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Report

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IMARES' capacity building activities with Institut Mauritanien des Recherches Océanographiques et de Pêche (IMROP) within the Woodside Chinguetti PFW Baseline project

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1. Introduction

An Environmental Impact Statement (EIS) prepared by Woodside (Perth, Australia) for the Chinguetti Development Project in Mauritania identified potential environmental effects from routine Produced Formation Water (PFW) discharges on the marine environment. Adverse effects on the industrial fisheries of Mauritania in particular, were identified as one of the key environmental risks represented by the project. Woodside therefore made a commitment to monitor PFW discharges and as a first step biological and water sampling was prepared prior to, and following first oil production from the Chinguetti Project.
Woodside, recognizing the importance of involvement of Mauritanian institutions in monitoring studies, requested that the project be undertaken in association with National Mauritanian Institute for Oceanographic and Fisheries Research (IMROP), which is the Mauritanian body responsible for protection of the sea. In addition, part of the project is dedicated to improvement of IMROP's capacity to perform sampling and to analyze the water and biological samples, so that over time all required activities could be performed by IMROP.
The project is being undertaken by the Marine Resources Assessment Group (MRAG) of United Kingdom and the Institute for Marine Resources and Ecosystem Studies (IMARES) of the Netherlands. The capacity building activities are being shared by both partners and coordinated by MRAG.
This document provides a final report on the capacity building activities performed by IMARES within the Woodside Chinguetti PFW Baseline project. The report covers the list of all activities performed, the discussion and evaluation of the current capacity of IMROP and suggestions/recommendations for further activities.

2. Capacity building activities performed

2.1 Project introduction to IMROP

Meeting between IMARES and IMROP was held on September 17th and 19th, 2005 in Nouadhibou. The meeting was attended by Dr. Heather Leslie (IMARES), Dr. Ad Corten (consultant), Dr. Khallahi O. Med Fall, Dr. Niang A., Dr. Hamoud O. Taleb and Dr. Aly O.Y. Dartige (all IMROP). During the meeting the project was introduced to IMROP representatives, IMROP involvement in the project was arranged and specific agreements (*e.g.* selection of the candidate for trainings, selection of analyses to be performed by IMROP, *etc.*) were made. In addition, the contact between MRAG and IMROP was established by providing IMROP with contact details of MRAG. More details can be read from the minutes attached as Annex 1.

2.2 Organizing HUET training for IMROP's nominee

HUET training including the medical check up was organized for IMROP's nominee Mr. Abou Ciré in the Netherlands. Additional details can be read from the trip diary (Annex 2). Mr. Abou Ciré was not able to complete the course and did not obtain the required certificate.

2.3 Field work planning for IMROP

A meeting among IMARES, IMROP and MRAG to discuss field work plans was held on October 3rd, 2005 in the Netherlands as a part of Mr. Abou Ciré's trip to the Netherlands (see Annex 2 for the trip diary). The meeting was attended by Dr. Heather Leslie (IMARES), Dr. JaapJan Zeeberg (IMARES), Dr. Ad Corten (consultant), Mr. John Hooper (MRAG) and Mr. Abou Ciré (IMROP). The discussion was dedicated to planning field work.

2.4 Providing CTD training

Training of CTD use was provided to Mr. Abou Ciré as a part of his trip to the Netherlands (see Annex 2 for the trip diary). The training was held on IMARES' vessel Tridens and was provided by Mr. Kees Bakker (IMARES).

2.5 Preparing the proposal for IMROP's role in the project

The detailed proposal for IMROP role in Woodside Chinguetti PFW Baseline Study was prepared by Dr. Heather Leslie (IMARES) and Dr. David Agnew (MRAG). The proposal was modified many times in an effort to adopt it to the conditions of IMROP. It was agreed that IMROP will perform analyses of Cd, Hg, Pb, Cu, Zn, Mn, PAHs and TPHs in water samples and of Ca, Mg, Na, K and Fe in *Sardinella* fish samples. The samples and the analytical material for the analyses performed by IMROP will be provided by the project budget. The proposal was presented to IMROP by John Hooper (MRAG) during the meeting held on April 6th, 2006 in Nouadhibou. One surprising outcome of the meeting was that IMROP expressed a wish to report their results to MRAG and IMARES only and not contribute to the final report to Woodside. No explanation was provided.

2.6 Evaluation of IMROP's capacity

Dr. Peter Korytár (PK) visited Mauritania between June 6th, 2006 and June 11th, 2006. The main scope of the visit was to evaluate the current capacity of IMROP to perform the required analysis within the project, to identify areas requiring improvements and capacity building. PK visited two IMROP laboratory facilities, one in Nouakchott (Wednesday June 7th, 2006) and one in Nouadhibou (Friday–Saturday June 9-10, 2006). In Nouakchott, PK had discussion with management of IMROP, Dr. Mamoudou Aliou Dia, IMROP Director and Dr. Aly Dartige, head of the analytical department. During the meeting PK discussed the future plans for the laboratories. PK also visited National Medica, regional dealer of chemicals and instrumentation, to be familiar with the ordering procedures. In Nouadhibou, PK worked one day with two IMROP technicians, Mr. Harouna Samba Tounkara and Mr. Cherif Ahmed Ould Ahmed on analysis of heavy metals and PAHs to evaluate their skills. PK had a meeting with Mr. Graham Booth (Wednesday June 7th, 2006), Woodside HSE manager. PK informed Mr. Booth about the progress achieved on the project. The exact timetable of the trip is shown in Annex 3 and the observations and outcomes of the meetings are discussed in Section 3.

2.7 Providing analytical protocols to analyze selected metals and 16 EPA PAHs

IMARES' validated and accredited protocols for analysis of metals and PAHs in fish samples were translated from Dutch into English and provided to IMROP in June 2006. Translation was carried out by Mrs. Gerda Booij (IMARES) and Mrs. Marion Hoek (IMARES).

2.8 Providing IMROP with fish samples

264 pieces of *Sardinella aurita* were caught by Dutch trawler at the Mauritanian coast (position 18°23'N-16°20'W) on January 18, 2006 as a part of prior-to-PFW-discharge biological sampling. Three pooled samples (A (2006/0527), B (2006/0528), and C (2006/0529)) were prepared and approximately 100 g from each was provided to IMROP. Samples were shipped together with gear for the second passive sampling and were delivered to Dr. Aly Dartige on July 31, 2006 by Mr. Evert van Barneveld (IMARES). The samples were placed into glass jars and sterilized prior to the shipment.

135 pieces of *Sardinella aurita* were caught by Dutch trawler at the Mauritanian coast (position 20°02'N-17°36'W) on July 1, 2006 as a part of post-PFW-discharge biological sampling. Three pooled samples (G (2006/0893), H (2006/0894), I (2006/0895)) were prepared and approximately 100 g from each was provided to IMROP. Samples were shipped by DHL courier services on November 15, 2006 to IMROP laboratories in Nouadhibou.

2.9 Purchase of consumables for IMROP

The list of consumables provided by Dr. Aly Dartige (IMROP) was reviewed by Dr. Peter Korytár (IMARES) to meet set priorities (*i.e.* analyses of metals, PAHs and TPHs). Consumables needed for the priority analyses and missing on the list were added and those not required for the priority analyses were removed. The final list of consumables which were purchased is shown in Annex 4. Mauritanian suppliers/distributors National Medica was commissioned to supply the consumables on October 18, 2006.

3. IMROP's current capacity

3.1 Nouakchott laboratories (evaluation is based on 30 min tour through the laboratories and ca. 20 min discussion with IMROP director Dr. Aliou Dia)

The building and the equipment in the Nouakchott laboratories are completely new. They were provided by the Japanese government as a gift to the Mauritanian government. The entire building is air-conditioned and is divided into two parts: offices (including meeting room and canteen) and laboratories. The laboratories consist of microbiology and chemistry section. The distribution of the rooms within the laboratories is designed to minimize the movement of samples and to avoid contamination and misidentification. There is a clear separation of sample preparation and analysis sections, which is another measure taken to minimize risk of contamination. The laboratories are equipped with state-of-the-art instrumentation. All instrumentation is brand new, unpacked, placed on the lab tables and ready to use. Since instrumentation has not been used yet, some initial tuning and/or installation might be required. All instrumentation required to perform the priority analysis is present. To provide an impression of how the laboratories look and the equipment available, photo documentation is provided in Annex 5.

While the building and instrumental equipment fulfil the highest standards required for analytical laboratories, consumables such as glassware, solvents, reference standards or disposable material are missing. IMROP's director Dr. Dia informed that they do not have money to purchase them and that they lack money for basic building maintenance, such as cleaning. Based on my visual evaluation, the building is still clean.

The main challenge for Nouakchott laboratories is to attract and keep qualified personnel. There are three technicians working in the chemistry laboratory. Aly Dartige informed IMARES that they are responsible for the basic chemistry measurements, such as pH, water salinity, *etc.* Based on this information the assumption can be made that they do not have knowledge and skills required to perform more complex analyses. Aly Dartige is planning to hire 4 new people for the chemistry laboratories to perform complex analyses.

3.2 Nouadhibou laboratories (evaluation is based on one day visit of laboratories and my work with two IMROP technicians, Harouna Samba Tounkara and Cherif Ahmed Ould Ahmed)

The building of IMROP's laboratories in Nouadhibou and its equipment are more than 20 years old and modernisation and improvement would be beneficial. The distribution of the rooms within the labs is not optimal and the instrumentation is placed in one small room. There are several rooms which may be used, but renovation is required. The electricity supply requires upgrading, because it operates close to its maximum and power shortages frequently occur. To provide an impression of how the laboratories look, photo documentation is attached in Annex 6.

As for the instrumentation, Nouadhibou laboratories do not have all the equipment required to perform any of the priority analyses (*i.e.* analysis of metals, PAHs and TPHs) with quality comparable to accredited laboratories. Basic consumables such as solvents and glassware are present, but stock is low. Detailed description of the instrumentation present, evaluation of its performance and list of missing equipment and consumables are given in Annex 7.

As for the personnel, there are two technicians working in the laboratories. Harouna Samba Tounkara is specialized in analysis of metals. He has good working knowledge of the atomic absorption spectrometer. His sample preparation skills and analytical thinking could be improved. He is very motivated and eager to achieve good results. He has the potential to achieve fast progress if appropriate coaching is provided. Cherif Ahmed Ould Ahmed is specialized in separation methods such as gas chromatography and liquid chromatography. He has good working knowledge of gas chromatography and he has long-term experience with this technique. He was also given responsibility for liquid chromatography, but his knowledge of this technique is limited. He needs further education in this field but is very motivated and wishes to achieve good results. Before his potential can be identified and coaching recommended, his skills in sample preparation requires evaluation.

4. Conclusions

IMROP has two laboratories, one very well equipped but with under qualified personnel (this still has to be evaluated; it is based just on discussions) in Nouakchott and one with insufficient equipment but with promising personnel in Nouadhibou. IMROP is currently not able to perform any of the analyses required within the Woodside Chinguetti PFW Baseline project. This might explain why IMROP expressed a wish to report their results to MRAG and IMARES only and not contribute to the final report to Woodside. IMARES has suggested to IMROP that the personnel from Nouadhibou move to the Nouakchott laboratories to gain the capacity in short time. The suggestion is under consideration of IMROP representatives.

Capacity building activities for IMROP within the Woodside Chinguetti PFW Baseline project were focused on field work and participation in analysis of selected analytes in fish samples as an interlaboratory comparison. This plan did not take into consideration that IMROP has difficulties with implementation of the analytical methods into their laboratories. Therefore, modification of the capacity building strategy was recommended and the proposal of new strategy was delivered to Woodside and MRAG in August 2006, as a draft tender document.

5. Annexes 1-7

Annex 1. Minutes from the meeting between IMARES and IMROP held on September 17 & 19, 2005 in Nouadhibou

Réunion de travail : IMROP-RIVO
Date : samedi 17 et lundi 19 septembre 2005
Ordre du jour : discussion du programme proposé par RIVO pour l'exécution de ses actions prévues dans l'étude « Chinguetti & Tiof baseline Produced Formation Water (PFW) monitoring programme » financé par Woodside.

Etaient présents :
Madame H.A. Leslie, responsable du projet au RIVO
Monsieur Ad Corten, consultant
Monsieur Khallahi O. Med Fall, chef du DRVE à l'IMROP
Monsieur Niang A., chef du DVIS à l'IMROP
Monsieur Hamoud O. Taleb, chef du LEM à l'IMROP
Monsieur Aly O. Y. Dartige, chef du LCM à l'IMROP (rapporteur)

Mme Heather a commencé par faire une présentation succincte des objectifs de l'étude et l'objet de sa mission à l'IMROP.
Ce projet, financé par woodside et piloté par le bureau d'étude anglais (MRAG) avec deux sous contractants à savoir l'Institut de Recherches Halieutiques Néerlandais (RIVO) et l'Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP), a pour objectif la détermination de l'état zéro de la zone, objet de l'exploitation pétrolière par Woodside (puits Chinguitti et Thiof). Cet état zéro sera comparé à la situation après l'exploitation attendue février/mars 2006. Un plan d'échantillonnage axé autour des deux puits est prévu en deux périodes, l'une avant l'exploitation et l'autre au début de celle-ci.
Cette étude se compose de trois parties :

1. suivi des paramètres physico-chimiques et des contaminants (métaux et hydrocarbures). Cette action est confiée au MRAG. Il s'occupera des prélèvements et du transport des échantillons d'eau pour les acheminer vers un laboratoire d'analyses spécialisé au Royaume Unie ;
2. suivi des contaminants chimiques (métaux et hydrocarbures) dans les poissons (*Sardinella Aurita*) ;
3. suivi des contaminants chimiques (hydrocarbures) dans les échantillonneurs passifs. Les échantillonneurs passifs sont des petits disques munis de filtres capables de retenir des concentrations d'hydrocarbures. Son utilisation pour les métaux sera également testée au cours de cette étude.

La partie confiée au RIVO concerne les deux derniers points. La description de la partie de l'étude confiée au RIVO intègre un volet « assistance et formation pour l'IMROP ».
La proposition présentée par le RIVO, relative aux prélèvements des échantillons de poissons et échantillonneurs passifs, tient compte de la nécessité de doubles échantillons, l'un destiné aux laboratoires de l'IMROP pour les besoins de l'inter calibration et l'autre sera expédié au RIVO. Cette proposition doit être soumise au MRAG.
Dans le cadre de l'assistance et de la formation du personnel de l'IMROP, le RIVO se propose de financer les actions suivantes :

- une formation pour l'obtention d'un certificat de sécurité à bord des Hélicoptères (HUET) sera accordée à un technicien du DRVE déjà en place pour un stage sur l'utilisation et la maintenance de la CTD acquise par le projet « Petits Pélagiques » entre le RIVO et l'IMROP. Pour des raisons pratiques, l'IMROP demande à ce qu'un deuxième technicien puisse bénéficier de la formation HUET.
- il a aussi été proposé qu'un chercheur de l'IMROP soit associé à tout le travail qui sera effectué par RIVO et donc qu'il puisse bénéficier d'une formation en HUET où d'une autorisation spéciale lui permettant d'avoir accès aux sites de prélèvement ;
- l'achat de consommables de laboratoires pour effectuer les analyses sur des échantillons prélevés dans le cadre de l'inter-calibration. Une enveloppe d'environ

de 20 000 Euro est prévue pour l'achat de ces consommables et la formation. Ce budget est conditionné par le contrat qui doit être signé entre Woodside et MRAG en octobre 2005. Pour activer la commande des réactifs et petits matériels, le RIVO demande à l'IMROP de lui envoyer la liste détaillée à commander.

Pour l'inter-calibration, il a été convenu d'effectuer les paramètres suivants selon le tableau ci-dessous :

Paramètres	Nombre d'échantillons	Limite de detection (wet weight basis)	Quantité d'échantillon par analyse	Durée d'analyses (jours)
Poissons				
Cadmium	6	1 ppb	2 g	7
Mercure	6	1 ppb	1 g	7
Plomb	6	1 ppb	2 g	7
Cuivre	6	1 ppm	2 g	7
Zinc	6	1 ppm	2 g	7
Manganèse	6	1 ppm	2 g	7
HPA	6	?	5 g	7
Hydrocarbures totaux	6	?	5 g	7
Echantillons passifs				
HPA	2 séries de 3 à différentes profondeurs	?	(1 disque)	7
Hydrocarbures totaux	2 séries de 3 à différentes profondeurs	?	(1disque)	7
Eau de mer				
Ca	10	?	100 ml	
Mg	10	?	100 ml	
Na	10	?	100 ml	
K	10	?	100 ml	
Fe (soluble)	10		100 ml	7

Pour mieux se préparer aux analyses susmentionnées, l'IMROP demande à RIVO de lui envoyer tous les documents nécessaires pour la réalisation du travail particulièrement :

- le planning des prélèvements ;
- le protocole des prélèvements et des analyses ;
- etc.

Quant à la participation de l'IMROP en tant que sous contractant au dit projet, il a été convenu que RIVO demande au MRAG d'initier une réunion avec l'IMROP pour discuter des modalités pratiques des actions à réaliser par l'IMROP particulièrement le suivi des paramètres physico-chimiques à l'aide de la CTD. Une réunion doit pouvoir se faire avant le démarrage du projet pour fixer les montants pour la location du matériel et de l'uniformisation de la méthodologie.
Enfin, pour un meilleur suivi du projet, RIVO avait exprimé le souhait qu'il y'ait une personne de contact à l'IMROP pour le projet. Monsieur Aly avait été désigné pour s'occuper de cette tâche.
Pour des questions pratiques et de suivi du projet par l'IMROP, il est prévu que toutes les réunions de travail relatives au projet vont se tenir à l'IMROP.

Annex 2. Diary of Abou Ciré's visit to the Netherlands to obtain HUET training

Wednesday, 28th September 2005 (day 1)
Abou Ciré arrived at 8:05 hours at the Schiphol airport by flight AF 1140 from Paris. RIVO employee, Dirk den Uijl, greeted Abou at the airport and brought him to hotel Prinsenhof in IJmuiden. Heather Leslie collected Abou at 13:30 hours and went to Haarlem (Achmea Arbo physician Dr. Bremer, Stationsplein 112, Haarlem) for the medical check, which is required before the HUET training is undertaken. The appointment for Abou was scheduled at 14:30 and for Heather at 15:00.

Thursday, 29th September 2005 (day 2)
Abou was collected from the hotel at 10:00 hours and brought to RIVO. He was given a tour through the RIVO facilities and had a discussion with Heather Leslie regarding the laboratory and field work.

Friday, 30th September 2005 (day 3)
Abou was collected from the hotel by Dirk and brought to the railway station in Alkmaar where he accompanied Heather. They took the train (departure time at 7:51) to Den Helder where they undertook the HUET training at DHTC (Zeilmakersweg 10, Den Helder). The training lasted till 17:00. Unfortunately, Abou failed to pass the exercises and did not get a certificate.

Saturday/Sunday, 1st/2nd October 2005 (days 4 and 5)

Monday, 3rd October 2005 (day 6)
A meeting dedicated to the field work was organized in RIVO from 8:30 till 10:30. Next to Abou the meeting was attended by John Hooper (MRAG, London), Heather Leslie, JaapJan Zeeberg and Ad Corten.
After the meeting, Abou has undertaken CTD training, which was provided by RIVO employee Mr. Kees Bakker. The training started at 11:00 and ended at 17:00.

Tuesday, 4th October 2005 (day 7)
Dirk took Abou at the Schiphol airport. Abou left the Netherlands at 8:10 hour by flight AF 8229 to Paris.

Annex 3. Diary of Peter Korytár's visit to Mauritania to evaluate capacity of the IMROP's laboratories in Nouakchott and Nouadhibou and to organize second round of the fish sampling

Tuesday, 6th June 2006 (day 1)
07:25 – 08:45 - Amsterdam - Paris (Flight AF 8223)
10:40 – 14:10 - Paris - Nouakchott (Flight AF 0764)
Accommodation in hotel Houda

Wednesday, 7th June 2006 (day 2)
10:00 – 11:00 - Visit of Nouakchott laboratories and meeting with Dr. Dia and Dr. Dartige
11:15 – 13:30 - Visit of oil conference held in Nouakchott
13:30 – 14:30 - Visit of Woodside facilities and meeting with Mr. Graham Booth
16:00 – 17:00 - Visit of National Medica – local chemical supplier
Accommodation in hotel Houda

Thursday, 8th June 2006 (day 3)
15:30 – 16:30 - Nouakchott - Nouadhibou (Flight MR 0763)
18:00 – 19:00 - Organizing second fish sampling with Dutch trawler
Accommodation in hotel Sahel

Friday, 9th June 2006 (day 4)
9:00 – 14:00 - Work with Mr. Harouna Tounkara and Mr. Cherif Ahmed Ould Ahmed on atomic absorption spectroscopy (AAS) and HPLC.
11:00 – 11:30 Meeting with Dr. Khallahi Brahin – discussion over the project and future plans with the labs
Accommodation in hotel Sahel

Saturday, 10th June 2006 (day 5)
9:00 – 11:00 - Work with Mr. Cherif Ahmed Ould Ahmed on gas chromatography.
12:00 – 17:30 - Travelling by car from Nouadhibou to Nouakchott
21:00 – 22:00 - Meeting with Dr. Aly Dartige in Nouakchott.
Accommodation in hotel Mounal

Sunday, 11th June 2006 (day 6)
07:25 – 14:35 - Nouakchott - Paris (Flight AF 0765)
10:40 – 14:10 - Paris - Amsterdam (Flight AF 2040)

Annex 4. List of consumables purchased by IMARES for IMROP laboratory in Nouadhibou at the local supplier of chemicals.

	Order #	Description	Amount	
1	20252.290	Acide chlorhydrique 37% RP Normapur pour analyses	2x	1 L
2	20704.246	Acide sulfurique 95% RP NORMAPUR pour analyse de traces de Cadmium, de mercure et de plomb RP Normapur pour analyses En flacon securité Embasafe	2x	1 L
3	28245.367	Sodium hydroxyde (NaOH) En pastilles RECTAPUR	1x	5 kg
4	20428242	Acide Nitrique 69 % NORMAPUR pour analyses des traces de CD-HG-PB	5x	1L
5	1.11727.2500	Ethanol 95-96% VOL RP NORMAPUR pour analyses	1x	5 L
6	26668.365	Potassium hydroxide RP NORMAPUR en pastilles P.A.	1x	5 kg
7	1.04391.1000	N-Hexane, pour la Chromatographie LICHROSOLV	2x	1 L
8	1.00017.2500	Acetonitrile, pour l'analyse des residus SUPRASOLV	1x	2,5 L
9	1.05855.0050	Magnesium Nitrate hexahydrate SUPRAPUR	2x	50g
10	05151.185	Solution Etalon Palladium Conc. 1G/L 5% HCL	1x	100ml
11	1.19776.0500	Plomb etalon UN2031 8,2°b)	1x	500ml
12	05119.264	Solution etalon Cadmium Conc. 1G/L dans 2% de HNO3	1x	500ml
13	1.70226.0500	Mercure solution etalon 1000 MG/Litre HG (NO3) 2HNO3 0,5 MOL/Litre	1x	500ml
14	1.19786.0500	Etalon mono-element, Merck, paramètres: Cuivre	1x	500ml
15	1.19797.0500	Etalon mono-element, Merck, paramètres: Argent	1x	500ml
16	1.19779.0500	Etalon mono-element, Merck, paramètres: Chrome	1x	500ml
17	1.19781.0500	Etalon mono-element, Merck, paramètres: Fer	1x	500ml
18	242278.182	Florisil (60 - 100 mesh)	1x	100 Gr
19	24279.185	Florisil PR (60-100 MESH) PR ANALY. Residu pesticide	5x	100 Gr
20	26668.296	Potassium hydroxide RP NORMAPUR pour Analyses	1x	1KG
21	8.09733.1000	Tetrahydro-1,2,3,4-naphtalène pour la synthese	1x	1L
22	23811.361	Ether diethylique RP NORMAPUR pour Analyses	2x	5litres
23	20847.295	Methanol RP NORMAPUR pour Analyses	1x	1 L
24	20066.296	Acetone RP NORMAPUR pour Analyses	1x	1 L
25	83665.320	Dichloromethane, PESTINORM (STAB. MB)	1x	2,5 L
26	1.01097.1000	Aluminiumoxide 90, standardisé pour l'analyse d'absorption chromatographique selon BROCKMANN granulometrie 63-200 UM	2x	1kg

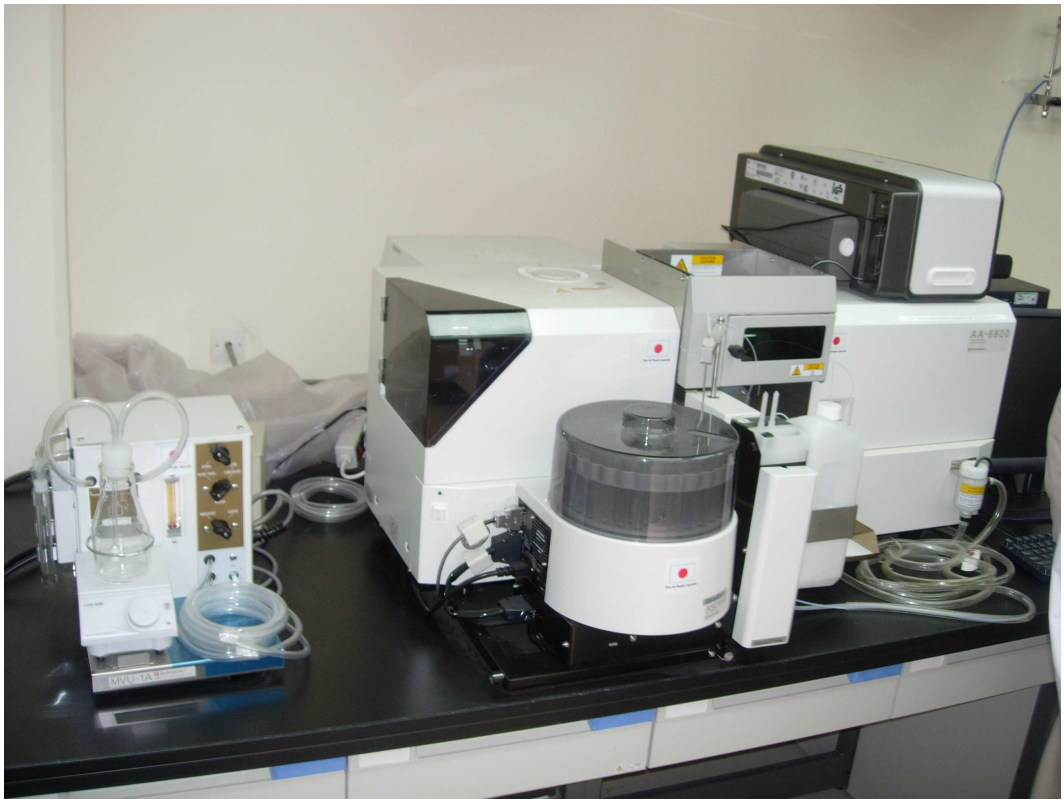
27	1.07734.1000	Gel de SILICE 60 granulometrie 63-200 UM	2x	1kg
28	28114.296	Sodium Sulfate RP NORMAPUR pour Analyses (Natrium sulphate)	3x	1 kg
29	BCR721-1EA	BCR Certified Reference Material (Plaice bile PAHs)	1x	1EA
30	47940-U	PAH Calibration MIX 1x1ML, AcetonitrileKit 610-N	1x	1 mL
31	47351	PAH Kit 610-N	1x	1EA
32	442475-25ML	Benzo(e)pyrene standard	1x	25 ml
33	34499-2,5L	2,2,4-Triméthylpentane, pour HPLC	2x	2,5 litres
34	26720-5G-F	4-cholesten-3-one	1x	5g
35	30540-5ML	Decane, standard for GC	1x	5 ml
36	87086-250MG	Tetracontane, standard for GC	1x	250 mg
37	94234-2ML	N-alkane mix of even alaknes (C10-C40) standard	1x	2 ml
38	68281-10ML	N-alkane standard Mixture C<t/10>-C<t/40>	1x	10 ml
39	46960-U	APP.IX OR.CHLOR PEST MIX, 1X1ML, TOL/HEX(5	1x	1 ml
40	28469-U	FS CAP SLB-5MS 15M 0.25MM 0.25UM	1x	1
41	25743-U	Capilary GC columns - non-polar deactivated 5 m x 0.32 mm, supelco	1x	1
42	861424-U	TPH MIX 1,1X1ML,CH2CL2:HEXANE(1:1) 2000U	1x	1 mL

Annex 5. Photo documentation of IMROP's laboratories in Nouakchott

IMROP's facilities in Nouakchott

Example of laboratory furniture (Nouakchott)

Sample preparation laboratory (Nouakchott)



Atomic absorption spectrometer with mercury vaporizer unit (Nouakchott)

High performance liquid chromatography (HPLC) with UV and fluorescence detectors (Nouakchott)

Gas chromatograph with FID and ECD detector (Nouakchott)

Automatic Soxhlet extractors for sample extraction (Nouakchott)

Annex 6. Photo documentation of IMROP's laboratories in Nouadhibou

Sample preparation laboratory 1 (Nouadhibou)

Sample preparation laboratory 2 (Nouadhibou)

Stock of chemicals and consumables (Nouadhibou)

High performance liquid chromatography (HPLC) with UV detector (Nouadhibou)

Annex 7. Evaluation of instrumentation in IMROP's laboratories in Nouadhibou and list of required equipment to perform priority analyses.

Analysis of metals

For the analyses of heavy metals, the labs are equipped with a new AAS instrument. During my visit, a problem with communication between computer and the instrument was reported and it was not solved before my departure. Probably, deeper involvement of the more experienced technician and/or consultation with PerkinElmer service engineer will be probably needed. When the excitation is performed in graphite furnace or in other words when it is used in the mode to measure lower concentrations, the power supply is not sufficient to provide required power and power break appears. This might be caused by the insufficient output of the power stabilization unit to which is instrument connected because the maximum output of the power stabilization unit is 3000 VA, while the requirement of the instrument is 5000 VA. The stuff of the laboratory was not aware of the output limitation and thought that the electricity supply to the building is insufficient. Therefore, a new line to the laboratory has been ordered from the local electricity supplier. According to information of Aly Dartige, the installation should take place within 2-3 weeks. In any case, a new electricity line will be beneficial because the current one operates close to its maximum.

Mineralization of the samples in microwave before analysis by AAS was sometimes insufficient. The microwave used is old and do not provide temperature and pressure control in the vessels. The new microwave would significantly increase the quality of the analyses.

Dilution of the stock solutions is done by repetitive use of one pipette (*e.g.* 10 ml = 10x1 ml), which introduce significant errors. In addition, pipettes are not calibrated. Four new pipettes (40 – 200 µl, 100 – 1000 µl, 1 – 5 ml and 1 – 10 ml) and periodic calibration are essential to achieve precise results.

Analysis of polycyclic aromatic hydrocarbons (PAHs)

For the analysis of PAHs, HPLC with UV-VIS detector is available. The HPLC instrument is equipped with isocratic pump, which does not allow to use gradient elution. Consequently only 10 out of 16 EPA PAHs are possible to determine. The detection is done by UV-VIS detector, which is not always sensitive and selective enough to guarantee good results. A new pump is essential to determine all 16 EPA PAHs and a new detector – programmable fluorescent detector – would significantly increase the quality of the results.

Reference standards of all 16 PAHs are missing. Their purchase is absolutely essential to produce any data.

Analysis of total petroleum hydrocarbons (TPHs)

Gas chromatograph with FID detector is available for analysis of total petroleum hydrocarbons. The system is working well.

Reference standard of TPH is missing and its purchase is essential for the analyses.

The sample preparation method is not implemented into the laboratory. Therefore, protocol will have to be either provided or developed. Purchase of some solvents and glassware for extraction and clean-up will be required.

List of essentially missing equipment to perform priority analyses in IMROP's laboratories in Nouadhibou

Standard of total petroleum hydrocarbons (RIVM oil, 5 ml ampoule)
Standard of 16 PAHs (US_106N_4, 4 x 1 ml ampoule)
Pipette 40 – 200 µl
Pipette 100 – 1000 µl
Pipette 1 – 5 ml
Pipette 1 – 10 ml
Solvents and glassware for TPH analysis
Microwave digester
Gradient HPLC pump (for 2-4 solvents)
Fluorescence programmable HPLC detector

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Signature: _____

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