




PROJECT:

EastMed Pipeline Project



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Abbreviations

Abbreviation	Description
EASEE	European Association for the Streamlining of Energy Exchange
EBRD	European Bank for Reconstruction and Development
IPPC	International Plant Protection Convention
NCSR	National Center for Scientific Research
PPC	Public Power Corporation
JMD	Joint Ministerial Decision
IED	Industrial Emissions Directive

External cooperation




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ANNEX 8 B AIR QUALITY BASELINE REPORTS FOR

PERMANENT FACILITIES SUBJECT TO IED DIRECTIVE

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8 B.1. INTRODUCTION

8 B.1.1. Scope of Work

Between the months of May 2021 and July 2021 a series of field survey campaigns was developed aiming to collect direct data on existing ambient air quality conditions in the areas around the proposed locations to install the compressor stations. At the time of conducting the field survey the Project design included two compressor stations in Greece, at Lasithi and Achaia areas.

The works were designed and conducted by the following team:

- Scientific coordinator and project manager: Dr. Thomas Maggos, NCSR Senior Researcher.
- Responsibles for field campaigns: Panagiotis Panagopoulos M.Sc and Dr. Dikaia Saraga.
- Chemical laboratory personnel: Maria Dasopoulou M.Sc and Dimitra Balla M.Sc.

8 B.2. RELEVANT LEGISLATION AND STANDARDS

During operation, the compressor station facilities emit air pollutants as a result of the combustion of natural gas that drives the compressor units. The emissions mainly consist of nitrogen dioxide (NO₂), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter less than 10 micrometers in diameter (PM₁₀), sulphur dioxide (SO₂), and hazardous air pollutants (HAPs). The combustion of natural gas in the compression stations through Gas Turbines (GT) is according to the standard of the European Association for the Streamlining of Energy Exchange – gas (EASEE-gas). Consequently, emissions of particulate matter (PM) and sulfur dioxide (SO₂) are negligible. According to the European Best available techniques Reference document (BREFs) developed under the IPPC Directive for large combustion installations, CO and NO_x are the only gas pollutants emitted that should be taken into account in air dispersion modelling studies.

Air quality standards in Greece are defined in EU Directive 2008/50/EC and in the Greek regulation on ambient air quality, Joint Ministerial Decision (JMD) 14122/549/E.103/2011 (Gov. Gaz. 488/B/30.03.11). The JMD harmonises Greek Environmental Law with the EU Directive 2008/50/EC on ambient air quality, and it sets air quality limits for NO_x, SO₂, PM₁₀, PM_{2.5}, Benzene, Pb, O₃, CO. The same limits apply in both the Directive and in the JMD

Air quality standards for the pollutants under study are presented in Table B-1.




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Table B-1 EU and Greek Air Quality Standards for CO and NOx

Averaging period	Limit value (Dir 2008/50/EC and JMD14122/549/E.103/2011)	Margin of tolerance
CO		
8 hours max average value	10000 µg/m ³	60%
NO₂		
1 hour	200 µg/m ³ , not to be exceeded more than 18 times a calendar year	50% on 19 July 1999, decreasing on 1 January 2001 and every 12 months thereafter by equal percentages to reach 0% by 1 January 2010
calendar year	40 µg/m ³	50% on 19 July 1999, decreasing on 1 January 2001 and every 12 months thereafter by equal percentages to reach 0% by 1 January 2011

Prepared by Demokritos on behalf ASPROFOS, 2022.. Data from : Ministry of the Environment and Energy,2021




8 B.3. METHODOLOGY

8 B.3.1. Selection of Sample Points

The survey was conducted to collect data on existing air quality conditions to be used to assess the potential impact of a new emission source (compressor station) on the airshed, particularly on any sensitive receivers.

The siting of the air quality monitoring was determined according to the German Technical Instruction on Air Emissions, or ‘TA – Luft’ as it is commonly referred, approach which is similarly applied in other EU countries (and applied previously in other EBRD funded projects).




According to this approach, the airshed is determined by the compressor station stack height in which the point of maximum ground concentration impact will usually fall - this gives a radius around the emission source of 1.5 km. However, since the exact location or orientation of the facility within the proposed site was not known at the time of conducting the survey, a conservatively 10 km radius from the centre of the proposed site was considered acceptable. This schematic sampling location pattern was also modified to monitor near any sensitive receptors in the vicinity (residential areas). The total number of sampling points were 10 at Lasithi and 10 at Achaia and are shown in Figure B-1 and Figure B-2. It is noted that the total number of samplings was 12 per site (10 sampling points and 12 samplings) as according to NCSR D’s contractual obligation, 1 duplicate and 1 travel blank sample needs also to be delivered for QA/QC purposes.

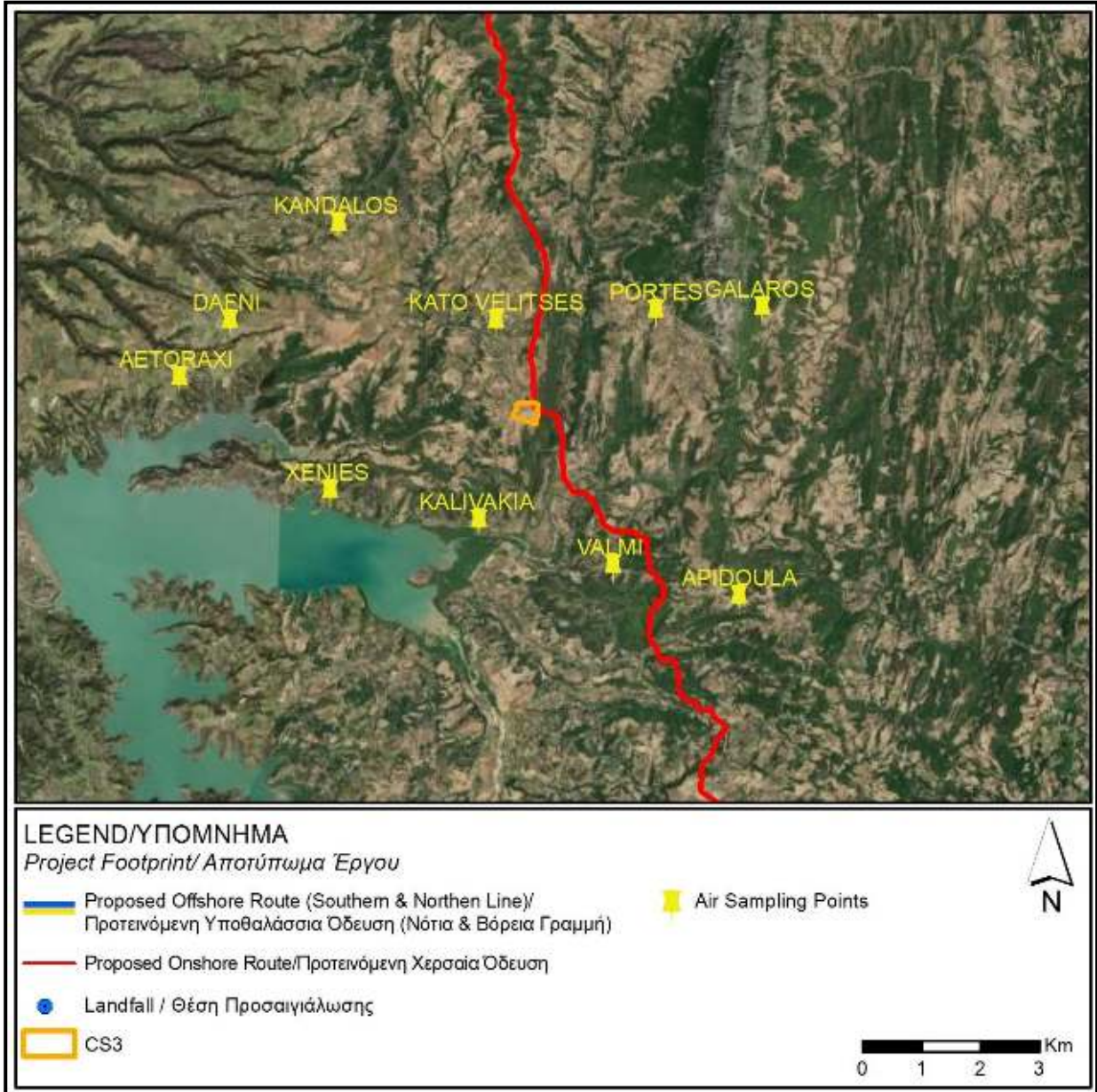
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Figure B-1 Ambient Air Sampling Locations in Proximity of Lasithi

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Figure B-2 Ambient Air Sampling Locations in Proximity of Achaia

8 B.3.2. Sampling Methodology and Samples Analysis

The measurements campaign was conducted with the use of passive diffusion tubes and lasted for 35 days for Lasithi campaign (26/05/2021 - 30/06/2021) and 41 days for Achaia campaign

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(03/06/2021 – 14/07/2021). The methodology of passive sampling was selected in order to measure the average pollutants background levels and the long-term comparability of the results. The passive samplers used were provided by Passam Ag Laboratory.

Active sampling was avoided for practical reasons (lack of electricity supply in the field, instrumentation needed for simultaneous measurements etc).

The passive samplers were placed on trees or electricity poles (at a height of 2 meters from the ground), considering the following restrictions:

- the sampling site should not be placed in a private field without permission (trees or poles on public roads/fields were preferred).
- the risk of samples' getting wet or destroyed from agricultural activities should be avoided.
- to protect the sampler from the weather, as well as minimising wind disturbance, a plastic shelter was used (Figure B-3).



Photos from May-June 2021 Field Survey at Lasithi



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Figure B-3 **Passive Samplers attached to electricity poles and trees**

8 B.4. **RESULTS**

The results of the air sampling campaign are presented in Table B-2, Table B-4 Table B-4 and Table B-5.

Table B-2 Analytical Results of Air Sampling at Lasithi (NO_x)

Site: Lasithi	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con µg/m ³
	Latitude	Longitude	Date	Time	Date	Time		
ASPROUTHOS	35°0'55"N	26°6'51"E	26/5/2021	12:17	30/6/2021	14:05	841.8	1.0
PPC	35°0'21"N	26°8'16"E	26/5/2021	12:30	30/6/2021	14:15	841.8	6.2
AGIA TRIADA	35°2'26"N	26°8'14"E	26/5/2021	12:50	30/6/2021	14:25	841.6	4.4
KALO XORIO	35°2'47"N	26°9'20"E	26/5/2021	13:05	30/6/2021	14:45	841.7	3.2
XIROKAMPOS	35°2'7"N	26°12'35"E	26/5/2021	15:40	30/6/2021	17:05	842.6	0.8
APIDI	35°3'24"N	26°7'6"E	26/5/2021	13:20	30/6/2021	15:00	841.7	0.8
ARMENOI	35°4'30"N	26°5'37"E	26/5/2021	13:40	30/6/2021	15:15	841.6	1.3

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Site: Lasithi	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con $\mu\text{g}/\text{m}^3$
NO _x	Latitude	Longitude	Date	Time	Date	Time		
CHANDRAS	35°4'39"N	26°6'13"E	26/5/2021	13:50	30/6/2021	15:22	841.5	<0.7
LITHINES	35°3'51"N	26°2'44"E	26/5/2021	14:10	30/6/2021	15:48	841.6	1.2
PERIVOLAKIA	35°2'46"N	26°3'12"E	26/5/2021	14:25	30/6/2021	16:10	841.8	<0.7
PERIVOLAKIA DUPLICATE	35°2'46"N	26°3'12"E	26/5/2021	14:25	30/6/2021	16:10	841.8	<0.7
TRAVEL BLANK								<0.7

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Table B-3 Analytical Results of Air Sampling at Lasithi (CO)

Site: Lasithi	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con $\mu\text{g}/\text{m}^3$
CO	Latitude	Longitude	Date	Time	Date	Time		
ASPROUTHOS	35°0'55"N	26°6'51"E	26/5/2021	12:17	30/6/2021	14:05	841.8	1173
PPC	35°0'21"N	26°8'16"E	26/5/2021	12:30	30/6/2021	14:15	841.8	1148
AGIA TRIADA	35°2'26"N	26°8'14"E	26/5/2021	12:50	30/6/2021	14:25	841.6	<600
KALO XORIO	35°2'47"N	26°9'20"E	26/5/2021	13:05	30/6/2021	14:45	841.7	672
XIROKAMPOS	35°2'7"N	26°12'35"E	26/5/2021	15:40	30/6/2021	17:05	842.6	<600
APIDI	35°3'24"N	26°7'6"E	26/5/2021	13:20	30/6/2021	15:00	841.7	<600
ARMENOI	35°4'30"N	26°5'37"E	26/5/2021	13:40	30/6/2021	15:15	841.6	<600
CHANDRAS	35°4'39"N	26°6'13"E	26/5/2021	13:50	30/6/2021	15:22	841.5	<600
LITHINES	35°3'51"N	26°2'44"E	26/5/2021	14:10	30/6/2021	15:48	841.6	<600
PERIVOLAKIA	35°2'46"N	26°3'12"E	26/5/2021	14:25	30/6/2021	16:10	841.8	<600
PERIVOLAKIA DUPLICATE	35°2'46"N	26°3'12"E	26/5/2021	14:25	30/6/2021	16:10	841.8	<600
TRAVEL BLANK								<600

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Table B-4 Analytical Results of Air Sampling at Achaia (NOX)

Site: Achaia	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con Ug/m^3
NO _x	Latitude	Longitude	Date	Time	Date	Time		
PORTES	37°56'33"N	21°33'48"E	3/6/2021	12:15	14/7/2021	16:34	988.3	<0.7




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Site: Achaia	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con Ug/m ³
NO _x	Latitude	Longitude	Date	Time	Date	Time		
PORTES DUPLICATE	37°56'33"N	21°33'48"E	3/6/2021	12:15	14/7/2021	16:34	988.3	<0.7
GALAROS	37°56'36"N	21°35'2"E	3/6/2021	12:35	14/7/2021	16:39	988.1	<0.7
VALMI	37°54'12"N	21°33'23"E	3/6/2021	12:55	14/7/2021	16:55	988	<0.7
APIDOULA	37°53'57"N	21°34'51"E	3/6/2021	13:05	14/7/2021	17:05	988	0.7
KALIVAKIA	37°54'35"N	21°31'49"E	3/6/2021	13:25	14/7/2021	17:20	987.9	1.8
XENIES	37°54'49"N	21°30'5"E	3/6/2021	13:35	14/7/2021	17:27	987.9	<0.7
AETORAXI	37°55'49"N	21°28'18"E	3/6/2021	13:50	14/7/2021	17:44	987.9	<0.7
DAFNI	37°56'21"N	21°28'52"E	3/6/2021	13:58	14/7/2021	17:49	987.9	1.2
KANDALOS	37°57'16"N	21°30'6"E	3/6/2021	14:09	14/7/2021	17:55	987.8	1.1
KATO VELITSES	37°56'25"N	21°31'57"E	3/6/2021	14:22	14/7/2021	18:04	987.7	<0.7
TRAVEL BLANK								<0.7

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Table B-5 Analytical Results of Air Sampling at Achaia (CO)

Site: Achaia	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con Ug/m ³
CO	Latitude	Longitude	Date	Time	Date	Time		
PORTES	37°56'33"N	21°33'48"E	3/6/2021	12:15	14/7/2021	16:34	988.3	<600
PORTES DUPLICATE	37°56'33"N	21°33'48"E	3/6/2021	12:15	14/7/2021	16:34	988.3	<600
GALAROS	37°56'36"N	21°35'2"E	3/6/2021	12:35	14/7/2021	16:39	988.1	<600
VALMI	37°54'12"N	21°33'23"E	3/6/2021	12:55	14/7/2021	16:55	988	<600
APIDOULA	37°53'57"N	21°34'51"E	3/6/2021	13:05	14/7/2021	17:05	988	<600
KALIVAKIA	37°54'35"N	21°31'49"E	3/6/2021	13:25	14/7/2021	17:20	987.9	<600
XENIES	37°54'49"N	21°30'5"E	3/6/2021	13:35	14/7/2021	17:27	987.9	<600
AETORAXI	37°55'49"N	21°28'18"E	3/6/2021	13:50	14/7/2021	17:44	987.9	675.0
DAFNI	37°56'21"N	21°28'52"E	3/6/2021	13:58	14/7/2021	17:49	987.9	<600
KANDALOS	37°57'16"N	21°30'6"E	3/6/2021	14:09	14/7/2021	17:55	987.8	<600

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Site: Achaia	COORDINATES (WG S84)		Start		End		Exp. Time (h)	Con Ug/m ³
CO	Latitude	Longitude	Date	Time	Date	Time		
KATO VELITSES	37°56'25"N	21°31'57"E	3/6/2021	14:22	14/7/2021	18:04	987.7	610.0
TRAVEL BLANK								<600

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At Lasithi area, the average values (during the sampling period) were 1.94 µg/m³ for NO_x while for CO all values were below or very close to the detection limit which is 0.6 mg/m³ except for the sampling sites of Asproolithos and PPC which are located very close to a power plant. According to Directive 2008/50/EC CO and NO_x limits were not exceeded the annual limits¹.

In the Achaia area, the average values (during the sampling period) were 0.88 µg/m³ for NO_x while for CO all values were below or very close to the detection limit which is 0.6 mg/m³. According to Directive 2008/50/EC CO and NO_x limits were not exceeded the annual limits².

Levels of all measured pollutants are significant low at the proposed areas, likely to be resulting from the lack of strong sources of pollution (except from the two sampling points of Asproolithos and PPC at Lasithi area) in the local areas. The air quality in the area is considered to be good.

8 B.5. LIMITATIONS

The number of sampling points used in the field survey is considered sufficient for obtaining a satisfying assessment of ambient air pollutants in the vicinity of the preferred sampling sites. Furthermore, the seasonal variation effect (possible winter sources) could be studied through further campaigns to enhance the gathered data set. However, based on results and existing emission sources it is assumed results would not appear significant variations.

¹ As the sampling period is approx. 1month we perform an indicative comparison with the annual limit.

² As the sampling period is approx. 1month we perform an indicative comparison with the annual limit.