



RICARDO-AEA

Final Report

Supporting Industrial Pollution Abatement in the West Bank

Prepared for [Plan Bleu](#)

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Contact:

Dr. Naser Odeh

Ricardo-AEA Ltd.

Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3570

e: naser.odeh@ricardo-aea.com

Ricardo-AEA is certificated to ISO9001 and ISO14001

Author:

Naser Odeh

Date:

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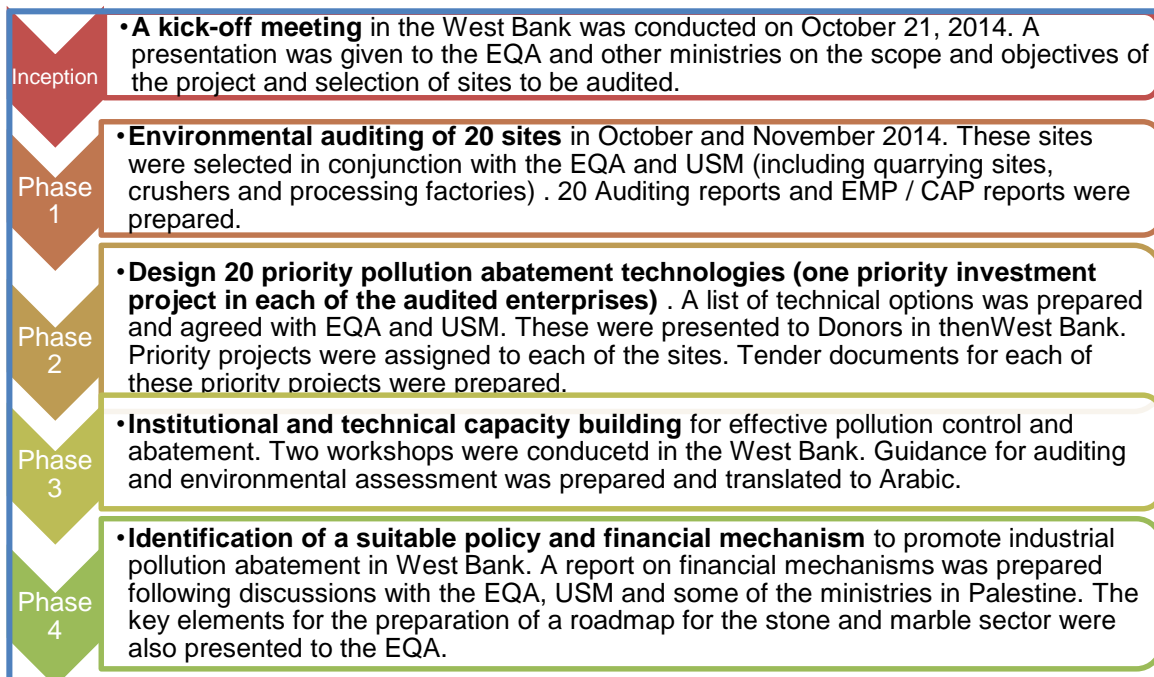
1 Introduction

This report provides a summary of Phases 1-4 of the project. The project was implemented in 4 phases which ran in parallel. The four phases are as follows:

- Phase 1: Environmental auditing of 20 priority SMI West Bank Companies
- Phase 2: Design of 20 priority pollution abatement projects
- Phase 3: Institutional and technical capacity building for effective industrial pollution control and abatement
- Phase 4: Identification of a suitable policy and financial mechanism to promote industrial pollution abatement on the West bank

The key stages of the project are shown in **Figure 1**.

Figure 1: Key Project Phases



2 Phase 1

The following activities were undertaken under Phase 1:

- Selecting a set of 20 pilot industrial facilities including quarrying sites, crushers and processing factories. Criteria for the selection of the sites was defined in consultation with the EQA and USM.
- Conducting Environmental Audits (EA) of the 20 selected facilities. This involved developing an audit protocol and tailored reporting templates, review of production processes and technologies, assessment of the nature and volume of pollution generated, identification of data gaps and methods to collect it, analysis of the environmental status of the industrial facilities, verifying their compliance with all Palestinian environmental regulations and identification of the production areas where environmental upgrading actions are required. Based on this information an EA report for each industrial facility was drafted.
- For each facility, an Environmental Management and Compliance Action Plan (EM/CAP) was written. The EMP / CAP reports prepared for each of the sites

2.1 Criteria identification

Based on the discussion with stakeholders during the inception workshop, and following feedback from the EQA and USM, criteria for site selection was identified. In selecting sites, geographical location, type of facility, location (i.e. relative to residential areas, industrial areas, etc), size, whether licensed or not and the availability of abatement options (e.g. filter press and silos in factories, water spraying in crushers, etc.) were considered.

2.2 Site selection

Based on the criteria identified, 20 sites were selected and agreed with the EQA and USM. The selected sites are shown in Table 1 below. Further details are given in the Phase 1 report.

Table 1: Sites audited

#	Site Name	Type of facility	Site contact person	Contact details	Data of audit	#	Site Name	Type of facility	Site contact person	Contact details	Data of audit
1	Middle East Marble Stone Co.	Factory	Riyad Ghaith	0505207052	23/10	11	Salem Salameh Quarry	Quarry	Eiad Salameh Abdallah	0598043599	29/11
2	Mohammad Halaykah	Quarry	Mohamad Halaykah	0599229334	25/10	12	Kamal Sbeeh Factory	Factory	Kamal Ayob Sbeeh	0599766290	22/11
3	Al-Istikama for Marble and Stones	Factory	Ahmad Aburoumieh	0599828183	25/10	13	Nidal Salameh Factory	Factory	Nidal Salameh Yamak	0599255552	29/11
4	Pal Stones	Factory	Yaser Zaben	0599351501	26/10	14	Al-Dmeide company	Factory	Abed Jabbar Dmeidi	0569665493	29/11
5	Al-Jaber Company	Quarry	Ahmad Abdullah Jabir Thawabtah	0599524450	20/11	15	Jenin Crusher	Crusher	Osama Kmeil	0599340081	22/11
6	Al-Taweel Crusher	Crusher	Ghaleb Samer Altaweel	0599251880	20/11	16	GBS for Industry and Trade	Factory	Ghassan Abu Erob	0599555553	22/11
7	Al-Waleed Company	Factory	Waleed Hassan Deiryra	0598407407	16/11	17	Al-Nafee' Factory	Factory	Reiad Nafee' Kamel	0569335633	22/11
8	Al-Janazra Company	Factory	Nawaf Issa Aljanazrah	0598470712	16/11	18	Al-Tarifi Modern Quarries	Crusher	Husein Tarifi	022955781	30/11
9	Al-yaseen Quarry	Quarry	Odeh Yaseen Jaradat	0599265000	19/11	19	Al-Shae'er Crusher	Crusher	Yosef Abdallah Hajaj	0599606232	29/11
10	Al-Nab'a Al-Jadedah Company	Factory	Hafez Ibrahim Alkhorodor	0599218001	19/11	20	Blue Stone Construction Company	Crusher	Abdel Hameed Alshikieh	599614614	29/11

2.3 Conducting audits

Environmental Audits for the 20 sites were conducted in October and November 2014. The audit campaign involved the following activities:

- Development of an audit protocol and tailored reporting templates which were used for all audits to be realized (this protocol was submitted and agreed with the EQA),
- Review of the production processes and technologies used,
- Assessment of the nature and volume of pollution generated,
- Identification of data gaps and identification of methods to collect it,
- Analysis of the environmental status of the industrial facilities and verification of their compliance with all Palestinian environmental regulations;
- Identification of the production areas where environmental upgrading actions are required; and
- Draft an EA report for each industrial facility, as per Annex 5 of the PEAP.

2.4 Audit findings

A summary of the quantitative data collected for each of the sites is given in Table 2 below. One of the aspects checked during audits was compliance with Decision 25 of the Council of Ministers for the year 2010. The results for each of the sites are shown in Table 3 (the 'site numbers' in Tables 2 and 3 correspond to those given in Table 1).

2.5 Environmental Management and Compliance Action Plans

EMP and CAP reports were produced for each of the sites. This included the following information:

- a. List of environmental issues on site,

- b. Technical recommendations and proposed actions for improving the environmental performance of the site,
- c. Environmental risk assessment listing the different risks, impacts, their assessment and their priority (high, medium, low)
- d. An action plan with clear timelines and organizational settings to implement the plan,
- e. Estimates of resource requirements for developing a compliance action plan and associated cost estimates
- f. Recommendations for a monitoring protocol for assessing and reporting on progress towards implementation of the plan and environmental compliance achieved by the industry.

Reports for the 20 sites were completed and shared on ‘Dropbox’ with the EQA.

Table 2: Summary of the resources, wastes and products from the audited sites

Site number	Site name	Resources							Wastes			Production		
		Water	Diesel	Grease	Oil	Floc.	Resin	Raw stone	Scraps	Sludge	Cake	Blocks (m3)	slabs (m2)	Agg.
Processors	1 Middle East	120				5	25(l)	80		120			1500	
	3 Al-Istikama	50				25	\$500	4500			250		67000	
	4 Pal Stones	700				10		300			350		7200	
	7 Alwaleed	350		80	300	50	320	650			200		15000	
	8 Aljanazra	40		20	40			120	35	20			1800	
	10 Al-Naba'a	120		140	200	75	\$1400	300	60		60		7000	
	13 Kamal Sbeih	40	400	20	20			100	40		25		1500	
	14 Nidal Salameh	160	2000	20	30			250	120				2500	
	17 Al-Dmeide	120	1200	60	60			150	60	150			2000	
	19 GBS	240	1000	20	70			180	90	240			3000	
	20 Al-Nafe'e	80	800	20	60	25		250	120		50		3700	
Quarry	2 Halaykah	0	6000	400	400			x				420		
	5 Al-Jaber	20	20000	720	1000			x	400			400		
	9 Al-Asdeqa'a	30	7500	750	510			x	350			650		
	15 Salem Salameh	15	7500	450	300			x	350			350		
Crushers	6 Altaweel	50	48000	350	900			35000 (t)						3.5
	11 Al Tarifi	8750	120000	300	1500	650		62500 (t)						6.3
	16 Al-Shae'er	0	3400	60	15									300 m ³
	18 Jenin	100	25000	200	150			45000 (t)	4000 (soil t)					41
	21 Blue Stone	300	38000	608	800			27750 (t)						28

Floc. = Flocculent

Agg. = Aggregate in 1000 tonnes

2.6 Identification of preliminary technical options

As part of Phase 1, the following environmental actions were recommended:

- Development of environmental management systems
- Upgrade systems from settling pools to thickening silo
- Upgrade silos from thickening silos to filter press systems
- Developing projects for utilising the sludge cake from factories
- Using gang saws
- Enhanced management during weather conditions
- Containment of workshops (for four sites):
- Containment of crusher plants:

These options were refined under Phase 2 of the project.

Table 3: Summary of Decision 25 criteria and environmental aspects of the visited quarries and crushers

		Factories										Quarries				Crushers					
Aspect / Site number		1	3	4	7	8	10	13	14	17	19	20	2	5	9	15	6	11	12	16	18
Decision 25 Criteria	Industrial area	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	x	✓	✓	✓	x	✓	x	✓	✓	x
	>1000 m natural site	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Paved street	✓	✓	✓	✓	✓	x	✓	x	x	✓	✓	x	x	x	x	x	x	x	x	x
	Site wall and vegetative bund	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Site paved	x	✓	✓	✓	x	x	✓	x	x	x	x	-	-	-	-	x	x	x	x	x
	Space of loading/unloading	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Storage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	x	x	✓	x	✓	✓	✓	✓
	Solid and liquid waste	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	✓	x	x	x
	Municipal and industrial waste water – treated separately	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	x	x	x	x	x	x	x	x
	Noise and vibration precautions	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Health and Safety	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	✓	x	x	x
Environmental Aspects	ISO 9001	x	x	x	L	x	x	x	x	x	x	x	x	x	x	x	x	L	x	x	x
	ISO 14001	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Environmental management system	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Documented procedures	x	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Documented training	x	x	x	✓	x	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x
	Dust suppression on primary cutting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	x	x	x	x	✓	x	x	✓
	Dust suppression in finishing	x	x	x	x	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-	-
	Sedimentation pools alone	x	x	x	x	✓	x	x	x	✓	✓	x	-	-	-	-	-	-	-	-	-
	Thickening silos for slurry	✓	✓	✓	✓	x	✓	x	✓	x	x	✓	-	-	-	-	-	-	-	-	-
	Filter press	x	✓	✓	✓	x	✓	✓	x	x	x	✓	-	-	-	-	-	-	-	-	-
	Flocculent used	✓	✓	✓	✓	x	✓	x	x	x	x	✓	-	-	-	-	-	-	-	-	-
	Over-burden kept for remediation	-	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-
	Waste added to over-burden/aggregate product	-	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	x	✓	✓	✓
	Defect stone to crusher	-	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-
	Fine/soil fraction added to aggregate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	x	✓	✓	x
Process water use	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	✓	x	x	x	

✓: Meets requirement, x: does not meet requirement, -: Not Applicable, L: lapsed

3 Phase 2

The following activities were undertaken under Phase 2 of the project:

- Definition of the technical design and specifications for the technologies and processes recommended for abatement;
- Identification (as follow up from Phase 1) priority solutions;
- Preparation of tender documents in accordance with the EQA and WB procurement Guidelines. This involved:
 - a. Preparation of detailed project technical notes;
 - b. Preparation of detailed cost-benefit analysis for each of the sites, evaluation and cost;

Phase 2 also involved assisting the EQA in presenting the priority projects during a donor meeting that brought together international development agencies active in the field of industrial pollution management in the West Bank (USAID, JICA, and UNDP).

3.1 Final technical recommendations and cost-benefit analysis

The technical options identified under Phase 1 (Section 2.6) were discussed with EQA and USM for consideration for further analysis. The final options were agreed with the EQA and USM (Table 4).

Table 4: Technical options considered for further analysis

All	Environmental Management System: To provide an underpinning framework upon which environmental performance can be promoted by developing an EMS for each of the 11 factories, 5 crushers and 4 quarries audited.
Factories	Protection of water resources - installation of silos and press filters on sites to enable water recycling leading to reduction in water consumption
	Reducing energy use – Installing inverter drives on existing block cutters in order to reduce electricity consumption during stone cutting
	Waste-to-product - developing a sludge collection system and an industrial manufacturing site for utilising the sludge cake from stone processing factories in the manufacture of construction materials
	Site improvements - Enclosing primary and secondary workshops to enable reduction of dust and noise pollution
Crusher/Quarry	Site improvements - Developing the infrastructure by paving the site thus leading to reduction in dust emissions and enabling better control of any water run-off from site
	Developing a specific Dust Management and Implementation Plan, including measurement (e.g. weather stations), infrastructure (e.g. paved roads) and procedures to control operations and encourage minimisation of dust emissions.
	Quarries: Development of a pilot project on quarry remediation
	Crushers: Strategic engineering improvement works to crusher hoppers and conveyors where they are not properly covered and where dust control can be improved (driven by the Dust Management Plan)

3.2 Donor meeting in Ramallah

A Donor meeting was held on March 26 at the Mövenpick Hotel, 1771 Ramallah West Bank. Present at the meeting were representatives from potential donor organisations (USAID, UNDP, JICA), as well as the Environment Quality Authority, Union of Stone and Marble, the Ministry of Finance, Ministry of National Economy in addition to Ricardo-AEA, the Stone and Marble Centre (SMC) at the Palestinian Polytechnic University and Birzeit University.

The focus of the donor meeting was to discuss options and recommendations for industrial abatement in the stone and marble sector in the West Bank. There was a call from participants that now is the time to provide support to implement projects on the ground as there has already been several studies undertaken which showed the feasibility and benefits of some of the options (e.g. sludge cake recycling, water recycling).

Donors thought the idea of **environmental management systems** (EMS) for the different sites and achieving ISO certification is a priority in order to allow the Palestinian stone and marble sector to remain competitive and to maintain its current markets.

Donors were also willing to adopt the idea of reducing electricity consumption from marble and stone factories through using variable speed drives on block cutters. Additional information was requested from USAID. Following the workshop, additional cost-benefit analysis was undertaken to determine the required investment relevant to the production rates (i.e. \$/m² of product). This information was shared with USAID following the workshop.

The USM and ministries attending the workshop highlighted that the challenges facing the stone and marble sector in Palestine are significant and go beyond the environmental impacts. The political situation is a major factor. It was, however, argued that improving environmental performance is

necessary for the Palestinian stone and marble industry to maintain its share of the market in the future.

A dissemination workshop to present the results of the study project to the stone and marble industry, to the relevant ministries in Palestine and to selected donors was thought to be a necessity and will add significant value to the project findings. This is believed to be one of the key requirements following the completion of the current study and it expected to help in keeping the momentum in supporting environmental abatements in the stone and marble sector.

3.3 Priority solutions and tender Documents

Following the donor meeting and the finalisation of the different technical options described above and based on the information collected for each of the sites under Phase 1, a priority solution was defined for each of the 20 sites audited. Table 5 shows a summary of the projects selected for each of the sites by site type and technology type. In deciding on the priority solution for a site, the specific circumstances of the sites, as determined from the audits, were considered including an evaluation of the environmental issues (which also covered occupational health impacts).

A **technical tender specification** has been developed for each of the 20 beneficiary sites that were identified and audited in Phase 1. These were provided as individual short reports which were issued and submitted to the EQA. The costs for each of the 20 projects were also presented to the EQA and USM (Table 6). The last column in Table 6 shows the cost for the preparation of an EMS for each of the sites.

Table 5: Priority projects by site and type

#	Site	Type	Water				Infrastructure						Total		
			Silos	Filter press	Combined silo + filter press	Sludge cake use	Primary infrastructure	Secondary infrastructure/abatement	Integrated primary/secondary infrastructure + abatement	Dust abatement on secondary processes alone	Crusher improvement works	Quarry Remediation pilots		Inverter motor	
1	Middle East	Processors		1											11
3	Al-Istikama							1							
4	Pal Stones									1					
7	Al-Waleed					1									
8	Al-Janazra								1						
10	Al-Naba'a												1		
13	Kamal Isbaih						1								
14	Nidal Salameh							1							
17	Al-Dmeide			1											
19	GBS				1										
20	Al-Nafe'e											1			
6	Al-Taweel	Crushers											1	5	
11	Al Tarifi												1		
16	Al-Shae'er												1		
18	Jenin Crusher												1		
21	Blue Stone												1		
2	Halaykah	Quarries											1	4	
5	Al-Jaber												1		
9	Jaradat												1		
15	Al-Asdeqa'a												1		
	Total Projects		1	1	1	1	2	1	1	5	4	2	20		

Table 6: Individual projects and corresponding indicative costs

	Site	Proposed project	Indicative Costs, \$	Breakdown of costs	Cost of the development of an environmental management system (EMS) for the site, \$
1	Middle East Marble Co.	Install Filter press to improve water recycling	\$85,000	<ul style="list-style-type: none"> * Silos do not need to be replaced * Assuming 30% of additional costs for administration and project management * \$45,000 for cost of filter press * \$5,000 for installation and infrastructure * \$15,000 for filter press collection box, * \$20,000 for other costs (administration and project management) 	\$ 8,000
2	Halaykah Quarry	Improvement to Quarry operations – Site remediation	\$100,000	<ul style="list-style-type: none"> * Assuming 10 dunums (10,000 m²) of land * Assuming materials are available around the area and transport costs are minimal * \$100,000 for materials, labour, transport costs and project management 	\$ 7,000 for EMS and \$14,000 for dust management plan
3	Al-Istikama for Marble and Stones	Building fabric and abatement improvements to the Secondary Workshop area (chisellers) to improve the containment of fugitive dust and noise from site operations	\$60,000	<ul style="list-style-type: none"> * Only secondary (including abatement) workshop area enclosure * \$45,000 for secondary workshop including abatement * \$15,000 for additional costs (project management, administration) 	\$ 8,000
4	Pal Stones	Abatement improvements to the Special Secondary Workshop area (lathes) to improve the containment of fugitive dust and noise from site operations	\$35,000	<ul style="list-style-type: none"> * Only abatement options for the secondary workshop area * \$25,000 * \$10,000 for additional costs (project management, administration) 	\$ 12,000
5	Al-Jaber Quarry	Improvement to Quarry operations – Site remediation	\$100,000	<ul style="list-style-type: none"> * Assuming 10 dunums (10,000 m²) of land * Assuming materials are available around the area and transport costs are minimal * \$100,000 for materials, labour, transport costs and project management 	\$ 7,000 for EMS and \$14,000 for dust management plan
6	Al-Taweel Crusher	Improvement to crusher infrastructure – enclosure of hopper, screening and grading, conveyors, addition of water sprays and paving of operational land and roads as appropriate	\$45,000	<ul style="list-style-type: none"> * \$ 25,000 for enclosures * \$ 5,000 for additional equipment * \$ 5,000 for pavement works * \$ 10,000 for project management and administration 	\$ 7,000 for EMS and \$14,000 for dust management plan
7	Al-Waleed Company	Establishing and undertaking a pilot project for filter press cake reuse	\$270,000	<ul style="list-style-type: none"> * Based on 200 m³ / year of sludge * Equipment installed on site * \$120,000 for equipment and machinery costs * \$100,000 for installation and other construction and commissioning costs * \$50,000 for project management and administration costs 	\$ 12,000

8	Al-Janazra Company	Building fabric and abatement improvements to the combined Workshop area to improve the containment of fugitive dust and noise from site operations	\$135,000	* Both primary and secondary and abatement workshop area enclosure in addition to abatement equipment for secondary workshop * \$60,000 for primary workshop * \$45,000 for secondary workshop including abatement * \$30,000 for additional costs (project management, administration)	\$ 8,000
9	Jaradat Quarry	Improvement to Quarry operations – Site remediation	\$100,000	* Assuming 10 dunums (10,000 m ²) of land * Assuming materials are available around the area and transport costs are minimal * \$100,000 for materials, labour, transport costs and project management	\$ 7,000 for EMS and \$14,000 for dust management plan
10	Al-Nab'a Al-Jadedah Company	To install variable speed drives to improve energy efficiency	\$15,000	* single block cutter * \$10,000 cost of variable speed drive * \$5,000 installation and additional costs	\$ 6,500
11	Al Tarifi Crusher	Improvement to crusher infrastructure – enclosure of hopper, screening and grading, conveyors, addition of water sprays and paving of operational land and roads as appropriate	\$45,000	* \$25,000 for enclosures * \$5,000 for additional equipment * \$ 5,000 for pavement works * \$ 10,000 for project management and administration	\$ 7,000 for EMS and \$14,000 for dust management plan
13	Kamal Isbaih Factory	Building fabric improvements to the Primary Workshop area to improve the containment of fugitive dust and noise from site operations	\$80,000	Only primary workshop enclosure * \$60,000 for primary workshop * \$20,000 for additional costs (project management, administration)	\$ 8,000
14	Nidal Salameh Factory	Building fabric and abatement improvements to the Secondary Workshop area (chisellers) to improve the containment of fugitive dust and noise from site operations	\$60,000	* Only secondary (including abatement) workshop area enclosure * \$45,000 for secondary workshop including abatement * \$15,000 for additional costs (project management, administration)	\$ 8,000
15	Salem Salameh Quarry	Improvement to Quarry operations – Site remediation	\$100,000	* Assuming 10 dunums (10,000 m ²) of land * Assuming materials are available around the area and transport costs are minimal * \$100,000 for materials, labour, transport costs and project management	\$ 7,000 for EMS and \$14,000 for dust management plan
16	Al-Shae'er Crusher	Improvement to crusher infrastructure – enclosure of hopper, screening and grading, conveyors, addition of water	\$45,000	* \$25,000 for enclosures * \$5,000 for additional equipment * \$ 5,000 for pavement works * \$ 10,000 for project management and administration	\$ 7,000 for EMS and \$14,000 for dust management plan

17	Al-Dmeide company	Improvement of water recycling by the installation of a twin silo water recycling system	\$45,000	* Twin silo system * Assuming ~30% of additional costs for administration and project management * \$30,000 for silos, * \$5,000 for installation and infrastructure * \$10,000 for other costs (administration and project management)	\$ 6,500
18	Jenin Crusher	Improvement to crusher infrastructure – enclosure of hopper, screening and grading, conveyors, addition of water sprays and paving of operational land and roads as appropriate	\$45,000	* \$25,000 for enclosures * \$5,000 for additional equipment * \$ 5,000 for pavement works * \$ 10,000 for project management and administration	\$ 7,000 for EMS and \$14,000 for dust management plan
19	GBS for Industry and Trade	Installation of silo and filter press to improve water recycling on site	\$190,000	* Installation of both silos and filter press systems * Assuming ~30% of additional costs for administration and project management * \$120,000 for silos and filter press * \$10,000 for installation and infrastructure * \$15,000 for filter press collection box, * \$45,000 for other costs (administration and project management)	\$ 12,000
20	Al-Nafee' Factory	To install variable speed drives to improve energy efficiency	\$15,000	* single block cutter * \$10,000 cost of variable speed drive * \$5,000 installation and additional costs	\$ 12,000
21	Blue Stone Crusher	Improvement to crusher infrastructure – enclosure of hopper, screening and grading, conveyors, addition of water sprays and paving of operational land and roads as appropriate	\$45,000	* \$25,000 for enclosures * \$5,000 for additional equipment * \$ 5,000 for pavement works * \$ 10,000 for project management and administration	\$ 7,000 for EMS and \$14,000 for dust management plan

4 Phase 3

In order to deliver Phase 3 of the project, there was a requirement to assess the current application of the international environmental management standard (ISO14001). This was desk-based assessment and was undertaken at an early stage in the project prior to the inception meeting. In addition, the assessment was also undertaken during the auditing campaign as part of Phase 1.

ISO 14001 forms the basis by which enterprises develop their Environmental Management Systems and is closely related to the international order to quality assurance and safety standards. ISO 14001 can be most effective when implemented through a consistent approach which creates a culture supporting the development and implementation of EMS within industry and development of a system that can be auditable.

The finding from the Phase 1 audits was that there was a very low uptake of management systems within the SMI. If that were not the case, it would have been appropriate for the EQA to include sites with ISO 14001 accreditation within The Arab Accreditation Co-operation (ARAC).

One of the recommendations under Phase 2 of the project is that an EMS is developed for each of the sites. It was recommended that donors support this kind of initiative and this showed some interest from

donors during the meeting held on March 26. This potential donor-funded development of EMS within the SMI, will require cooperation between industry and Government as well as ARAC. As discussed in Phase 2 of the project (on recommendations), capacity building of a West Bank-based environmental management consultancy network should be considered. This will lead to the formation of a body within the State of Palestine capable of issuing certification.

4.1 Development of technical guidance

Technical guidance was developed for environmental assessment and auditing in the stone and marble sector. Although this guidance was being developed within this project, it still needed to reach a broader audience than just the stone and marble industry. As a result, a more generic guidance was required that can be applied to other industrial sectors. Such generic guidance is referred to as horizontal guidance in the UK and would provide a framework for any further ‘vertical’ (i.e. sector-specific) guidance. Such an approach is common and has worked very well in the past.

The Guidance manual was set out to

- provide all the information required by the auditor to carry out their duties.
- help other individuals prepare environmental management plans (EMPs) for managing specific risks,
- help prepare compliance action plans (CAPS) to show how a site can recover from a poor environmental situation and in the future become a compliant and productive site.

The contents of Issue 2 of the Guidance released following the final capacity building workshop (held on March 25 in Ramallah with EQA inspectors) is shown in Figure 1.

Figure 1: Generic technical guidance contents

RICARDO-AEA		Generic Technical Guidance	
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The draft guidance document was developed, based on our original proposed plan and adapted through application of the auditing procedure by the project audit team during Phase 1. A draft guidance document was released to Plan Bleu and the EQA on 15 December 2014. This draft guidance document formed the basis of the subsequent first workshop (Section **Error! Reference source not found.**). It should be noted that this Guidance is written with regulators, operators and consultants who will be involved in preparation of environmental management plans in mind. While the guidance also considers

the impact on residents and businesses in the vicinity of sites, outreach to these businesses and residents is outside the scope of this Guidance.

4.2 Training workshop and audit pilot exercise

The guidance prepared was presented to EQA at a training workshop in Ramallah between January 19 and 21, 2015. Representatives from the Ministry of National Economy (MoNE), the Union of Stone and Marble (USM), the Palestinian Stone and Marble Centre (PSMC) of the Palestinian Polytechnic University and the department of engineering at Birzeit (BZT) University were present. The main objective of the workshop was training the EQA Environmental Inspectors on auditing and Office managers on developing EM / CA plans.

The workshop was split into three days and provided an update of the 20 audits. Guidance for auditing and on preparation of EMPs and CAPs was presented. Abatement technologies for dust, noise and water recycling was also presented.

4.2.1 Review of legislation

Law 7 for the year 1999 provides the overall framework for environmental legislation. The environmental regulation of the Stone and Marble Industry is dealt with in Decision 25 of the Council of Ministers for the year 2010. The requirements of Decision 25 were presented to the workshop participants in a table which also showed the actual situation on site for each of the 20 sites audited. This was thought to be useful and had stimulated discussions during the workshop. Discussions between senior EQA staff and representatives from the MoNE were initiated in terms of what they are likely to find on site. This discussion helped the ministries recognise that they need to take control of what can and cannot be built in industrial areas and residential areas and how to separate the two.

One of the key issues discussed during the workshop was the fact that businesses which started before Decision 25 was implemented do not operate to the current requirements. These new businesses will thus require an improved approach. There was a discussion on what sort of approach should be taken. Some participants thought that it may be appropriate for some businesses to be closed temporarily to undertake improvement works but it was agreed that sites need to be considered on a case-by-case basis.

4.2.2 Feedback from site audits

One of the high level aims of this project was to assess how far the quality management (ISO 9001) and environmental management (ISO14001) standards had penetrated within the stone and marble industry in Palestine. There is understanding within the industry in Palestine that there will be an urgent need in the near future to obtain ISO certification in order to maintain the current markets. Many companies expressed, during the auditing campaign, their willingness to bear some of the costs needed to achieve such certification. However, it was highlighted by many that support from the Government and other funding agencies will be required to achieve this goal.

This was discussed at this point in the workshop where a fundamental issue with the development of environmental management plans (EMP) was highlighted. For a successful EMP, ISO 9001 and ISO 14001 management systems need to be built into the existing quality, environmental and operational management systems. However, these do not currently exist in a formally documented way, with consistent and measureable implementation, for the stone and marble industry in Palestine. As a result, the EMP in this case is unlikely to be successful.

Of the 20 sites audited, only two have ever had documented management systems with ISO 9001 certification in the past. For these two businesses (one a crusher operator and the other a stone processing factory), the ISO certification has lapsed and has never been renewed. The crusher operator, however, still maintains the operational procedures and could regain certification and extend it to ISO14001. There was another stone factory that did have written management and standard operating procedures developed but no longer uses them.

The majority of the industry operated via an oral tradition, where new employees learn the operation by watching older workers. In some areas, such as around Hebron, the employees that operate the more complex machinery do go to the PSMC at PPU for training.

A variety of equipment is employed within the stone processing factories. Some factory operators found that high performance equipment can have improved products and efficient water recycling can save money. These findings and the associated improved performance helped some factories expand, initially utilising aid, but more recently using their own internal investment. If this trend continues, larger enterprises could out compete those which are not reinvesting in their business or improving their performance. These larger businesses are more likely to see the benefit of quality systems as these improve their product, reduce wastage and improve their competitiveness in the larger European and international markets.

4.2.3 Guidance on the environmental auditing procedure

An initial topic for debate was the fundamental issue of who should do the audit, the EQA as the environmental regulator or the business. This was debated and a number of ideas to help the EQA consider what their function could be were introduced.

The need for daily inspection by the operational supervisor of the factory against an agreed checklist as defined by the environmental management plan. There could also be an environmental management measurement plan for each aspect such as the chemical composition of resultant filter press cake.

The workshop participants appreciated how the lack of procedures and records within the industry will make the process much more challenging. It was concluded that, although they are limited by resources, the EQA need to be able to carry out audits, but these need to be on a risk basis, to capture the potentially higher risk sites where compliance is likely to be a significant issue. In addition, audits can be targeted at sites with greater appetite for developing written procedures and gaining relevant certification to help them expand their markets. Clearly it is a process that will take some time and require EQA to work with these businesses in the long term to make gradual improvements. There will still, however, be sites that would need immediate improvements.

4.2.4 Preparation of an Environmental Management Plan (EMP)

This session presented to participants what would typically be expected in an environmental management plan (EMP). It was explained that the overall management system and is in fact part of the overall site EMS. Its ownership is thus with the business concerned and it will be for them to develop this. Without this approach, it is very unlikely that the EMP would be implemented. It was discussed that for new sites, where an environmental impact assessment (EIA) has been developed, the site would be required to have a proper management system as well as an EMP. These can then be used to address and control any issues arising from the EIA and to ensure that the site follows the State requirements.

However, there are many SMI businesses that have been in operation before changes in the law over the last few years. As a result, it was made clear that some support is needed to enable the proper development of individual EMPs from business that currently see no need for written operating procedures, management systems or documentation.

4.2.5 Preparation of a Compliance Action Plan (CAP)

An example of a compliance action plan (CAP) was presented. The CAP is an action plan owned by the company, but would need to be approved by the State. The interaction between the different State functions, such as EQA and MoNE does need good coordination. In practice, the CAP would be required following a site audit where the EQA environmental inspector considers that an environmental risk or breach of Decision 25 existed and that a swift, focused action was required. The business would be shown what would be required in the CAP by the inspector, and could possibly be prepared there and then in outline. The environmental inspector would then review the CAP and approve it. It will be key for the EQA to notify MoNE that a CAP has been requested as further non-compliance may need sanctions relating to the operating licence/permit.

4.2.6 Audit pilot exercise

The third day of the workshop (January 21, 2015) consisted of a site visit to the 'Al Rafati for Marble and Granite' stone processing factory in the industrial area of Ramallah. This area is in the city, so was an example of a possible high risk site due to the proximity of domestic properties within the industrial zone. The activity was different from the primary processing factories encountered in Phase 1 and the

cutting activities were limited to the final trimming and cutting of marble and granite slabs into finished products, primarily kitchen and bathroom worktops. The exercise was for the new environmental inspectors to get a feel for what it is like to visit a factory and to ask questions from the owner/operator.

The EQA environmental inspectors were encouraged to do the audit themselves and to ask for evidence while inspecting the site. Following the site visit, the EQA and project team returned to the EQA office to discuss what the environmental inspectors had learned from the visit. The project team asked some questions based on what they had witnessed. The issues of dust and water were the key issues highlighted.

For information, the factory has a sump below the cutting equipment where water was collected. The sludge falls by gravitational precipitation and the water is drawn back and reused. The slurry is pumped out into a tanker by the Municipal Authority for disposal. The factory has a number of ventilation ducts to remove dust from the production process.

4.3 Second workshop

Feedback from the audit pilot exercise was gathered from EQA staff during a second workshop held in Ramallah on March 24, 2015. Following this feedback, the audit template and guidance were updated and final versions submitted to the EQA

5 Phase 4

Phase 4 of the project focussed on reviewing existing financial mechanisms and their relevance to Palestine. These were presented to the EQA and two mechanisms were recommended for further review.

Not all financial mechanisms are suitable for introduction to Palestine. We reviewed a number of successful schemes throughout Europe and the MENA including subsidies, emissions trading and access to finance.

The situation in Palestine is characterised by limited funds with uncertain access to tax revenues, but a functioning financial sector exists. With this in mind, two case studies which demonstrated a suitable incentive programme were explored further. These were the Environmental Protection Fund (EPF) in Egypt, and the Neighbourhood Investment Fund which operates in countries that neighbour the European Union.

The EPF provides financial assistance including grants, soft loans and interest rate subsidies to organisations for pollution abatement financed by government revenues and the financial sector in Egypt. This appears to be closely aligned with the Egyptian Pollution Abatement Programme (EPAP), a donor-funded project which provides subsidised access to finance for pollution abatement in Egypt. The NIF provides grants to a wide variety of projects (including pollution abatement) in the regions Neighbouring Europe. This grant finance is blended with development bank funds and private finance through loans to fund the total project.

It is recommended that similar models which provide finance for sustainable development are adopted in the stone and marble sector in Palestine. In order to implement the provision of credit, relationships must be built with the development agencies/banks that will fund the programme and the banks in Palestine that will distribute the credit.

A roadmap needs to be developed. This should involve an immediate development of a proposal and feasibility study. The purpose of this feasibility study is to ensure that demand will exist for finance and to investigate whether a funding programme should be operated by authorities in Palestine or by external actors.

Similar programmes have in fact been adopted in Palestine previously but failed due to a lack of uptake of the available finance. It is recommended that minimum standards for environmental quality are also enacted to reflect the importance of pollution abatement in Palestine.

RICARDO-AEA

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000

e: enquiry@ricardo-aea.com

www.ricardo-aea.com