of PM Exposure at intra-urban scale in preparation of MAIA mission (APEMAIA)

DEL001.7 Progress Report

Contract n. 2023-39-HH.0

CUP n. F83D23000210005

ASI CONTRACT N°	2023-39-HH.0		
PROJECT NAME	Assessment of PM Exposure at intra-urban scale in preparation of MAIA mission (APEMAIA)	CONTRACTOR	Institute of Atmospheric Pollution Research – National Research Council
PROJECT MANAGER	Maria Adamo (CNR-ITIAm)	DATE SUBMITTED	N/A
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PROJECT BEGIN DATE	26/09/2023	PROJECT END DATE	25/09/2025



Institute of
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National Research Council of Italy

Project: APEMAIA

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EXECUTIVE SUMMARY

This progress report is issued in the frame of Contract in place between ASI and CNR-IIA for the APEMAIA project. The activities of APEMAIA project are carried out by a consortium led by CNR-IIA acting as prime contractor and supported by DIF and ARPA Puglia.

This report describes the APEMAIA project management and technical activities performed in the reporting period from 26/09/2025 to 25/03/2026.

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1 AIM OF THE DOCUMENT

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This report describes the APEMAIA project management and technical activities performed in the reporting period from 25/03/2025 to 25/02/2026 considering the extension of the lifetime of the project.

1.1 Applicable documents

[AD 1] ASI Contract No. 2023-39-HH.0

[AD 2] subcontract CNR-IIA and DIF Prot. CNR-IIA n. 0276290 del 21/09/2023

[AD 3] subcontract CNR-IIA and ARPA Prot. CNR-IIA n. 0273735 del 19/09/2023

1.2 Reference documents

- [RD-1] WORLD HEALTH ORGANIZATION. (2021). WHO GLOBAL AIR QUALITY GUIDELINES: PARTICULATE MATTER (PM_{2.5} AND PM₁₀), OZONE, NITROGEN DIOXIDE, SULFUR DIOXIDE AND CARBON MONOXIDE. WORLD HEALTH ORGANIZATION. [HTTPS://IRIS.WHO.INT/HANDLE/10665/345329](https://iris.who.int/handle/10665/345329)
LICENSE: CC BY-NC-SA 3.0 IGO
- [RD-2] UN HABITAT. SDG 11.6.2. METADATA (2017). AVAILABLE ONLINE:
[HTTPS://UNSTATS.UN.ORG/SDGS/METADATA/FILES/METADATA-11-06-02.PDF](https://unstats.un.org/sdgs/metadata/files/METADATA-11-06-02.pdf).
- [RD-3] AQUILINO, M.; ADAMO, M.; BLONDA, P.; BARBANENTE, A.; TARANTINO, C. IMPROVEMENT OF A DASYMETRIC METHOD FOR IMPLEMENTING SUSTAINABLE DEVELOPMENT GOAL 11 INDICATORS AT AN INTRA-URBAN SCALE. REMOTE SENSING 2021, 13, 2835, DOI:10.3390/rs13142835.

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2 PROGRAM MANAGEMENT

2.1 Milestones status

Below are reported the main milestones planned for the project.

Table 2-1 – Milestones status.

MILESTONE	#	SCHEDULE	DATE	STATUS ISSUE
Kick-Off meeting	KO	T0	2023/09/26	Completed
Advancement Meeting 1	RA1	T0 + 3M	2023/12/26	Completed
Advancement Meeting 2	RA2	T0 + 12M	2024/09/26	Completed on 2024/12/11
Advancement Meeting 3	RA3	T0 + 18M	2025/03/26	Post dated
Final Meeting	RF	T0 + 24M	2025/09/26	As per schedule

2.2 Deliverables status

The following project outputs were expected during this reporting period:

- DEL009 – Description of the second system module (WP2) for the estimation of PM2.5 and PM10 at high resolution (SW006) and analysis of relations between urban heat islands and intra-urban scale pollution (SW006)

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3 TECHNICAL OVERVIEW ON ONGOING ACTIVITIES

In this section, we provide an update on the progress of the work packages and activities performed during the reporting period from 25/03/2025 to 25/02/2026. Following the extension granted by ASI, the activities are progressing according to the revised project schedule, and no critical issues are currently reported.

3.1 Work Package advancements status

- **WP 1101: Management (T0 – T0+24)**

Started on October 26, 2023, currently ongoing as per the agreed schedule (87.5% with respect to the WP1101 schedule).

- **WP 1103 –WebGIS Implementation (T0+12 – T0+24)**

Started on 2024/10/26, currently ongoing as per the agreed schedule (75 % with respect to the WP1103 schedule).

- **WP 1104 – Dissemination and Reporting (T0+1 – T0+24)**

Started on 2023/10/26, currently ongoing as per the agreed schedule (96% with respect to the WP1104 schedule).

- **WP 2103 – HR PM2.5 and PM10 extraction (T0+4 - T0+20)**

Started on 2024/01/26 and completed on 25/02/2026 as per the agreed schedule (100% with respect to the WP 2103 schedule).

- **WP 2104 – HR PM2.5 and PM10 population exposure (T0+5 - T0+22)**

Started on 2024/02/26, currently ongoing as per the agreed schedule (94% with respect to the WP 2104 schedule).

- **WP 3102 – Open-source implementation of all system modules (T0+4 – T0+24)**

Started on 2024/01/26, currently ongoing as per the agreed schedule (85% with respect to the WP 3101 schedule).

- **WP 4101 – Collection of PM data from ARPA stations (T0+3 – T0+20)**

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Started on 2023/11/26 and completed on 25/02/2026 as per the agreed schedule (100% with respect to the WP 4101 schedule).

- **WP 4102 – Collection of data from Air Quality and meteorological models (T0+3 – T0+20)**
Started on 2023/11/26 and completed on 25/02/2026 as per the agreed schedule (100% with respect to the WP 4102 schedule).
- **WP 4103 – Output products Validation (T0+18 – T0+24)**
Started on 2025/03/25, currently ongoing as per the agreed schedule (50% with respect to the WP 4103 schedule).

3.2 Progress report on technical activities

In the following the activities that have been carried out during the reporting period for each WP.

- **WP 1101 –Management (T0 – T0+24)**

Activities within this work package will advance with an emphasis on scientific and technical coordination among the partners. Some of the conducted tasks:

- Monitoring and coordinating technical activities through regular meetings with subcontractors. Numerous meetings have been conducted with both ARPA Puglia and DIF subcontractors. The meetings covered various topics, including:
- Validation of the new released products;
- Discussion and consolidation of the assumptions and input data supporting the exposure assessment, as well as of the criteria for the validation of the resulting products;
- Preparation of this progress report;
- Updating of the cloud space for project documentation sharing (sharepoint);
- Collection of all the contributions to reply to ASI revision of the deliverables.

- **WP 1103 — WebGIS Implementation (T0+12 – T0+24)**

The development of graphical interface of WebGIS platform is still ongoing.

- **WP 1104 – Dissemination and Reporting (T0+1 – T0+24)**

The following tasks were carried out as part of this work package:

- Continued population of the GitHub project profile hosting the open-source code repositories, with the upload and update of the codes developed within the project activities;
- Publication of the paper: N. Amoroso, A. Fania, G. Lorusso, R. Cilli, M. Adamo, M. Aquilino, M. De Lucia, L. Bellantuono, A. Lacalamita, M. Larocca, T. Maggipinto, A. Morabito, A. Nocioni, E. Pantaleo, R. Primerano, S. Tangaro, R. Bellotti, "High-Resolution Air Quality Estimation in Puglia: Leveraging AI and Explainability Techniques", Atmospheric Pollution Research, 2025.
- Submission and acceptance, following peer review, of an abstract for a poster presentation at the European Aerosol Conference (EAC 2025), held in Lecce, Italy, in September 2025: M. De Lucia, M. Aquilino, C. Tarantino, S. Fuina, ..., M. Adamo, "High-resolution PM prediction at intra-urban scale: the APEMAIA project in preparation for the MAIA mission", EAC 2025 – European Aerosol Conference, Lecce, Italy, 2025

- **WP 2103 – HR PM_{2.5} and PM₁₀ extraction (T₀+4 - T₀+20)**

The following tasks were carried out as part of this work package:

- Consolidation of the AI models for the estimation of daily PM_{2.5} and PM₁₀ concentrations;
- Release of an updated version of the daily PM_{2.5} and PM₁₀ maps;
- Production of the corresponding annual and seasonal maps derived from the daily estimates.

- **WP 2104 – HR PM_{2.5} and PM₁₀ population exposure (T₀+5 - T₀+22)**

The development of an automatic routine for creating disaggregated demographic data from ISTAT indicators using the dasymetric QGIS plugin in a loop.

- **WP 3102 – Open-source implementation of all system modules (T₀+4 – T₀+24)**

The following work package activities are still pending:

- Dockerfile were published on a public GitHub repository under an open-source license (e.g., MIT or GPL).
- Detailed documentation and usage instructions were added to the repository README

- **WP 4102 – Collection of data from Air Quality and meteorological models (T0+3 – T0+20)**

3D numerical estimates of meteorological variables produced by the WRF modelling system and the WRFPRS module for the urban areas of Bari and Taranto and Air Quality FARM Model Output have been released accordingly to the timeline, format and methods defined with the other partners. The WPs activities can be considered completed.

Link on ReCas Cloud Storage repository:

- WRF Numerical Model Output:
[/lustre/apemaia_project/Input/CNR_IJA/WRFOUT](#)
- WRFPRS Numerical Model Output:
[/lustre/apemaia_project/Input/ARPA/WRFPRS](#)
- Air Quality FARM Model Output:
[/lustre/apemaia_project/Input/ARPA/Modelli_QA](#)

- **WP 4103 – Output products Validation (T0+3 – T0+20)**

Validation of the Apemaia predictive model output in Bari study area for the years 2019, 2020, 2021, and 2022 using the Deltatool, a statistical analysis software developed by the JRC (Joint Research Center) within the framework of FAIRMODE, to evaluate model performance in specific applications carried out in accordance with Legislative Decree 155/2010.