Air Quality, Noise and Risk Assessments

Additional Assessments for Regulatory Compliance

Technical Proposal

HBP Ref.: T9752XEM

September 13, 2019

Ghazanfar Group
Afghanistan
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1. Introduction

Afghan Power Plant Company (‘APPC’ or ‘Project Company’) plans to build, own, operate, maintain and transfer an independent 58.56-megawatt (MW) green-field, natural gas based reciprocating engine power plant. APPC is a subsidiary of the Ghazanfar Group (the ‘Client’), which is a private Afghan enterprise with operations across Afghanistan, Central Asia and the Middle East. The Project is proposed as a greenfield development located near Mazar-e Sharif in Afghanistan’s northern Balkh Province that would primarily consist of a gas fired power plant, a gas supply infrastructure, electrical infrastructure, switchyard, gas connections points and electrical connection (Exhibit 1.1).

The Project will utilize natural gas to be supplied by Afghanistan’s Ministry of Mines and Petroleum - Afghan Gas Enterprise from existing gas fields located 100-kilometer (km) west of the Project site near Sheberghan in Jowzjan Province, Afghanistan. The Project will generate electricity that will be dispatched to Da Afghanistan Breshna Sherkat, the Afghan national utility entity, under a Power Purchase Agreement over 20 years.

The Client wishes to acquire services to carry out additional assessments including air quality, noise and risk assessments and based on the assessments update the Environmental and Social Management Plan in conformance of the Project to applicable environmental laws and regulation.

Hagler Bailly Pakistan (Pvt.) Ltd. (HBP) is pleased to submit this technical proposal for carrying out the proposed activities. The associated financial proposal is submitted under separate cover (HBP Ref: N9752XEM).

Organization of Proposal

The proposal is organized as follows:

Section 2 (Approach) provides the approach and methodology together with the proposed time estimates and deliverables.

Section 3 (Proposed Project Team) includes information on team organization and introduces the key technical staff members who will be involved in delivering the above-mentioned services.

Section 4 (Corporate Qualifications) provides information on the Hagler Bailly Pakistan and capabilities.

Section 5 (Corporate Experience) provides an outline of HBP’s relevant experience.
Exhibit 1.1: Project Location
2. Approach

2.1 Scope of the Study as in TORs

The scope of work (SoW) is described in the following sub-sections.

2.1.1 Review of Available Data and Assessments

Review environmental and social assessments undertaken as well as other technical documents or other existing information/documentation.

2.1.2 Additional Assessments

Undertake and report on additional baseline monitoring and assessments in the areas of (i) air quality, (ii) noise and (iii) risk (hazardous materials) (see Section 2.3) to ensure compliance with the Applicable Standards, including Afghanistan regulations, ADB Safeguard Policy Statement (SPS, 2009) and social requirements; World Bank Group (WBG) General Environmental, Health, and Safety Guidelines (General EHS Guidelines) and WBG EHS Guidelines for Thermal Power Plants.

Acquire any necessary information and data from the consultants listed in Exhibit 2.1 that prepared the key assessment documents and other technical documents.

For each assessment, describe and justify in detail the chosen methodology, data input, quality assurance and control, site conditions and its sufficiency to meet the Applicable Standards. Present and discuss assessed impact, sensitive receivers and affected communities, expected compliance and limitations.

Agree with the Project Company on proposed mitigation measures as well as the revised ESMP.

**Exhibit 2.1: Previous Studies**

<table>
<thead>
<tr>
<th>Document</th>
<th>Date</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and Social Impact Assessment (ESIA)</td>
<td>Nov 2018</td>
<td>Greentech</td>
</tr>
<tr>
<td>Environmental and Social Review Summary (Final), including an Environmental and Social Action Plan (ESAP)</td>
<td>20 Feb 2019</td>
<td>Hagler Bailly Pakistan (HBP)</td>
</tr>
<tr>
<td>Air Quality Modelling Report (Stack height)</td>
<td>16 Apr 2019</td>
<td></td>
</tr>
<tr>
<td>Air Quality Modelling Report (Model Inputs)</td>
<td>3 May 2019</td>
<td></td>
</tr>
<tr>
<td>Review of Air Quality Aspect (Issue 2)</td>
<td>15 May 2019</td>
<td>Ricardo Energy &amp; Environment</td>
</tr>
</tbody>
</table>
Air Quality Assessment

► Review latest available information/ action plan and conduct air quality impact assessment including air quality modelling of the Project with internationally-recognized methodology per the Applicable Standards and generate outputs as agreed with ADB, guided by actions and recommendations detailed in the Review of Air Quality Aspect (Issue 2) and discussions.

► Prepare sampling plan and carry out sufficient baseline monitoring with passive sampling methodology on NO\textsubscript{2} and SO\textsubscript{2}.

Noise Assessment

► Review latest available information/ action plan and assess noise impact, carry out comprehensive noise propagation modelling to evaluate expected compliance with noise requirements of the Applicable Standards.

► Establishing sufficient noise baseline by collecting site data with a monitoring plan agreed with ADB.

Hazardous Materials Assessment

► Risk (hazardous materials) Assessment - review latest available information and carry out project design specific risk assessment and follows international methodologies per WBG EHS Guidelines 1.5 Hazardous Materials Management. It specifies that hazard assessment should be performed by specialized professionals using internationally-accepted methodologies such as HAZOP, FMEA or HAZID.

Upgrade of ESMP

► Identify control and mitigation measures on the assessed air quality, noise and risk. Propose monitoring activities as required in the Applicable Standards and include in the ESMP, which should conform with SPS requirements for environmental management plans.

2.1.3 Support the Project Company’s Revision of Environmental and Social Management Plan (ESMP)

Support the Project Company to revise the ESMP (in the ESIA) per Applicable Standards, noting in particular the specific environmental management plan requirements of the SPS to manage identified impacts through mitigation measures, as well as monitoring and reporting over construction and operation phase. The ESMP will be revised based on existing management plans per the ESIA, outcomes of the E&S Review Summary by HBP, impact and mitigation measures identified in the additional assessments.

Update the ESMP to ensure all elements are required by the SPS are included. The SPS requires that ESMP must include the proposed mitigation measures, environmental monitoring and reporting requirements (including the relevant criteria set out in the Applicable Standards, indicators, frequency, timing, responsible party etc.), related institutional or organizational arrangements, capacity development and training measures,
implementation schedule cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.

The consultant will discuss with the Project Company and lenders to develop an agreed ESMP.

2.2 Notes on Scope of Work

It is assumed that a list of all documents related to hazardous materials and waste, required to review the risk assessment studies; HAZOP, FMEA and HAZID will be provided by the Client and no field visit will be required for this purpose. HBP will only review and update the risk assessment report on the basis of information provided.

2.3 Proposed Work Plan and Deliverables

HBP has reviewed the proposed scope of work and detailed tasks required to meet the objectives (see Section 2.1) as described in Exhibit 2.2. The assignment is expected to take 10 weeks to complete.

HBP will carry out onsite baseline data collection for air quality and noise to enable update of modelling assessments. HBP will carry out this work in one of the following two manners:

- HBP will send one of its own staff members from Pakistan to do baseline data collection for noise and air quality if the security situation permits and if insurance cover for the person collecting the data in field can be obtained.

- In case it is not possible to meet the above requirements, then HBP will engage a technical person from Afghanistan and arrange for him to travel to Islamabad for training in data collection. The trainings will cover measurement and calibration of noise meters and installation/uninstallation and shipment of passive sampling diffusion tubes to international laboratories. The trained person will then collect the data, and travel to Islamabad again to deliver the data and the instruments used for collection of data.

Costing for both of these alternatives is provided in the financial proposal Reference Additional Assessments for Regulatory Compliance, Financial Proposal, HBP Ref.: N9752XEM.

Exhibit 2.2: Deliverables and Schedule

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Overall Tasks/Deliverable</th>
<th>HBP Task and Deliverable and Local Consultant’s Scope</th>
<th>Delivery Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Written feedback summary on information review</td>
<td>Written feedback summary on information. Sampling/ monitoring plans for air quality and noise assessment</td>
<td>7 working days after contract</td>
</tr>
</tbody>
</table>
## Technical Proposal:
### Additional Assessments for Regulatory Compliance
#### Air Quality, Noise and Risk Assessments

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Overall Tasks/Deliverable</th>
<th>HBP Task and Deliverable and Local Consultant’s Scope</th>
<th>Delivery Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sampling/ monitoring plans for air quality and noise assessment</td>
<td>Discussions with lenders representatives and owners to confirm technical details of assessments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussions to confirm technical details of assessments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Site visit for baseline data collection for air quality and noise assessments</td>
<td>HBP staff or a person trained by HBP and working under direction of HBP will carry out onsite baseline data collection of air quality and noise.</td>
<td>TBD as per sampling plan. However, expected to take 20-30 working days for air quality sampling, shipment of samples, and analysis at international lab for air quality samples irrespective of number of sampling locations. Time for noise sampling depends on number of sampling locations and each site at least take a day that includes installation and uninstallation of noise meter and 24-hour measurement duration.</td>
</tr>
<tr>
<td>3A</td>
<td>Draft Additional Assessments Report on all assessments per tasks (air and noise)</td>
<td>Draft Additional Assessments Report on all assessments (air and noise)</td>
<td>10 days after receipt of results for air quality for the laboratory.</td>
</tr>
<tr>
<td>3B</td>
<td>Draft Additional Assessments Report on all assessments per tasks (hazardous materials and waste)</td>
<td>See Section 2.2. Draft Additional Assessments Report on all assessments (hazardous materials and waste)</td>
<td>10 days after receipt of all relevant documentation for risk assessment review.</td>
</tr>
<tr>
<td>4</td>
<td>Draft ESMP</td>
<td>Review of the ESMP (see Deliverable 1)</td>
<td>Alongside additional assessment reports (air and noise)</td>
</tr>
<tr>
<td>5A</td>
<td>Final Additional Assessments Report</td>
<td>Air Quality Assessment Report Noise Assessment Report</td>
<td>5 days after client review</td>
</tr>
<tr>
<td>5B</td>
<td>Final ESMP</td>
<td></td>
<td>5 days after client review</td>
</tr>
</tbody>
</table>
3. Proposed Project Team

This section introduces HBP’s proposed team for the studies. The team has been selected keeping in view the issues likely to be significant during the assignment, and the experts’ experience with similar assessments. Key aspects of the team are:

- Strong Team Leader with comprehensive understanding and over 20 years’ experience in environmental and social impact assessments, socioeconomics (livelihood and vulnerability), ecology and physical environment studies and managing multidisciplinary teams in complex Environmental and Social Impact Assessment of Mega Projects based on international standards such as IFC include the ESIA for the Reko Diq Copper Project, ESIA of Gulpur, Karot and Kohala Hydropower Projects, and ESIA of Thar Coal Projects (mining and power) in Block VI, Block IIIA, Block IIIB and Block IV.

- Strong Project Manager with experience in environmental and social assessment and management systems for thermal power plants, as well as large mining and power generation projects for risk averse clients and under both local legal requirements, as well as those of International Finance Institutions.

- Multidisciplinary team providing technical expertise across all elements of the SOW.

- Direct and local experience of key team members, including Project Manager and Project Advisor, at Afghanistan, such as environmental and social impact assessments of Bamiyan Coal Mine Development and Aynak Copper Mine in Afghanistan.

- Experience of the team in environmental and social assessment of power production projects including renewables like solar and hydropower, as well as coal fired power plants.

- Experience on detailed environmental and social risk assessment (beyond EIA), and support in client in management of environmental and social risks for construction and operation of thermal power plants to comply with IFC Performance Standards.

A summary of experience, expertise, responsibilities, and cameos of the core team member is provided in Exhibit 3.1. The detailed resumes are provided in Appendix A.
Exhibit 3.1: Summary of Experience, Expertise, and Cameos of Core Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Experience</th>
<th>Relevant Expertise</th>
<th>Responsibilities</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaqar Zakaria</td>
<td>Environmental and Social Specialist (Project Advisor)</td>
<td>More than 30 years’ experience with 25 years in environmental and social impact studies</td>
<td>ESIA, SEA, CIA, Ecosystem Services, Biodiversity Conservation, Biodiversity Management Plan and Action Plans, National Park Management Plans, Natural Resource Management, Policy Studies, Livelihood Assessment, Environmental Management</td>
<td>Overall quality control; and ensure objectives of the assignment are met.</td>
<td>BS (Chemical Engineering), Massachusetts Institute of Technology, USA, 1974, MS (Chemical Engineering), Massachusetts Institute of Technology, USA, 1975</td>
</tr>
<tr>
<td>Bilal Khan</td>
<td>Environmental and Water Specialist (Project Manager)</td>
<td>10 years</td>
<td>ESIA, CIA, SEA, environmental modelling, EMPs</td>
<td>Coordination with client; project management; technical aspects of physical baseline and impact assessment; predictive numerical modeling for air quality and noise; cumulative impact assessment; coordination with technical teams.</td>
<td>BEng (Environmental), University of New South Wales, Australia, 2012, BSc (Geology), University of New South Wales, Australia, 2012</td>
</tr>
</tbody>
</table>

Vaqar Zakaria is a recognized environmental specialist in Pakistan. He brings more than 30 years’ experience, with 25 years’ in conducting environmental and social assessment studies in the industry, water, power, mining, transport, and agriculture sectors in Pakistan and Afghanistan, where he has led preparation of over 70 project ESIs, and four Strategic Environmental Assessments (SEAs). He has advised the World Bank, Asian Development Bank (ADB) and private sector on environmental assessment and management of large and complex multi-billion dollar industrial and infrastructure developments including several in Afghanistan. He regularly advises the Government of Pakistan on environmental policies, legislation, standards, and institutional issues.

He has supervised preparation of baseline studies and impact modeling for air quality and noise in a number of thermal power generation and road infrastructure projects following the guidelines of the World Bank Group and ADB. Recent examples include five coal fired power generation projects in Sindh including the 600 MW the ADB funded Jamshoro Power Generation Project, two coal fired power generation projects near Karachi, and three mine mouth coal fired projects in Thar region of Sindh province. He has also been engaged in noise modeling studies for ADB funded road infrastructure projects in Georgia.

Bilal Khan has multi-disciplinary experience in engineering-design; environmental and social impact assessments and environmental modelling. His relevant environmental experience extending over approximately 10 years includes baseline studies, impact assessments, development of environmental and ecological management plans, as well as technical environmental modelling aspects related to ESIs, CIAs and SEAs for mining, power generation, and industrial and urban development projects. Bilal has developed methodologies and survey plans for baseline studies that include sampling for air quality, surface and groundwater and soil quality, and overseen multiple related impact modelling exercises. Mr.
Khan has diversified knowledge of surface and groundwater modeling using multiple modelling tools. In addition, Bilal has experience advising and supporting clients in development of environmental and social management systems, human resources systems, mostly in compliance with IFC performance standards (see detail resume in Appendix A).

Bilal was Project Manager for the Strategic Environmental Assessment for Port and Power Plant developments at Keti Bandar, where relevant impacts associated with the Indus Swatch are and Indus delta were part of the scoping process. The work has involved assessment of impacts on the inter-tidal delta due to discharge of wastewaters, as well as impacts on air and noise due to the power plants and associated railway line.

Bilal lead the team for Strategic Environment Assessment for 3,960 MW Thar Energy Park for Engro Power Gen Limited focusing on air quality modelling, water-related impact assessment, as well as a preliminary cumulative impact assessment effort based on the IFC Good Practice Guidelines on Cumulative Impact Assessment. He was Project Manager for the IFC-commissioned Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim where the cumulative impacts of over 100 operating or anticipated projects was determined. This included port and industrial developments, and power plants. The CIA included a comprehensive assessment of impacts on biodiversity values such as mangrove habitat, air quality, water resources, and water and sediment quality.

Bilal has experience working on a groundwater resource assessment in Sindh, where he developed a conceptual groundwater model for BHP in the vicinity of the Zamzama Gas Plant. He was part of the team that developed the numerical groundwater modelling experience for the Aynak Mining Project using the native MODFLOW environment. Bilal has experience in development of multiple site wide water management balances (for projects in various countries), feeding into site-wide water management planning and water-use optimization for multiple large mining (site wide), tailings and heap-leach facilities. He has recently carried out climate risk assessments for multiple large development projects in Pakistan using IPCC approved Global and Regional Climate Model results.

Bilal has worked on numerous legal and regulatory reviews for large projects, identifying risks in the early project phases, and has in depth knowledge and understanding on the non-trivial environmental and social laws applying in Pakistan. He is familiar with the requirements of the ISO 14001, 45001, 9001 and 17025 standards.

Bilal is currently Technical Coordinator for the Asian Development Bank Technical Assistance entitled “Ecosystem Revitalization of the River Ravi Basin” where he developed hydrology, water quality, climate and public health assessment methodologies, and currently working with the team carrying out the assessments.

Bilal is involved as Project Manager in Environmental and Social Advisory to Power Cement Limited to bring their systems in conformance with requirements of the IFC. The work has included Legal and Compliance Review, development of an Environmental and Social, and Occupational Health and Safety Management System, including associated environmental and social risk assessments covering gaps in the previous EIA. The implementation of the systems is pending a final audit of the systems implementation. Separately, Bilal is also leading the team in a water vulnerability assessment for the cement project to address impacts of the project on water extraction.

He has experience on projects in Pakistan, Australia, Georgia, Nepal, Afghanistan, Brazil, South Africa and Papua New Guinea.

<table>
<thead>
<tr>
<th>Aziz Karim</th>
<th>Senior Environmental Specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experience:</strong></td>
<td>17 years</td>
</tr>
<tr>
<td><strong>Relevant Expertise:</strong></td>
<td>EIA, ESIA, IEEs, Environmental Audits, Monitoring and Compliance, Physical Environment, EMMP Development and Soil and Groundwater Investigations</td>
</tr>
</tbody>
</table>
Mr Karim is associated with the Environmental Monitoring Group in Hagler Bailly Pakistan. He holds master degrees in Environment Management and Biochemistry with more than 15 years of environmental management progressive experience on significant national level development projects in Pakistan and Afghanistan.

Broadly, he has worked as a key team member for EIA and EISA development for significant national level development projects in Pakistan and Afghanistan. Some of these include EIA and ESIA of coal-fired power plants being constructed in Jamshoro (funded by ADB), in Lakhra (funded by JICA), at HUBCO (funded by HUBCO), in Thar Block II (funded by Sindh Engro Coal Mining Company) and two other coal fired plants at Port Qasim (funded by FFBL and Sinohydro) in the capacity of Physical Environment Expert. In the same capacity, I have also worked on ESIA of coal mining projects in Block II and VI in Thar-Pakistan and Bamyang-Afghanistan; and copper mining projects in Reko Diq-Pakistan and Aynak- Afghanistan. During the assignments, he has conducted baseline surveys for noise, traffic, water resources and sampling, soil, air quality, sensitive receptors of the transport route and baseline marine environmental studies for seawater and sediment. Seawater sampling was performed at various depths of the water column, collected invertebrate samples and various fish samples.

He has developed Environmental Monitoring and Mitigation Plans (EMMP) for refurbishment and up-gradation project for Mangla Hydropower Station and conducted environmental auditing and compliance monitoring of EMMP during construction, rehabilitation and up-gradation projects at seven public sector hydro and thermal power stations located in Jamshoro, Muzaffargarh, Tarbela, Gudo, Gomal Zam, Satpara and Mangla. The project was funded by USAID.

He has also worked as Independent Environmental Monitoring Consultant (IEMC) in 2004 for PARCO’s While Oil Pipeline Project and International Independent Consultant (IIC) for E&S monitoring of OPIC’s funded projects in Pakistan in 2017 against OPIC guidelines, loan agreements, IFC PS for Environmental and Social Compliance. Currently, he is engaged as IEMC for construction of Chemical and Polymer Plant for Engro in Karachi.

He had worked extensively on Phase I and Phase II Environmental Assessments focusing soil and groundwater investigations for Shell Pakistan and Chevron Pakistan from 2002 till 2015 at both, its marketing and storage sites country-wide. He has also worked on Phase I and Phase II ESA studies at three industrial sites in Karachi for Environmental Resource Management. He has completed these studies as per methodology laid out in ASTM Standards and USEPA Guidelines.

In the recent past, he was engaged on a project as environmental auditor and trainer for Asian Development Bank (ADB) for Improving the Implementation of Environmental Safeguards in Pakistan and Afghanistan. During the period (2013- 2015) participated in multiple training workshops for IAs, EAs and contractors both in Pakistan and in Afghanistan. He has lead a team of environmental auditors for Environmental Audits of ADB funded Projects in Pakistan and Afghanistan and conducted multiple audits and prepared reports for active projects in Pakistan as well as in Afghanistan. Currently, he is engaged with NTDC under FMC portfolio as National Environmental Safeguard Specialist for Second Power Transmission Enhancement Investment Program (MFF-2) funded by ADB.
Sadia Asghar  
**Environmental Engineer/ Physical Environment Expert**

**Experience:** 5 years

**Relevant Expertise:** physical environment baselines and impact assessments (air, noise, water, soil, traffic, and climate), social aspects, development of environmental management and monitoring plans, environmental modeling

**BSc (Environmental Engineering), University of Engineering & Technology, Lahore, 2014**

Ms. Asghar holds an undergraduate degree in Environmental Engineering with expertise in air quality modeling including gas fired and coal-fired power facilities that involves stoic air calculations, coal heating value analysis, natural gas combustion analysis and calculation of emission rates in relation to the operations of coal-fired power plants, coal loading and unloading activities, coal storage and transportation, coal mining processes and noise modeling of power plants and highways and calculating GHG emissions for thermal and hydropower and fertilizer manufacturing plants. In addition, she has worked on various projects to analyze and assess soil and surface and groundwater quality of different areas in Pakistan. Ms. Asghar is able to develop air, water, soil and noise sampling and traffic survey methodologies, to collect and compile sampling data, to carry out sampling analysis, to conduct predictive numeric modeling and to suggest appropriate mitigation and remedial measures with an objective of making the projects resource efficient.

She has good analytical skills to develop physical environmental baselines, conduct impact assessment and prepare environmental management plans for projects including thermal and hydropower plants and projects related to infrastructure. Furthermore, she has worked on the social side of various projects including conducting consultations, preparing consultation logs and addressing concerns and coordinated in resettlement studies.

As an integral part of Hagler Bailly Pakistan, she has worked on several environmental and social impact assessments and cumulative impact assessments as project manager and as environmental specialist for thermal, solar and hydropower developments and transport industry for national and international investors in Pakistan such as ADB, IFC, CSAIL, HUBCO, FFBL, Sojitz Corporation, Nishat Group, Engro Corporation, Mira Power and Kohala Power Limited. She has worked in areas of Sindh, Khyber Pakhtunkhwa, Punjab and Azad Jammu and Kashmir and also in Georgia and Kyrgyzstan.

She has supported the team in developing the environmental and social management system and its underlying plans for Nishat Group and Power Cement Limited and specifically developed the hazardous material and waste management plan and contractor management plan.

She has contributed in number of environmental and social compliance audits, to assess compliance with applicable laws, including detailed analysis of gaps in the environmental and social impact assessment, previous monitoring being carried out and existing management plans for HUBCO, Engro and Nishat Group.

She has worked with team as being independent monitoring consultants to develop the monitoring methodologies and plans, to carry out the environmental monitoring analysis and to prepare and review the monthly monitoring reports.

She has calculated GHG emissions for various sectors including thermal and hydropower plants based on the plant capacity, fuel consumption, plant availability factor and emission of carbon dioxide per unit of production of power and verified the carbon footprints for fertilizer manufacturing plant for Engro.

She has carried out detailed review of available information in conformance with IFC Performance Standards. Identified the non-compliances and the gaps in the management and monitoring systems of Engro Fertilizer Limited, Daharki and recommended the possible solutions to meet the requirements of IFC Performance Standards.
<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramsha Fatima</td>
<td>Environmental Engineer</td>
</tr>
<tr>
<td>Experience:</td>
<td>~5 years</td>
</tr>
<tr>
<td>Relevant Expertise:</td>
<td>ESMS, EIA and IEEs,</td>
</tr>
<tr>
<td></td>
<td>Environmental Management</td>
</tr>
<tr>
<td></td>
<td>and Monitoring, Environmental Audits, noise assessments</td>
</tr>
<tr>
<td>BSc (Environmental Engineering), University of Engineering &amp; Technology, Taxila, 2014</td>
<td></td>
</tr>
</tbody>
</table>

Ms. Ramsha Fatima has experience conducting baseline assessments, environmental and social assessments, as well as environmental and social monitoring and audits for development projects in Pakistan. She has experience in analysis of noise, air quality, water and wastewater.

Ms. Fatima has developed multiple underlying plans for an Environmental Social and Occupational Health & Safety Management System (ESMS) to comply with requirements of the International Finance Corporation for Power Cement Limited and Deutsche Investitions- und Entwicklungsgesellschaft mbH. She is familiar with requirements of ISO 14001, 45001 and 17025 and worked on multiple plans of ESMS for Hyundai Nishat Motors Limited in light of IFC Performance Standards and ISO Standards. She has also prepared training material and provided implementation support to the client.

Ms. Fatima’s recent projects include Environmental and Social Due Diligence of Engro Fertilizer Plants, Daharki for CDC Group PLC, UK. She has also contributed towards the establishment of the Environmental Management Framework for Harbin Electric International Co. Ltd, China and is responsible for reviews, quality assurance and document control of the project. She has also worked on noise modelling for the Strategic Environmental Assessment for the Keti Bandar Project that includes assessment of 10,000 MW capacity coal fired power plants along with a train line from Thar Coalfields.

Ramsha has also been involved in literature reviews, field surveys and water quality assessments for an on-going Technical Assistance by the Asian Development Bank to the Government of Punjab on Revitalization of River Ravi Basin. Previously she has been involved in a groundwater resources vulnerability assessment, and support in development of a regional water management framework in Sindh. She has conducted several IEEs and EIAs for seismic and exploratory drilling projects for clients such as Pakistan Oilfields Limited, Orient Petroleum Limited, Oil and Gas Development Corporation Limited and Total PARCO.

<table>
<thead>
<tr>
<th>Muhammad Naveed Akbar</th>
<th>EHS Specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience:</td>
<td>10 Years</td>
</tr>
<tr>
<td>Relevant Expertise:</td>
<td>Implementation and monitoring of HSE management system as per ISO and OHSAS standards, office and field-based hazard and risk assessment surveys, incident investigation, HSE training, Solid and liquid waste management.</td>
</tr>
<tr>
<td>Responsibilities:</td>
<td>Coordination with field HSE team and implementation of HSE management system</td>
</tr>
<tr>
<td>MS (Environmental Sciences), Bahria University, Karachi Campus, 2012-2013</td>
<td></td>
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<tr>
<td>MSc. Applied Chemistry, University of Karachi, 2008-2009</td>
<td></td>
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<tr>
<td>BSc. Applied Chemistry, University of Karachi, 2006-2008</td>
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</tbody>
</table>

Mr. Muhammad Naveed holds Master/Mphil degree in Environmental Sciences & Masters in Applied Chemistry and Chemical Technology. Lead Auditor of ISO 14001:2015, ISO 9001:2015, OHSAS 18001 and NEBOSH-IGC qualified. He is a member of American Society of Safety Professionals - Pakistan Chapter (ASSP).

He has more than 9 years of experience on working with manufacturing, oil distribution and power industry in Pakistan as a HSE Professional focusing on development and implementation.
of environmental and safety management system. Hands-on experience in identifying hidden hazards, hazard communication, convincing presentations, development and training of HSE procedures, knowledge of legal requirements, process safety and fire safety.

The projects include implementation of environmental management plan and company HSE requirements at construction of three 220KV grid stations, four 132KV grid stations, addition of five new 220KV transmission lines, addition of five 132KV transmissions lines and expansion of three Power Plants located in Karachi. He has carried out hazard identification and risk assessment of bulk oil distribution terminals handling crude and other petroleum products and established fire safety management system for offices to comply with Building Code of Pakistan - Fire Safety Provision. He is also part of the team gathering Karachi’s data for WWF-One Plant City Challenge.

Recently he has been engaged in development and implementation of Environment Health and Safety as well as Occupational Health and Safety (ES OHS) Management Systems for various companies to ensure compliance with IFC Performance Standards. He has also conducted trainings and audits to check compliance with these standards. Some recent projects he has worked on include Advisory and Support on Development and Implementation of Environmental Management System for Power Cement Limited and Jamshoro Coal-Fired Power Project, Environmental and Social Impact Evaluation and Due Diligence of Mazar Independent Power Project for IFC and Fertilizer Manufacturing Company for International Investor, as well as Development of Environmental and Social Management System and Organizational Health and Safety Management Systems for Hyundai Nishat Motors (Pvt.) Ltd, Lahore.

Asid Ur Rehman  GIS and Remote Sensing Specialist

Firm: Hagler Bailly Pakistan

Relevant Expertise: GIS data development, mapping, GIS data analysis, satellite remote sensing, satellite image processing, earth science data analysis, and satellite climatology

MS (Remote Sensing and GISc), Institute of Space Technology, Islamabad, Pakistan, 2017

MSc (Space Science), University of the Punjab, Lahore, Pakistan, 2008

Asid Ur Rehman is a remote sensing and geographic information system professional. He has more than 10 years of experience with a strengths in GIS data development and mapping, spatial analysis, ESRI enterprise geodatabases, cartography, satellite image (optical & radar) processing, pixel-based and object-based satellite image analysis, remote sensing indices modelling, satellite-based precipitation analysis, time series earth data analysis and scientific programming in MATLAB. He has applied remote sensing and GIS on various thematic areas like ecosystem revitalization at basin scale, environment and social impact assessments, natural resource management, environment protection, wetlands conservation, sustainable forest management, urban planning, land and revenue records management, sustainable urbanization and disaster risk management/reduction.

Currently, Asid is implementing basin scale applications of remote sensing and GIS to support team in studying various kinds of spatial phenomena like mapping of water pollution sources, calculation of pollution loads from various sources (point & disburse sources), surface water quality analysis & mapping, river geomorphological and ecological temporal analysis, temporal land use change analysis, potential surface runoff calculations, potential evapotranspiration & aridity index analysis using climate datasets, climate trends, and climate change and its subsequent impacts on environment and water. Further, he is contributing in designing of pesticide, food, ecology, socioeconomic and health surveys and development of GIS-related inventories and databases. Asid is also managing various GIS mapping projects at national scale. Previously, at UN-Habitat Pakistan, he managed GIS and remote sensing component in various projects like State of Pakistan Cities Report (SPCR), Multi-hazard Vulnerability and Risk Assessment (MHVRA) of two districts of Khyber Pakhtunkhwa, Vulnerability Assessment for Delivering Policy Advice on Repeated Disasters in Baluchistan, Geo-spatial Mapping & Preliminary Survey of Administrative Government Buildings in Most Vulnerable Districts of Hagler Bailly Pakistan

T9752XEM: 09/13/19

Proposed Project Team

3-7
Pakistan, and GIS Automation and Capacity Building for the Statistics Division at Federal and Provincial Census Office. In his engagement with World Wide Fund for Nature Pakistan (WWF-P), he was primarily responsible for processing and analyzing remote sensing imagery for nature conservation and environment protection studies to achieve the organization’s objective of preserving genetic, species and ecosystem diversity. Overall, he was responsible for: procuring and archiving satellite images, interpreting and analyzing remote sensing datasets, developing spatial databases, maintaining vector datasets, conducting GIS/remote sensing trainings and workshops for Govt/non-Govt organizations, conducting field surveys for ground reference data collection, and compiling related documents and reports of the projects.

<table>
<thead>
<tr>
<th>Muhammad Tahir</th>
<th>Environmental Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experience:</strong></td>
<td>1 year</td>
</tr>
<tr>
<td><strong>Relevant Expertise:</strong></td>
<td>Physical Environment Baselines and Sampling (Water and Wastewater), Environmental Management and Monitoring, Environmental Modeling</td>
</tr>
<tr>
<td><strong>Responsibilities:</strong></td>
<td>Data Analysis</td>
</tr>
<tr>
<td><strong>BSc (Environmental Engineering), University of Engineering &amp; Technology, Lahore, 2018</strong></td>
<td></td>
</tr>
<tr>
<td>Mr. Tahir holds an undergraduate degree in Environmental Engineering with expertise in physical environment baselines and sampling (water and wastewater). He has experience in conducting air quality modeling. He is able to develop air, water and wastewater survey methodologies, to collect and compile sampling data, to carry out sampling analysis, to conduct predictive numeric modeling and to suggest appropriate mitigation and remedial measures with an objective of making the projects resource efficient. Mr. Tahir’s recent projects include Environmental and Social Impact Assessment of TransAsia Refinery at Port Qasim Karachi. He has also contributed towards the Strategic Environmental Assessment for Keti Bandar, Karachi as an air quality modeling expert. He has also been involved in literature reviews, data analysis, field surveys and water quality assessments for an on-going Technical Assistance by the Asian Development Bank to the Government of Punjab on Revitalization of River Ravi Basin project.</td>
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<thead>
<tr>
<th>Syed Ali Imam Tahir</th>
<th>Environmental Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experience:</strong></td>
<td>1 year</td>
</tr>
<tr>
<td><strong>Relevant Expertise:</strong></td>
<td>ESMS, EIA/IEEs, Environmental Modelling and Research</td>
</tr>
<tr>
<td><strong>Responsibilities:</strong></td>
<td>Data Analysis</td>
</tr>
<tr>
<td><strong>BSc (Environmental Engineering), National University of Science and Technology, Islamabad, 2018</strong></td>
<td></td>
</tr>
<tr>
<td>Mr. Syed Ali Imam Tahir holds an undergraduate degree in Environmental Engineering with expertise in environmental impact scoping, process assessment and literature reviews. He is able to evaluate various environment related processes through detailed literature reviews, databases and modelling to design environmental monitoring strategies and methodologies. Mr. Syed Ali Imam Tahir’s recent projects include Environmental and Social Impact Assessment of TransAsia Refinery at Port Qasim Karachi. He has also contributed towards the Environmental and Social Due Diligence and High-Level Process Safety Review for Engro Fertilizers Plants at Daharki as an analyst for the fertilizer plant’s environmental compliances on a process-wise basis. He has also been involved in literature reviews, data analysis, field surveys, methodologies and e-flows modelling for an on-going Technical Assistance by the Asian Development Bank to the Government of Punjab on Revitalization of River Ravi Basin project.</td>
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</tr>
</tbody>
</table>
Technical Proposal:  
Additional Assessments for Regulatory Compliance  
Air Quality, Noise and Risk Assessments

<table>
<thead>
<tr>
<th>Ali Amin</th>
<th>GIS Analyst</th>
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<tbody>
<tr>
<td><strong>Experience:</strong> 3 Years</td>
<td></td>
</tr>
<tr>
<td><strong>Relevant Expertise:</strong> Tabular data processing, GIS data development and maintenance, map layouts development, GIS automation through models, linking non-spatial data with spatial features</td>
<td></td>
</tr>
<tr>
<td><strong>MS (Remote Sensing and GIS),</strong> National University of Sciences &amp; Technology (NUST), Islamabad, 2018</td>
<td></td>
</tr>
<tr>
<td><strong>BS (Space Science),</strong> University of the Punjab, Lahore, 2015</td>
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</tbody>
</table>

Ali Amin has more than 3 years of experience in using Geographic Information Systems (ArcGIS, QGIS, Global Mapper, Google Earth) and GPS. He has expertise in data capture, inserting GPS data, vector analysis, and raster analysis. He is adept at using extensions like geodatabase, topology validation, and error removal, ArcHydro tools for catchment and hydrology processing, cross section and distance elevation data capturing. He also possesses a good command on raster surface analysis like watershed, viewshed, and surface interpolation. He also has expertise in proximity analysis and spatial data conversion from one format to another. He has developed a GIS-based pollution source inventory for entire Ravi basin.

Currently, he is developing Snow Runoff Model for Upper Chenab and Ravi Basin. He is also providing GIS support in conducting various types of surveys like health, water quality and pesticide surveys. He is manipulating survey data into databases, cleaning the data for errors, and linking it with GIS environment for mapping. Previously, he worked as GIS Supervisor at Pakistan Railway, where his primary responsibilities were to survey Railway land, compilation and analysis of surveyed data, interpreting and analyzing remote sensing datasets, developing spatial databases, maintaining vector datasets, conducting GIS/remote sensing trainings for Government officials.
4. Corporate Qualifications

Hagler Bailly Pakistan (Pvt.) Ltd. is based in Islamabad, Pakistan and is associated with the Tetra Tech, Inc., a preeminent US-based consultancy firm with a global presence. Hagler Bailly Pakistan provides management, economic, regulatory, and technical counseling especially tuned to developing country needs. The firm’s services are targeted at the energy, environment, industry, communications and transportation, infrastructure development, information technology, and related technical applications. Hagler Bailly Pakistan’s philosophy stresses upon information sharing, communication, and teamwork within the company, thus enabling each practice area to draw upon the skills of others. This enables the staff to stay abreast of latest developments at the international level so that every client receives the best possible results.

Hagler Bailly’s presence in Pakistan dates back to 1985 when it first opened a project office of the US-based parent company in the country. In 1990, it was transformed into a branch office of RCG/Hagler Bailly, Inc., USA, and subsequently it was incorporated locally as an independent business entity. Since its modest beginnings, the firm has grown substantially to become one of Pakistan’s preeminent consulting enterprises, staffed and operated by a highly qualified team of Pakistani professionals. They are graduates of some of the world’s most prestigious educational institutions and have been involved in a number of important national projects requiring extensive first-hand experience. Leading staff members hold master’s and doctorate degrees in the fields of engineering, science, economics, environment, and business management. The firm operates a fully-equipped head office in Islamabad and Lahore with the necessary support staff and modern business aids, and provides field services throughout the country as well as regionally. The company’s organizational structure is presented in Exhibit 4.1.

In addition to its indigenous resources, the firm benefits from the enormous consulting expertise of affiliated Tetra Tech, Inc., professionals worldwide. Tetra Tech’s 16,000 associates work through 400 offices in more than 110 countries on six continents. Tetra Tech has expanded its geographic presence significantly in recent years through internal growth and strategic acquisitions worldwide, with considerable operations in Asia, Europe, and the Middle East. Tetra Tech holds a minority interest in Hagler Bailly Pakistan and is represented on its Board of Directors.
Exhibit 4.1: Company’s Organizational Structure

The firm’s expertise covers the following areas of specialization:

4.1 Environmental Services

- Physical, Socioeconomic and Ecological Baseline Surveys
- Environmental and Social Impact and Risk Assessments
- Environmental and Social Management Systems and Audits
- Health, Safety & Environmental Training and Certification
- Regulatory Compliance, Guidelines, and Due Diligence
4.2 **Energy Services**

- Energy Market Forecasts and Analysis
- Pricing, Financial, and Economic Evaluation
- Project Feasibility Analysis
- Power Generation and Transformation
- Electricity Transmission and Distribution
- Oil and Gas Refining and Retailing
- Fuel Supply Options
- Oil and Gas Processing and Pipeline Systems
- Renewable and Alternative Energy Options
- Energy Efficiency and Conservation
- Policy and Regulatory Advice
- Energy Studies and Program Design

4.3 **Technology Management Services**

- IT Solutions, Software, and Information Products
- Corporate Management, Governance, and HRD Support
- Technical Studies, Facility Design, and Computer Simulations
- Technology Marketing and Adaptation
- Policy, Program, and Project Development
- Spatial Information Applications
- Transportation Systems
4.4 Support Services and Tools

4.4.1 Environmental Modeling Tools

Hagler Bailly Pakistan has in-house technical and specialist expertise to carry out a range of environmental modelling. Hagler Bailly Pakistan’s staff has the required tools (software and hardware resources) and training to conduct hydrology and water resources, groundwater, water quality, hydraulic, hydrodynamic, air dispersion and noise modelling. Hagler Bailly Pakistan’s core staff maintain the following capacities:

- **Air Dispersion Modeling** – to predict the dispersion and ambient concentration of air pollutants from various sources such as point (power plants, generators), area (berths, mines, cement plants) and line (roads, railways, conveyor belts) at specific receptors (e.g. communities). Hagler Bailly Pakistan has capacity and experience to utilize US EPA preferred and recommended regulatory models including Gaussian plume models such as AERMOD, OCD, and AERSCREEN and integrated Lagrangian puff models such as CALPUFF.

- **Dense Gas Dispersion Modeling** – to predict impact of dispersal of non-buoyant dense gases at ground-level and area source dense gas (or aerosol) clouds released with zero momentum into the atmospheric boundary layer over flat, level terrain. Hagler Bailly Pakistan has capacity and experience to utilize tools such as NASA’S DEGADIS. The model describes the dispersion processes which accompany the ensuing gravity-driven flow and entrainment of the gas into the boundary layer.

- **Noise Modeling** – to predict noise levels received by the environment through propagation from noise emitting sources such as road, railway, industry (point, area and line source) and parking lots. Hagler Bailly Pakistan has capacity and experience to carry out modelling utilizing ISO and industry-standard methods for noise propagation using SoundPLAN™ essential and SoundPLAN™ software suite.

- **Climate Change Analysis** – to provide climate parameters under various greenhouse gas concentration pathways for the future. Hagler Bailly Pakistan has developed its own propriety codes, utilizing languages such as ncl and Matlab to extract and evaluate data from Atmosphere-Ocean-Global-Climate Models (AOGCMs) and as well as related dynamically downscaled Regional Climate Models (RCMs) utilized by the Intergovernmental Panel on Climate Change (IPCC) for representative concentration pathways (RCPs) under future time horizons for variables such as temperature and precipitation.

- **Water Resources, Water Balance, and Hydrodynamic Modelling** – to predict the water supply and availability, carry out supply and demand balances, as well as carry out associated or separate studies on hydraulics and hydrodynamics. Hagler Bailly Pakistan has capacity and experience to utilize various deterministic and stochastic models and techniques for all parts of the water-cycle including, WRF, ArcSWAT, SRF, HEC-HMS, HEC-RAS, GoldSim and MODFLOW, as well as some CFD models.
Technical Proposal:
Additional Assessments for Regulatory Compliance
Air Quality, Noise and Risk Assessments

- **Water Quality, Geochemistry and Contamination Plumes** – to estimate mixing of contamination plumes in water bodies and their compliance with standards and guidelines as well as prediction of water quality and total pollutant load in groundwater aquifers and surface water bodies including estuaries, rivers and lakes. Hagler Bailly Pakistan has capacity and experience to utilize US EPA tools such as Visual Plumes, and other software such as MT3DMS, PhreeqC, CORMIX, Flux3D and LOADEST.

4.4.2 Environmental Sampling Equipment

In addition to laboratory equipment, Hagler Bailly Pakistan has a variety of environmental field measurement and sampling equipment including:

- **Water and soil** – hand augers; monitoring-well drilling and installation tools; soil and sediment sampling tools; bailers; bladder pumps; portable water quality loggers and probes, including down-hole probes, for in situ measurement of pH, dissolved oxygen (DO), oxygen reduction potential (ORP), electrical conductivity (EC), temperature, nitrate, ammonium, ammonia, chlorophyll a, blue-green algae, turbidity and water level; as well as down-hole oil-water interface meters.

- **Air quality** – multiple gas detector (VOCs, SO₂, NO, CO, H₂S and O₂), low volume samplers for particulate matter, and iso-kinetic samplers for stack emissions.

- **Noise** – state of the art sound level meters.

- **Ecology** – various sampling equipment for large and small mammals; fish sampling tools with capabilities including electrofishing, trawling and tagging; and others.

- **Global Positioning** – high quality precision GPS units.

4.4.3 Environmental Laboratory

Hagler Bailly Pakistan operates an environmental laboratory that is equipped to provide analytical and environmental monitoring services for ambient air, noise and water as well as emissions. Hagler Bailly Pakistan’s environmental laboratory, located in Islamabad, is equipped with technical aids and experienced staff trained to conduct on-site auditing and certification as well as blind laboratory sample testing. Our team also provides advice and training for clients who wish to develop their own measurement capabilities for regular compliance submittals.

Hagler Bailly Pakistan’s environmental laboratory regularly utilizes and collaborates with other local and international laboratories. This includes utilization of international laboratories for quality assurance and control e.g. split samples between labs. Additionally, collaborations typically include utilization of specific facilities such as rental or utilization of high precision equipment (e.g. ICP-MS, ICP-OES, GC-MS with electron probe), specialized chemical extraction of pollutants and digestion (where required), and specific lab analysis such as persistent organic pollutants and pesticides, flame retardants, antibiotics, as well as a full-suite of petroleum hydrocarbons.
4.4.4 Geographic Information Systems and Mapping

Hagler Bailly Pakistan possesses geographic information system (GIS) and remote sensing analysis facilities through a qualified and experienced team. The team is capable of carrying out specialist spatial analysis such as bunch spatial analysis, terrain analysis, groundwater and surface water analysis, site suitability analysis, land cover and land cover change analysis, vegetation analysis, river morphological analysis, topographic mapping, 3D modelling, and climate induced hazards, vulnerability and risk analysis. Analyses are performed by using advanced software like ArcGIS, QGIS, ERDAS Imagine, ENVI, eCognition and MATLAB. Computer-aided design and drafting (CADD) facilities for engineering diagrams and drawings, several bitmap and vector illustration tools, drafting for mechanical, electrical, and process, are also available.

Hagler Bailly Pakistan can provide customized solutions as well as web hosted services to a variety of design, mapping, and documentation needs. Hagler Bailly Pakistan also holds the capacity for beginner to advanced level training on GIS and remote sensing applications.

4.4.5 Research, Standards and Guidelines

Hagler Bailly Pakistan have access to almost all major research journals as well as international guidelines and standards, including the International Standards Organization (ISO), ASTM, and American Public Health Association (APHA) standards, through ongoing subscription services. This allows Hagler Bailly staff to stay abreast of state-of-the-art research, guidelines and standards to aid our clients.

4.4.6 Backstopping

Hagler Bailly Pakistan is associated with the Tetra Tech Inc., US, an international management, consulting, research, and financial services firm, headquartered in Pasadena, California, US. Hagler Bailly Pakistan maintains a close working relationship with the Tetra Tech Inc. for technical support where needed. Our clients thus benefit from the enormous consulting expertise of professionals in our US affiliate.

4.5 Quality Assurance and Quality Control

Hagler Bailly Pakistan has an ISO9001 compliant Quality Management System in operation.

4.5.1 Organizational QA/QC program

At Hagler Bailly Pakistan, project execution follows clear management and implementation procedures covering resource allocation; work plans, timelines, and key milestones; reporting lines and client communications; management oversight; accounting; and product review and quality assurance.

Hagler Bailly Pakistan implements a proprietary enterprise-wide computer-based management information system (MIS) that separately tracks, records, controls and integrates several business implementation functions, including project milestones and...
deliverables, internal quality control (QC) procedures, project-wise staff time allocation, financial expenditure and transactions, company-wide information resources, and office and project equipment inventories. The firm employs detailed document and software quality assurance documentation, dedicated QC personnel, and supporting resources. Key project reports—apart from iterative authors’ and QC staff editing—are also provided with peer review to gather ‘independent’ feedback and provide a content, comprehensibility and language check from a ‘knowledgeable layman’ perspective. In addition, the company employs documented corporate policies and procedures relating to HSE, field operations, and general corporate requirements.

As a consequence of such systematic attention and internal safeguards built into its business practices, Hagler Bailly Pakistan’s office operations are in general conformance with ISO 9001 procedural and operational requirements, respectively, and its reputation for quality of service and deliverables meets or exceeds international industry standards and remains unmatched in the country.

4.5.2  Product Review Process to Ensure Quality Work

At Hagler Bailly Pakistan, each project is assigned, at the outset, a Project Manager, responsible for all direct management, implementation, liaison, reporting, and deliverables related to the assignment, along with a Backup Manager who can fill in, as and when required. In addition, a Director-level Divisional Manager is also designated to provide general oversight, review key outputs, respond to any issues—internal or those pointed out by consortium partners or the client—as well as to support the Project Manager and team, as needed.

Allocation of project tasks and staff responsibilities is formally undertaken and refined, if necessary, at the project’s outset: in the staffing plan at proposal preparation, contract finalization and activation, and project kickoff meetings. The staffing plan at each stage, and any changes to it subsequently, is prepared by the Project Manager in charge and reviewed and approved by both senior Divisional Managers and by a company Director at weekly departmental meetings held to plan and oversee project planning and implementation. Staff performance is constantly reviewed at subsequent such meetings and through direct project or indirect departmental supervisory roles provided independently by senior management, and any necessary changes, replacements, or augmentation deemed necessary is provided to preempt any service delivery issues. Staff performance and capability assessment is also a key element of mandatory post-project reviews and periodic formal performance-based staff evaluations conducted to provide necessary feedback, incentives, and salary increments to all employees.

Third-party or contractor services are similarly closely monitored, and any issues identified that are not immediately rectified are flagged by Project Managers to Divisional Managers or Directors for necessary decision or action, which may include official notification of service termination. Replacement services are always identified during the initial selection process in case the primary service provider fails to provide satisfactory performance or is unable to meet project workload or schedule requirements.

Hagler Bailly Pakistan adheres to international industry standards and guidelines, as applicable to any project context. All technical staff is trained and instructed on
compliance with acceptable methodologies, procedures, and relevant standards documentation. In addition, the firm continually develops, maintains and upgrades its own standard guidelines for tasks routinely undertaken so as to ensure consistence and quality of the final outputs produced.

Once completed, project outputs and draft reports are independently reviewed internally in the company, if necessary, for both technical content and other quality issues beyond those provided by the project team and manager. All documents and changes are recorded using version control software and edit tracking, so that they can be audited, if required, at any stage. Hagler Bailly Pakistan maintains standard guidelines for document preparation that are strictly followed, and no deliverable is approved for dispatch to the client until specifically approved in Hagler Bailly Pakistan Projects MIS by the responsible QA/QC officer.

4.6 Environmental and Social, and Occupational Health and Safety Management System

Hagler Bailly Pakistan operates an environmental and social, and occupational health and safety system (ES-OHS-MS) for its operations, including our offices and for projects. Our process includes risk assessments for project work prior to start work on client sites. Our system is compliant with the Performance Standards of the International Finance, ISO14001 and ISO45001. Hagler Bailly Pakistan also operates a Human Resources (HR) manual and has additional standard operating procedures to ensure information confidentiality and integrity for our clients.
5. Corporate Experience

Hagler Bailly Pakistan provides management, economic, regulatory, and technical counseling to meet developing country needs. The firm’s services include energy, environment, industry, communications and transportation, infrastructure development, and information technology applications. It provides consulting support to a wide range of clients, including various agencies of the Government of Pakistan, multinational corporations, multilateral and bilateral donors, and private sector businesses—ranging from involvement in the design and implementation of billion-dollar investment and financing programs and multi-year national or regional programmatic interventions to entity-specific short-term advisory, auditing, operational and technical services—for a total of 697 distinct projects and over 200 separate clients so far, not including recurring commercial and technical service contracts. This has included more than 150 environmental assessments (ESAs, ESIAs, EIAs and IEEs) of development projects such as petroleum marketing, exploration and production, industrial projects including cement industry, natural resource management projects, and infrastructure projects.

HBP, due to its quality of work and always meeting expectations of its clients has become widely known throughout the country and in regional prospective. HBP has worked nearly in every sector varying from, health care, cement, textile to hydroelectric and thermal power plants, mining, transport infrastructure and oil and gas.

HBP’s work experience relevant to the scope of work is provided in Exhibit 5.1.

<table>
<thead>
<tr>
<th>Exhibit 5.1: Relevant Project Experience</th>
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<tbody>
<tr>
<td><strong>Development and Implementation Advisory on Environmental and Social, and Occupational Health and Safety Management System for Jamshoro Power Project</strong></td>
</tr>
<tr>
<td><strong>Client</strong></td>
</tr>
<tr>
<td><strong>Study Type</strong></td>
</tr>
<tr>
<td><strong>Year</strong></td>
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</tbody>
</table>

Harbin Electric International is one of the engineering, procurement and construction (EPC) bidders for the construction of the 1,320 MW coal-fired thermal power plant in the Jamshoro District of Sindh province of Pakistan. Harbin Electric acquired the services of Hagler Bailly Pakistan for developing an environmental and social, and occupational health and safety management system for the three-year construction phase of the project in alignment with International Finance Corporation (IFC) Performance Standards and the Asian Development Bank’s Safeguard Policy Statement. Hagler Bailly Pakistan's environment, health and safety staff at the construction site also supported the client in achieving compliance with the system developed.
### Environmental and Social Due Diligence for Expansion of Fertilizer Plants

<table>
<thead>
<tr>
<th>Client</th>
<th>CDC Group plc, London, United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Due diligence, IFC and WBG guidelines</td>
</tr>
<tr>
<td>Year</td>
<td>2019</td>
</tr>
</tbody>
</table>

CDC Group PLC considered a debt investment in fertilizer manufacturing plants in Pakistan's Sindh province. Hagler Bailly Pakistan was engaged as the lender's independent environmental and social advisor to conduct environmental and social (E&S) due diligence against applicable local, national and international environmental and social legislation, IFC Performance Standards and World Bank Environmental, Health and Safety Guidelines. The E&S assessment included consideration of the entire operations of both plants as well as the planned upgrades. The work is ongoing with completion of the Environmental and Social Due Diligence Reports.

### Noise Modeling of Section 2 of Tbilisi-Rustavi Highway

<table>
<thead>
<tr>
<th>Client</th>
<th>Asian Development Bank (ADB), Manila, Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Noise modeling and assessment, IFC Guidelines</td>
</tr>
<tr>
<td>Year</td>
<td>2019</td>
</tr>
</tbody>
</table>

The Asian Development Bank (ADB) is assisting the Government of Georgia in upgrading the 6.8 km long Section 2 of Tbilisi-Rustavi Highway. A segment of 3.65 km of Section 2 will be the new road that passes very close to several buildings whose occupants registered concerns about potential noise emanating from the road construction activities as well as the subsequent increased movement of vehicular traffic on the highway. ADB acquired the services of Hagler Bailly Pakistan to measure existing noise levels in the vicinity of the proposed road and on the concerned buildings to establish a baseline, model future noise levels from the planned road development activity and propose appropriate mitigation measures that can be set in place to achieve compliance with World Bank - EHS guidelines.

### Updating of Noise Modeling Report of Tbilisi-Rustavi Urban Road Link

<table>
<thead>
<tr>
<th>Client</th>
<th>Asian Development Bank (ADB), Manila, Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Noise modeling and assessment, IFC Guidelines, Model Calibration</td>
</tr>
<tr>
<td>Year</td>
<td>2019</td>
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</tbody>
</table>

A noise assessment report on Tbilisi-Rustavi Urban Road Link, which included establishment of baseline noise levels of the area and prediction of operational noise levels from the planned road development activity, have already been developed and approved. The project is an update to the previous report with updated traffic and speed data and mitigations and corresponding cost.

### Advisory and Support on Development of Environmental Management System for Power Cement Limited

<table>
<thead>
<tr>
<th>Client</th>
<th>Deutsche Investitions-und Entwicklungsgesellschaft (DEG), Köln, Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Development of ESMS, OHSMS, Human Resource Plans; IFC Performance Standards; Cement Plant</td>
</tr>
<tr>
<td>Year</td>
<td>2018-2019</td>
</tr>
</tbody>
</table>

Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooriabad Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL’s investment into a new Plant. To support PCL’s ability to comply with DEGs’ environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an
advisory, and provide support in development of an Environment and Social Management System, underlying plans and procedures.

The worked involved revaluation of all environmental and social risks, as part of development of an IFC and GIIP-compliant risk register. The included identification of all mitigation and monitoring for the Project, including construction and operation phases. The support included advisory and training, as well as documentation, on stakeholder consultations carried out in key villages in the vicinity of the Project. Additional aspects included, training of senior management, as well as the EHS team in IFC Performance Standards and how they apply for the Project.

### Water Vulnerability Study for Cement Plant in Sindh

<table>
<thead>
<tr>
<th>Client</th>
<th>Deutsche Investitions-und Entwicklungsgesellschaft (DEG), Köln, Germany</th>
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<tbody>
<tr>
<td>Study Type</td>
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<tr>
<td>Year</td>
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</tbody>
</table>

Power Cement Limited (PCL), a subsidiary of the Arif Habib Group, operates a cement manufacturing plant in the Nooriabad Industrial Area near Jamshoro in Pakistan's Sindh province. PCL plans to construct a second cement plant with a capacity of 7,700 tonnes per day within the premises of the existing facility. The Arif Habib Group is in discussions with Deutsche Investitions- und Entwicklungsgesellschaft (DEG), a German development finance institution, regarding debt financing for PCL's investment in the new plant. To support PCL's ability to comply with DEG's environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan to carry out a water vulnerability study to characterize the impact of pumping groundwater by the new project and to evaluate future water availability risks to PCL's operation in the medium term (20 to 30 year perspective).

### Noise Modeling of Bishkek-Osh Road

<table>
<thead>
<tr>
<th>Client</th>
<th>EPTISA Servicios de Ingeniería, S.L., Madrid, Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Noise modeling and assessment, IFC Guidelines, Kyrgyzstan Standards, Model Calibration</td>
</tr>
<tr>
<td>Year</td>
<td>2017-2018</td>
</tr>
</tbody>
</table>

The Asian Development Bank (ADB) is assisting the Government of Kyrgyzstan for rehabilitation and upgrading of the 45 km long section of Bishkek-Osh Road linking Bishkek and Kara Balta towns. The road section passes very close to several buildings that can be a potential and continuous source of noise for the inhabitants of the buildings. EPTISA Servicios de Ingeniería, S.L., the construction supervision consultant of this Project, acquired the services of Hagler Bailly Pakistan to carry out the noise modeling and establish the future noise contours for Bishkek-Osh Road along Central Asia Regional Economic Corridor 3 on Bishkek Kara Balta Sections. The services include presents the current and updated noise level baseline of the Project, address the issues of significant noise impacts along the existing road alignment and to recommend and assess the cost of the best available mitigation measures needed to meet the World Health Organization (WHO) and Kyrgyzstan's standards whichever is more stringent.

### Updating of the Batumi Bypass Environmental Impact Assessment Report

<table>
<thead>
<tr>
<th>Client</th>
<th>Roads Department, Government of Georgia, Tbilisi, Georgia and Asian Development Bank (ADB), Manila, Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>EIA, Air modeling and assessment, noise modeling and assessment, IFC and Georgia Standards, baseline measurements</td>
</tr>
<tr>
<td>Year</td>
<td>2016-2018</td>
</tr>
</tbody>
</table>

The Asian Development Bank is assisting the Government of Georgia in upgrading the Batumi Bypass (13.2 km) environmental impact assessment report. The Roads Department of the Government of Georgia acquired the services of Hagler Bailly Pakistan Pvt. Ltd. to undertake a detailed environmental and social impact assessment of a Batumi Bypass road in western Georgia.
Historically, Hagler Bailly Pakistan has completed several environmental assessments to ensure regulatory compliance. Here are some examples:

### Technical Proposal:
**Additional Assessments for Regulatory Compliance**
**Air Quality, Noise and Risk Assessments**

#### Environmental Monitoring of Cement Plants located in Pothohar Region of Punjab Province

<table>
<thead>
<tr>
<th>Client</th>
<th>Bestway Cement Limited, Islamabad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Cement Plant, Stack Emission Monitoring, IFC, Performance Standards, PEQS</td>
</tr>
<tr>
<td>Year</td>
<td>2018</td>
</tr>
</tbody>
</table>

D.G Khan Cement Company Limited (DGKCCCL) and Bestway Cement Limited (BCL) operate three cement manufacturing plants in district Chakwal, Punjab. DGKCL and BCL engaged Hagler Bailly Pakistan (Pvt.) Ltd. (HBP) for conducting environmental monitoring tests to determine if the emissions from the plants are in compliance with Punjab Environmental Quality Standards (PEQS) of Punjab Environmental Protection Agency (PEPA) and international best practices such as International Finance Corporation's Environmental Health and Safety (IFC-EHS) guidelines.

#### Environmental Assessment and Resettlement Plan of 99 MW Arkari Gol Hydropower Project

<table>
<thead>
<tr>
<th>Client</th>
<th>Master Hydro (Pvt.) Ltd., Lahore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Hydroelectric power, ESIA</td>
</tr>
<tr>
<td>Year</td>
<td>2018</td>
</tr>
</tbody>
</table>

Master Hydro (Pvt.) Ltd. (MHL) is developing the 99 MW Arkari Gol hydropower project on the Arkari River in Chitral District of the Khyber Pakhtunkhwa province of Pakistan. The project includes a weir, diversion tunnel and powerhouse on the Arkari River before its confluence with the Lutkho River. The Project is currently the subject of a feasibility study, which will evaluate the technical, environmental and socioeconomic factors influencing and arising from the Project. MHL has acquired the services of Hagler Bailly Pakistan to carry out an environmental and social impact assessment (ESIA) and to develop a resettlement action plan (RAP) for the project that meets with applicable federal and provincial laws as well as the environmental performance standards of the International Finance Corporation (IFC) and safeguards of the Asian Development Bank (ADB).

#### Environmental and Social Impact Assessment of Sharmai Hydropower Project

<table>
<thead>
<tr>
<th>Client</th>
<th>Sapphire Electric Company Limited, Lahore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Hydroelectric power, ESIA</td>
</tr>
<tr>
<td>Year</td>
<td>2017-2018</td>
</tr>
</tbody>
</table>

Sapphire Electric Company Limited (SECL) is developing the 150 megawatt (MW) Sharmai Hydropower Project in Khyber Pakhtunkhwa (KP). The proposed Project is a run-of-river project located on Panjkora River in Upper Dir District. In order to assess the impacts of the Project on the surrounding environment and comply with the applicable national environmental regulations and International Finance Corporation sustainability safeguards, SECL acquired the services of Hagler Bailly Pakistan to carry out the Environmental and Social Impact Assessment of the proposed Project.
Environmental and Social Assessment of HUBCO Coal Transfer Jetty

**Client**
Hub Power Station, Islamabad

**Study Type**
Port Development, EIA, Compliance with some IFC Guidelines and WB EHS Standards

**Year**
2015-2018

The Hub Power Company Limited (HUBCO), the owner of the 1,292 MW Hub Power Station located in Hub, Balochistan, planned to install a new 1,200 MW coal-fired power generation unit in the vicinity of its existing power plant. A coal jetty and trestle were planned as associated projects to unload imported coal from ships and transfer to the proposed power plant. As part of regulatory compliance requirements, HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental and social impact assessment (ESIA) of the proposed coal jetty and transfer facility. The ESIA was conducted in accordance with the Balochistan Environmental Protection Act, 2013 and best environmental practice. In the ESIA, a detailed assessment of various issues, such as predicted impacts on marine fish, migratory turtles, fishing, and coastal erosion, were undertaken.

Environmental and Social Impact Assessment of 330 MW Coal-fired Power Project in Thar Block II

**Client**
Siddiqsons Energy Limited, Karachi

**Study Type**
ESIA

**Year**
2017

Siddiqsons Energy Limited intended to establish a 330 MW Thar lignite coal-based power plant in the Energy Park associated with Block II Thar Coalfields in Sindh. Hagler Bailly Pakistan was engaged to conduct an Environmental and Social Impact Assessment for the project for necessary regulatory compliance approvals.

Noise Modeling of Tbilisi-Rustavi Urban Road Link

**Client**
Asian Development Bank (ADB), Manila, Philippines

**Study Type**
Noise modeling and assessment, noise baseline measurements, IFC and Georgian standards

**Year**
2017

The Asian Development Bank is financing the Government of Georgia in constructing the Tbilisi-Rustavi urban road link (Section 2). The length of this section is 6.8 kilometer however, a length of 3.65 kilometer of the road passes very close to several buildings whose occupants registered concerns about potential noise emanating from the road construction activities as well as subsequent increased movement of vehicular traffic on the highway. Asian Development Bank, acquired the services of Hagler Bailly Pakistan to measure existing noise levels in the vicinity to establish a baseline and model noise levels from the planned road development activity. As part of the assignment, various mitigations measures were considered and their impact on the noise levels were assessed. Cost of selected mitigation measures were also determined.

Feasibility Study and Project Development Services and IEE for the Kulachi Solar PV IPP Project

**Client**
Target Energy (Pvt.) Ltd., Islamabad

**Study Type**
Solar power, IEE

**Year**
2017

Target Energy (Pvt.) Ltd., part of a consortium of international investor companies, acquired the services of Hagler Bailly Pakistan to conduct a feasibility study for a 50 MW solar photovoltaic IPP project located near Kulachi in the D. I. Khan district of Khyber Pakhtunkhwa province. The project will provide power to the Peshawar Electric Supply Company (PESCO) at its 132-kV grid station in the vicinity under contract with the Central Power Purchasing Agency Guarantee
Environmental and Social Impact Assessment of Balakot Hydropower Project

Client: Asian Development Bank (ADB), Manila, Philippines

Study Type: Hydroelectric power, ESIA

Year: 2017

The Asian Development Bank (ADB), under its Hydropower Investment Development Program, is financing a 300 MW run-of-river hydropower plant and associated infrastructure located near Balakot in the Mansehra district of Khyber Pakhtunkhwa (KP) province, Pakistan. ADB contracted the services of Hagler Bailly Pakistan to carry out an environmental and social impact assessment (ESIA) of the Balakot Hydropower Project and to establish safeguards frameworks for the environmental review, land acquisition and resettlement for this and other similar projects that ADB is considering sponsoring in AJK. Hagler Bailly Pakistan completed a social and poverty analysis, resettlement plan, biodiversity management plan, climate change risk assessment, and environmental flow assessment as part of its services.

Environmental Impact Assessment of Coal-Fired Power Plant Project

Client: Fauji Fertilizer Bin Qasim Limited (FFBL), Rawalpindi and Fauji Fertilizer Company Limited (FFCL), Rawalpindi

Study Type: EIA, Coal Power Plant, Compliance with National Guidelines

Year: 2016-2017

Fauji Fertilizer Bin Qasim Limited (FFBL) planned to develop a second 220 MW coal-fired power plant project, CCP-2, near its under under construction 118 MW coal power plant (CCP) located within the existing FFBL fertilizer plant complex in the Eastern Industrial Zone of Port Bin Qasim, Karachi. To ensure compliance with environmental regulations and financing requirements, FFBL acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) of the proposed facility. The scope of the EIA included an assessment of the project's impact on ambient air quality, particularly of expected sulfur emissions from coal combustion, traffic, noise and safety issues associated with road transportation of coal to the plant, impact on local ecological and socioeconomic conditions, detailed stakeholder consultations, as well as the preparation of an environmental management plan to address CCP-2 construction and operational issues, such as ash storage, handling, and disposal.

Environmental and Social Impact Assessment of 330 MW Coal-fired Power Project in Thar Block II Energy Park

Client: HUBCO

Study Type: EIA, Coal Power Plant, Compliance with IFC Guidelines and WB EHS Standards

Year: 2016-2017

The Hub Power Company Limited intended to establish a 330 MW lignite coal-fired power plant in the Energy Park associated with Thar Coalfields Block II in the Tharparkar district in southern Sindh, Pakistan. In order to comply with the applicable national environmental regulations, Hub Power engaged Hagler Bailly Pakistan to conduct an environmental and social impact assessment (ESIA) for the project.
## Environmental and Social Impact Assessment of 330 MW Coal-fired Power Plant at Thar Block II Energy Park

**Client**: House of Habib, Karachi  
**Study Type**: EIA, Coal Power Plant  
**Year**: 2016-2017

The House of Habib, a diversified Karachi-based business group, intended to establish a 330 MW lignite coal-fired power plant in the energy park associated with Thar Coalfields Block II in the Tharparkar district in southern Sindh, Pakistan. Hagler Bailly Pakistan was engaged to conduct an environmental and social impact assessment (ESIA) for the project for necessary regulatory compliance approvals.

## Environmental and Social Impact Assessment of the Kohala Hydropower Project

**Client**: Kohala Hydropower Company Limited, Islamabad  
**Study Type**: Hydroelectric power, ESIA  
**Year**: 2016-2017

The Kohala Hydro Company (Pvt) Ltd (KHCL), a wholly owned subsidiary of the China Three Gorges South Asia Investment Ltd. (CSAIL) plans to develop the 1,124-megawatt (MW) Kohala Hydropower Project in Azad Jammu and Kashmir (AJK). The Project consists of a concrete dam on River Jhelum with a height of 69 m, two tunnels with a length of about 17.4 km each to divert water from the reservoir created by the dam to a powerhouse, and a partially underground powerhouse to generate 1100 MW of electric power. China Water Resources Beifang Investigation, Design, and Research Company, the owners’ engineer for the Kohala Hydropower Project being set up by the Kohala Hydro Company, engaged Hagler Bailly Pakistan (HBP) to prepare an Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the Project. The Study Area for the project was classified as Critical Habitat in view of presence of the Critically Endangered Kashmir Catfish that occurs both upstream and downstream of the dam. The ESIA followed the corporate environmental standards of CSAIL, and the IFC Performance Standards. The RAP was prepared in accordance with the requirements of the International Finance Corporation (IFC) and local regulations.

## Rapid Environmental Analysis of 108 MW Golen Gol Hydroelectric Power Project

**Client**: AA Associates-Techno Consult International (JV), Islamabad  
**Study Type**: Exiting EIA Gap analysis, Impact Assessment  
**Year**: 2016-2017

AA Associates-Techno Consult International (JV), as contractor for USAID’s Quick Impact Energy Program, acquired the services of Hagler Bailly Pakistan to conduct a rapid environmental analysis (REA) of project monitoring conducted by the Water and Power Development Authority (WAPDA) of the 108 MW run-of-the-river Golen Gol hydroelectric project in northern Pakistan. Hagler Bailly Pakistan conducted an environmental due diligence of the project to identify key environmental issues, including non-compliance with applicable national and international standards and guidelines, and recommended appropriate measures for the management of associated liabilities.

## Environmental Assessment and Compliance Services for Oil and Gas Exploration and Development Concessions

**Client**: MOL Pakistan Oil and Gas Co. BV, Islamabad  
**Study Type**: Environmental assessments; EIA/IEE  
**Year**: 2010-2016

MOL Pakistan Oil & Gas Co BV contracted Hagler Bailly Pakistan for environmental studies to be executed on a call-on basis. The scope of services included environmental impact assessments, initial environmental examinations, and related studies for MOL’s oil and gas
### Exploration and Production (E&P) Blocks in Pakistan

These included the Tal exploration block and Manzalai development and production lease in Khyber Pakhtunkhwa (KPK) province and the Margalla and Margalla North blocks in Islamabad and surrounding areas of Punjab and KPK. Hagler Bailly Pakistan's assessments were also used by MOL for obtaining the necessary environmental compliance clearances from the KPK Environmental Protection, as well as for developing and maintaining an environmental database of the company's E&P license areas.

### EIA of Regasified Liquefied Natural Gas Combined Cycle Power Plant, Port Qasim, Karachi

| Client | Engro Powergen (Pvt.) Limited, Karachi |
| Study Type | EIA, Gas Power Plant, compliance with standards, baseline measurements, air quality modeling and assessment |
| Year | 2016 |

Engro Powergen Limited (EPL) planned to develop a 450 MW combined-cycle power plant based on Regasified liquefied natural gas at Port Qasim near Karachi, Pakistan. EPL acquired the services of Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of the proposed project which would comply with the regulatory requirements of the Government of Sindh.

The scope of the EIA included conducting baseline studies to characterize the existing social and biophysical environment using primary and secondary data. Public consultations were held to ensure that project stakeholders were informed of the project development plan and provided an opportunity to influence it. As part of the EIA, the environmental and social impacts of the project, both negative and positive, were analyzed and mitigation, management, and monitoring plans were developed for the construction phase of the project.

### Environmental and Social Impact Assessment of Bamiyan Coal Mine Development and Power Plant

| Client | MCC-JCL Aynak Minerals Company, Kabul, Afghanistan |
| Study Type | EIA, Compliance with some IFC Guidelines and WB EHS Standards, ESIA of transmission line |
| Year | 2011-2015 |

MCC-JCL Aynak Mineral Company (MJAM), a subsidiary of Metallurgical Corporation of China, was awarded a contract by the Government of Afghanistan to develop the Aynak copper mines in the northeastern Logar province of the country. In order to meet the requirements of electricity for mining operations, MJAM undertook to develop coal mines in nearby Bamiyan province for setting up a coal-based power plant of 450 MW at the mine site. MJAM acquired the services of Hagler Bailly Pakistan to undertake an environmental and social impact assessment (ESIA) of the mining and power project. The ESIA is mandated under the regulatory requirements of Afghanistan, as well as for meeting the social and environmental performance standards of the World Bank. The baseline study conducted for the ESIA covered ecological surveys during the four annual seasons, hydrological surveys along the Bamiyan River, socioeconomic study focusing on the area around the project site and where resettlement was planned, and baseline studies for noise, traffic, air quality, and water quality at the project site. The ESIA examined the environmental and social issues associated with the project in detail and evaluated potential key impacts on air quality, hydrological resources, socioeconomic environment, archeological resources, along with matters pertaining to community resettlement.
<table>
<thead>
<tr>
<th>Study Type</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal power, Strategic Assessment, Cumulative Impact Assessment, Compliance with some IFC Guidelines and WB EHS Standards</td>
<td>2014-2015</td>
</tr>
</tbody>
</table>

Thar Power Company Limited (TPL) planned to develop an 'Energy Park' in Block II of the Thar Coalfields in Pakistan's Sindh province to accommodate up to six super and subcritical coal-fired power plants with a total power generation capacity of about 3,960 MW. TPL acquired the services of Hagler Bailly Pakistan to conduct a Strategic Environmental and Social Study to assess the potential environmental and social issues associated with the proposed multi-project park. The Study highlighted environmental legislative and regulatory requirements that TPL will have to take into account to develop the energy park; provided strategic environmental decisions to aid in planning and development of the Energy Park; identified critical environmental issues in the early stages of development of the Energy Park such that environment can be incorporated into design and planning, and development of sound environmental management policies; and assessed the cumulative impacts within the regional Thar Coalfields development. The preliminary cumulative impact assessment, following the International Finance Corporation (IFC) Good Practice Handbook on Cumulative Impact Assessment, included assessment of Valued Environmental and Social Components (VECs) identified, including Indigenous Peoples and Livelihood, Biodiversity, Water Resources and Quality, Gender, Mobility on Transportation Routes, and Air Quality.

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental services, copper mining</td>
<td>2011-2014</td>
</tr>
</tbody>
</table>

Tethyan Copper Company Pakistan (Pvt.) Ltd. (TCC), a company jointly owned by Barrick Gold Corporation and Antofagasta Minerals SA, intended to develop a large-scale open pit mining and ore processing operation for the production of copper at Reko Diq, District Chagai, in Pakistan's western Balochistan province. An environmental assessment of the proposed project was completed in 2010. TCC contracted Hagler Bailly Pakistan for the technical assessment of a weather station operated by the Pakistan Meteorological Department (PMD) at Gwadar, acquisition of climatic data from the PMD, checks on data quality, and other environmental services.

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and Social Impact Assessment</td>
<td>2009-2014</td>
</tr>
</tbody>
</table>

MCC-JCL Aynak Mineral Company (MJAM), a subsidiary of Metallurgical Corporation of China, was awarded a contract to develop the Aynak copper mines by the Government of Afghanistan. Aynak is a world-class copper deposit located to the south of Afghanistan's capital, Kabul. MJAM acquired the services of Hagler Bailly Pakistan, in association with SRK Consulting, Australia, to undertake an environmental and social impact assessment (ESIA) of the proposed mining project. The ESIA is mandated under the regulatory requirements of Afghanistan as well as for meeting social and environmental performance standards of the World Bank. The baseline study conducted for the ESIA covers ecological surveys during the four annual seasons, hydrological surveys along the Logar River, socioeconomic study focusing on the area around the mine site and where resettlement is planned, and baseline studies for noise, traffic, air quality, and water quality at the project site. The ESIA examined environmental and social issues with the proposed project in detail, key amongst which were impacts on air quality, hydrological resources, socioeconomic environment, archeological resources, and issues associated with resettlement and acid rock drainage and metal leaching.
## Rapid Environmental Analysis of Run-of-the-River Hydroelectric Power Projects

<table>
<thead>
<tr>
<th>Client</th>
<th>Study Type</th>
<th>Year</th>
</tr>
</thead>
</table>

The United States Agency for International Development (USAID), through its contractor, Advanced Engineering Associates International (AEAI), USA, sought Hagler Bailly Pakistan's services to carry out a rapid environmental analysis of the Duber Khwar and Allai Khwar hydroelectric power projects being built on Duber Khwar River, Kohistan and Allai Khwar River, Batagram, respectively, in northern Pakistan. The services provided by Hagler Bailly Pakistan included a review of relevant documentation, including feasibility studies, environmental impact assessments (EIAs), environmental monitoring and management plans (EMMPs), field visits to assess regulatory compliance, and independent social assessment for both power projects. Hagler Bailly Pakistan also suggested impact mitigation measures considered appropriate for implementation during the construction of the hydroelectric projects as per international environmental safeguards and guidelines.

## Environmental Assessment of 1,320 MW Coal-Fired Power Plant at Port Qasim

<table>
<thead>
<tr>
<th>Client</th>
<th>Study Type</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinohydro (Hong Kong) Holding Limited, Hong Kong</td>
<td>Environmental Impact Assessment</td>
<td>2014</td>
</tr>
</tbody>
</table>

Sinohydro (Hong Kong) Holding Limited, China, hired Hagler Bailly Pakistan's services to undertake an environmental impact assessment (EIA) of a 2x660 MW coal-fired power plant at Port Qasim, Karachi. The proposed development also involved the construction of a short-term ash disposal yard inside the plant and a long-term ash disposal yard outside it; and a coal jetty at the project site with a 280 m-long berth and a capacity to handle a 70,000 DWT vessel.

Hagler Bailly Pakistan's services included the preparation of baseline assessments, public disclosure and stakeholder consultations, impact assessment studies, analysis of alternatives, and preparation of environmental monitoring and management plans in accordance with Pakistan's environmental regulations. Impact assessment studies undertaken included an analysis of the impact of coal combustion and fugitive dust emissions from the ash yards on ambient air quality; and, the impact on marine ecological resources from land reclamation for the proposed project site and dredging works for the shipping lane from Port Qasim to the plant site.

## Preparatory Site Surveys for Thar Coal-Fired Power Plant Project

<table>
<thead>
<tr>
<th>Client</th>
<th>Study Type</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitsui Consultants Co., Ltd., Tokyo, Japan</td>
<td>Site selection study, environmental and social assessment, dispersion modeling</td>
<td>2013-2014</td>
</tr>
</tbody>
</table>

The Government of Japan, under a bilateral agreement, provided assistance to Pakistan for developing the large Thar coalfield in Tharparkar, in the southeast of Sindh province. In this regard, the Japan International Cooperation Agency (JICA) initiated a study through Mitsui Consultants and Nippon Koei Company to develop the feasibility of setting up a supercritical coal-fired power plant utilizing lignite from the Thar coalfield. Mitsui Consultants acquired the services of Hagler Bailly Pakistan to undertake a preparatory survey for the coal-fired power plant project. This included an initial survey of four feasible plant locations, assisting the Mitsui team in selecting one of the four proposed sites, detailed environmental and social surveys of the selected site, and air dispersion modeling of the proposed plant.
Technical Proposal:

Additional Assessments for Regulatory Compliance

Air Quality, Noise and Risk Assessments

<table>
<thead>
<tr>
<th>Client</th>
<th>Wardell Armstrong International, Cornwall, United Kingdom and Oracle Coalfields PLC, Ely, United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>ESIA, coal mining</td>
</tr>
<tr>
<td>Year</td>
<td>2011-2013</td>
</tr>
<tr>
<td>Sindh Carbon Energy Limited, a subsidiary of Oracle Coalfield Limited (Oracle), obtained the license for coal mining in Block VI of Thar Coalfield. Block VI, covering an area of 66 square kilometers is located in the Tharparkar district of Sindh. Wardell Armstrong International (WAI) and Hagler Bailly Pakistan were engaged to conduct the environmental and social impact assessment (ESIA) for the coal mining project, following the national legislation and environmental and social performance standards of the World Bank. Hagler Bailly Pakistan's main responsibilities included assessment of baseline conditions in and around Block VI. Physical, biological and socioeconomic surveys were conducted in the block over one year to capture the seasonal variation particularly in ecological conditions, water resources, community migration patterns, and air quality. Hagler Bailly also assisted in the preparation of the final ESIA. Hagler Bailly Pakistan also provided support to Sindh Carbon Energy Limited in the management of the corporate social responsibility programme.</td>
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<table>
<thead>
<tr>
<th>Client</th>
<th>Fauji Fertilizer Bin Qasim Limited (FFBL), Rawalpindi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>EIA, Power Plant, Compliance with National and some IFC Guidelines and WB EHS Standards</td>
</tr>
<tr>
<td>Year</td>
<td>2013</td>
</tr>
<tr>
<td>Fauji Fertilizer Bin Qasim Limited (FFBL) planned to develop a coal-fired combined steam and power (CSP) project within the existing FFBL fertilizer plant complex located in the Eastern Industrial Zone of Port Bin Qasim, Karachi. In order to comply with environmental regulations and financing requirements, FFBL acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) of the proposed facility. The scope of the EIA included an environmental audit of the existing FFBL fertilizer plant, detailed stakeholder consultations, assessment of the impact on ambient air quality of coal combustion, particularly of expected sulfur emissions, traffic, noise and safety issues associated with road transportation of coal to the plant, project impact on local ecological and socioeconomic conditions, and the preparation of an environmental management plan to address CSP plant construction and operational issues, such as ash storage, handling, and disposal.</td>
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<table>
<thead>
<tr>
<th>Client</th>
<th>Asian Development Bank (ADB), Manila, Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>EIA, Power Plant, Compliance with National and some IFC Guidelines and WB EHS Standards</td>
</tr>
<tr>
<td>Year</td>
<td>2013</td>
</tr>
<tr>
<td>The Asian Development Bank (ADB) hired Hagler Bailly Pakistan's services to undertake an environmental impact assessment (EIA) of a proposed 1,200 MW coal-fired thermal power plant at Jamshoro in Pakistan's Sindh province. These services included preparation of baseline assessments, public disclosure and stakeholder consultations, impact assessments, analysis of alternatives, and preparation of environmental monitoring and management plans, in accordance with the requirements of ADB safeguards and Pakistan's environmental regulations. A detailed air quality impact study was conducted based on the USEPA's AERMOD air dispersion model.</td>
<td></td>
</tr>
</tbody>
</table>
### Environmental Impact Assessment of Coal-fired Power Plant at Hub

**Client**
Hub Power Station, Islamabad

**Study Type**
EIA, Power Plant, Compliance with IFC Guidelines and WB EHS Standards

**Year**
2013

The Hub Power Company Limited (HUBCO), the owner of the 1,292 MW Hub Power Station located in Hub, Balochistan, planned to install a new coal-fired power generation plant in the vicinity of its existing power plant. As part of regulatory compliance requirements, HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) of the proposed project. The EIA was conducted in accordance with the Balochistan Environmental Protection Act, 2013, and its subservient regulations, such as those regarding review of initial environmental examination and environmental impact assessment. The scope of the EIA included assessing the environmental and social impact of construction activities, including on-site civil works, installation of equipment, on-site coal yard, ash storage, and coal and ash transfer systems. It also considered the disposal of fly ash, bottom ash and gypsum, and the incremental impact of cooling wastewater disposal on the receiving water body. The EIA also considered the impacts of gaseous emissions on ambient air quality during the operation of the new plant. Air quality impact studies included baseline data assessment and modeling and impact assessments based on three different possible coal specifications, two different stack heights, and two different possible plant locations.

### Environmental and Social Impact Assessment of Coal-fired Power Plant at Thar

**Client**
Engro Powergen (Pvt.) Limited, Karachi and Sinocoal International Engineering Design and Research Institute, Beijing, China

**Study Type**
EIA, Compliance with some IFC Guidelines and WB EHS Standards

**Year**
2012-2014

Engro PowerGen planned to install a 1,200 MW coal-fired power plant near Islamkot in Tharparker district in southern Sindh, Pakistan. Engro hired the services of Hagler Bailly Pakistan to undertake an environmental and social impact assessment (ESIA) of the power project, in accord with the regulatory requirements of the Sindh Environmental Protection Agency. The ESIA was conducted in tandem with an ongoing ESIA of the coal field development plan. The key issues that were addressed in the study included the impact of gaseous emission on ambient air quality, socioeconomic impact of the project, particularly that of the influx of labor from outside the area, effect on the area’s ecological resources, impact of local cooling water sourcing and wastewater discharges, and issues related to noise and traffic expected to be generated. A detailed public consultation was conducted to identify major issues and stakeholder concerns which were incorporated and addressed in the ESIA report.

### Environmental Impact Assessment of Reko Diq Copper Mining Operations

**Client**
Tethyan Copper Company Pakistan (Pvt.) Ltd. (TCC), Islamabad

**Study Type**
EIA, Large-scale Development, World Bank EHS, IFC Performance Standards, Multi-Stage Stakeholder Consultations, 600-km corridor of impact in pristine area.

**Year**
2007-2012

Tethyan Copper Company Pty Limited (TCC), a company jointly owned by Barrick Gold Corporation and Antofagasta Minerals SA, intended to develop a large-scale open pit mining and ore processing operation for the production of copper from the world-class deposits found at Reko Diq, District Chagai, in Pakistan’s western Balochistan province. To ensure that the activities envisaged by TCC complied with the relevant environmental legislation of Pakistan as well as the environmental guidelines of the International Finance Corporation (IFC), TCC procured the services of SRK Consulting (UK) Ltd. and Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of the proposed project and associated developments.
Environmental Assessment of Boiler Retrofits at 1,200 MW Bin Qasim Power Plant

Client: Karachi Electric Supply Company Limited (KESC), Karachi
Study Type: Environmental Impact Assessment
Year: 2012

Karachi Electric Supply Company (KESC) planned to replace four furnace oil-fired boilers with coal-fired boilers at its 1,200 MW Bin Qasim Power Plant located in Karachi. KESC hired services of Hagler Bailly Pakistan to conduct an environmental impact assessment of the project to comply with national legal requirements and the Equator Principles. The scope of work included environmental audit of existing plants, detailed stakeholder consultations, and baseline studies on socioeconomic, traffic, water quality, air quality and ecological conditions at the site.

Initial Environmental Examination of Makori 3 Development Well

Client: MOL Pakistan Oil and Gas Co. BV, Islamabad
Study Type: Initial Environmental Examination
Year: 2009-2012

MOL Pakistan intended to drill the Makori 3 Development Well at the Makori Field, located in Kohat district, Northwest Frontier Province (NWFP) of Pakistan. MOL contracted Hagler Bailly Pakistan to carry out an initial environmental examination (IEE) of the proposed drilling activities for submission to the provincial Environmental Protection Agency.

Environmental and Social Impact Studies of Thar Block II Coal Project

Client: Sindh Engro Coal Mining Company, Pakistan
Study Type: EIA, Power Plant, Compliance with National and some IFC Guidelines and WB EHS Standards
Year: 2009-2011

The Sindh Engro Coal Mining Company Limited (SECMC), a joint-venture company of Engro PowerGen Ltd. and the Government of Sindh, intended to develop an open-pit mine in Block II of the Thar Coal Field located in the Tharparker district in southern Sindh, Pakistan. As a part of the initial phase of project development, SECMC engaged Hagler Bailly Pakistan and SRK Consulting, UK, to conduct environmental and social investigations to support the preparation of a feasibility study for the project, and to provide inputs for an environmental and social impact assessment (ESIA) for the project, scheduled for completion during the project's second phase. The studies were conducted in conformity with Pakistani legislation and guidelines of the World Bank. The scope of services provided by Hagler Bailly Pakistan, with support from SRK Consulting, included preparation of physical, social, and ecological baselines, scoping consultations to identify major issues and stakeholder concerns, preparation of a preliminary resettlement plan, identification and assessment of significant impacts and corresponding mitigation measures, and estimation of mitigation costs to be included in the economic evaluation of the project.

Sampling and Analysis of Ambient Air and Stack Gases

Client: Pakistan Cement Company Limited, Islamabad
Study Type: Ambient air, stack emissions and effluent sampling and analysis
Year: 2008

Pakistan Cement Company Limited (PCCL), a cement manufacturing plant located in Chakwal district in northern Pakistan and owned by Egypt's Orascom, required measurement of pollutant concentrations in ambient air, gaseous emissions, and wastewater discharges from various
sources at the facility. These environmental performance data were to be submitted to the Punjab Environmental Protection Agency under Self-Monitoring and Reporting (SMART) regulations, for which Hagler Bailly Pakistan was contracted to undertake plant-wide stack and effluent samples and analyses.

### Site Selection for MOL’s Central Oil and Gas Processing Facility

<table>
<thead>
<tr>
<th>Client</th>
<th>MOL Pakistan Oil and Gas Co. BV, Islamabad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Site selection studies in KP</td>
</tr>
<tr>
<td>Year</td>
<td>2005-2007</td>
</tr>
</tbody>
</table>

MOL Pakistan planned to construct a central processing facility to handle oil and gas production from its Makori and Manzalai fields in the Kohat and Karak Districts in northern Pakistan. Hagler Bailly Pakistan was contracted to undertake a site selection study for the proposed facility, taking into account various economic, environmental, and safety considerations.

### Additional Studies for Site Selection of Central Processing Facility

<table>
<thead>
<tr>
<th>Client</th>
<th>MOL Pakistan Oil and Gas Co. BV, Islamabad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Site selection studies in KP</td>
</tr>
<tr>
<td>Year</td>
<td>2006</td>
</tr>
</tbody>
</table>

MOL Pakistan employed Hagler Bailly Pakistan to conduct additional studies for the selection of a suitable site for its central processing facility (CPF) to handle oil and gas production from the Makori and Manzalai fields in the Kohat and Karak districts of northwest Pakistan. Recommendation: This assignment is an extension of the work undertaken under the project code PFM and, therefore, should not be entered separately in the brochure.

### Initial Environmental Examination of Intergen Power Plant

<table>
<thead>
<tr>
<th>Client</th>
<th>Wartsila Diesel, Pakistan and Elan Partners, Islamabad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>IEE, power plant, environmental assessment in KP</td>
</tr>
<tr>
<td>Year</td>
<td>2005</td>
</tr>
</tbody>
</table>

Wartsila Corporation engaged Hagler Bailly Pakistan to conduct an initial environmental examination (IEE) for a 160 MW power plant near the town of Lachi, in the Kohat District of the Northwest Frontier Province in Pakistan. The power plant proponent, Intergen (Pvt.) Ltd., is a joint venture between Wartsila and Interconstruct (Pvt.) Ltd., a local construction company.

### Environmental Impact Assessment of Duddar Lead-Zinc Mining Project

<table>
<thead>
<tr>
<th>Client</th>
<th>MCC Resources Development Company (Pvt.) Limited (MRDL), Karachi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>EIA, lead-zinc mining, environmental assessment in KP</td>
</tr>
<tr>
<td>Year</td>
<td>2004</td>
</tr>
</tbody>
</table>

The MCC Resources Development Company (Pvt) Limited (MRDL), a subsidiary of the state-owned Metallurgical Construction Corporation of China, intended to mine lead and zinc deposits in Duddar in Pakistan's southwestern province of Balochistan for which the necessary mining infrastructure needed to be developed. MRDL engaged Hagler Bailly Pakistan to carry out an environmental impact assessment of the proposed construction and operational activities related to the project.
Appendix A: Resumes of Proposed Project Team

See following pages.
## Vaqar Zakaria

| 1. Title | Project Advisor |
| 2. Name of Firm | Hagler Bailly Pakistan |
| 3. Name of Expert | Vaqar Zakaria |
| 4. Date of Birth | March 17, 1952 | Citizenship: Pakistan |
| 5. Education | Degree | Date | Institution |
| | MS (Chemical Engineering) | 1975 | Massachusetts Institute of Technology, USA |
| | BS (Chemical Engineering) | 1974 | Massachusetts Institute of Technology, USA |
| 6. Membership in Professional Associations | ▪ Member, Pakistan Institute of Chemical Engineers |
| | ▪ Registered with Pakistan Engineering Council |
| | ▪ President, Himalayan Wildlife Foundation |
| 7. Other Training | – |
| 8. Countries of Work Experience | Pakistan, Nepal, Georgia, Afghanistan, Kyrgyzstan, Egypt, USA |
| 9. Languages | Language | Reading | Writing | Spoken |
| | English | Excellent | Excellent | Excellent |
| | Urdu | Good | Good | Good |
| | Punjabi | Good | Fair | Fair |
| 10. Employment Record | From: 1990 | To: Present |
| Employer: | Hagler Bailly Pakistan |
| Position Held: | Managing Director |
| From: 1986 | To: 1990 |
| Employer: | RCG/Hagler Bailly, Inc./ Pakistan’s National Energy Conservation Program (ENERCON) |
| Position Held: | Senior Associate/ Senior Industrial Consultant |
| From: 1982 | To: 1986 |
| Employer: | Attock Refinery Ltd., Pakistan |
| Position Held: | Senior Engineer |
| From: 1978 | To: 1982 |
| Employer: | Descon Engineering, Pakistan |
| Position Held: | Deputy Project Manager |
| From: 1975 | To: 1977 |
| Employer: | Energy Resources Co., Inc., USA |
| Position Held: | Senior Scientist |
From: 1974  
To: 1975  
Employer: MIT Energy Laboratory, USA  
Position Held: Research Associate

11. Task Areas  12. Details of Work Undertaken

- Project Advisor  
- Technical Support

Environmental and Social Due Diligence for Expansion of Engro Fertilizer Plants, 2019, Daharki, Sindh, CDC Group plc, London, United Kingdom: Project Advisor

CDC Group PLC considered a debt investment in fertilizer manufacturing plants owned and operated by Engro Fertilizer at Daharki in Pakistan’s Sindh province. The planned upgrades included replacing a waste heat boiler, which was required to increase energy efficiency for existing fertilizer plants. Hagler Bailly Pakistan was engaged as the lender’s independent environmental and social advisor to conduct environmental and social (E&S) due diligence against applicable local, national and international environmental and social legislation, IFC Performance Standards and World Bank Environmental, Health and Safety Guidelines. The E&S assessment included consideration of the entire operations of both plants as well as the planned upgrades.

As Project Advisor, provided guidance on the development of methodologies and recommendations for environmental and social due diligence report in line with IFC Performance Standards.

- Team Leadership  
- Project Advisor  
- Environmental and Social Management Systems Development


Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooriabad Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL’s investment into a new Plant. To support PCL’s ability to comply with DEGs’ environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an advisory, and provide support in development of an Environment and Social Management System, underlying plans and procedures.

As Project Advisor, provided guidance and leadership to the teams for the development of environmental and social management system and reviewed the plans and underlying standard operating procedures.
Power Cement Limited (PCL), a subsidiary of the Arif Habib Group, operates a cement manufacturing plant in the Nooriabad Industrial Area near Jamshoro in Pakistan's Sindh province. PCL plans to construct a second cement plant with a capacity of 7,700 tonnes per day within the premises of the existing facility. The Arif Habib Group is in discussions with Deutsche Investitions- und Entwicklungsgesellschaft (DEG), a German development finance institution, regarding debt financing for PCL's investment in the new plant. To support PCL's ability to comply with DEG's environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan to carry out a water vulnerability study to characterize the impact of pumping groundwater by the new project and to evaluate future water availability risks to PCL's operation in the medium term (20-30-year perspective).

Provided technical guidance to the project team in the development and implementation of baseline assessment of water use, supply and quality for community and industrial users.

Hyundai Nishat Motor (Pvt) Ltd., a joint venture of Sojitz Corporation, Japan and Nishat Group, Pakistan planned to establish a Plant to assemble and distribute vehicles of Hyundai Motor Corporation in Pakistan. The Plant will be built within Plot No. 172 to 208 in M3 Faisalabad Industrial Estate (FIE) developed by Faisalabad Industrial Estate Development and Management Company (FIEDMC). In order to comply with the applicable national environmental regulations, conditions of environmental approval granted by Punjab EPA, EMP and EIA of the Plant and best international practices such as Performance Standards (PS) of International Finance Corporation (IFC) and PS of Multilateral Investment Guarantee Agency (MIGA), the Client acquired the services of Hagler Bailly Pakistan (Pvt.) Ltd., for development of Environmental and Social Management System and Organizational Health and Safety Management System in conformity to ISO 14001 and OHSAS 18001 in mind for certification.

Provided guidance and technical support to the teams for the development of environmental and social management system and organizational health and safety management system.

The project developed a noise assessment report on Tbilisi-Rustavi Urban Road Link which included establishment of baseline noise levels and prediction of operational noise levels from the planned road development activity for one building along Section 2.

Provided technical guidance in developing noise assessment methodology, evaluating and contouring the modeled results and recommending the appropriate mitigation measures. Managed
resource deployment, quality and budget control and communication with client and lenders.

- **Technical Advisor**  
  Noise Modeling of Bishkek Osh-Road, 2017-2018, EPTISA Servicios de Ingeniería, S.L, Spain, Technical Advisor
  The project developed a noise assessment report for the front dwellings from the upgradation of Bishkek-Osh Road. Assessment included establishment of baseline noise levels and estimation of construction and operational noise levels in three future scenarios; year 5, 10 and 15 after the road comes in operation. The project is in consistent with national (Kyrgyzstan) and international (International Finance Corporation) standards. Provided technical guidance in developing noise assessment methodology, evaluating and contouring the modeled results and recommending the appropriate mitigation measures.

- **Project Advisor**  
  The Siddiqsons Energy Limited intended to establish a 330 MW Thar lignite coal-based power plant in the Energy Park associated with Block II Thar Coalfields in Sindh. Hagler Bailly Pakistan was engaged to conduct an Environmental and Social Impact Assessment for the project for necessary regulatory compliance approvals. Provided technical supervision and advisory, assisted impact assessment and reviewed monitoring reports.

- **Technical Advisor**  
  Noise Modeling of Tbilisi-Rustavi Urban Road Link, 2017, Asian Development Bank (ADB), Manila, Technical Advisor
  The project developed a noise assessment report on Tbilisi-Rustavi Urban Road Link which included establishment of baseline noise levels of the area and prediction of operational noise levels from the planned road development activity. Provided technical guidance in developing noise assessment methodology, evaluating and contouring the modeled results and recommending the appropriate mitigation measures. Managed resource deployment, quality and budget control and communication with client and lenders.

- **Project Management**  
  EIA of Regasified Liquefied Natural Gas Combined Cycle Power Plant, Port Qasim, Karachi, 2016, Engro Powergen (Pvt.) Limited, Karachi: Project Manager
  Engro Powergen Limited (EPL) planned to develop a 450 MW combined-cycle power plant based on Regasified liquefied natural gas at Port Qasim near Karachi, Pakistan. EPL acquired the services of Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of the proposed project which would comply with the regulatory requirements of the Government of Sindh.
  The scope of the EIA included conducting baseline studies to characterize the existing social and biophysical environment using primary and secondary data. Public consultations were held to ensure that project stakeholders were informed of the project development plan and provided an opportunity to influence it. As part of the EIA, the environmental and social
Impacts of the project, both negative and positive, were analyzed and mitigation, management, and monitoring plans were developed for the construction phase of the project. As a Project Manager, managed the complete project from client liaison to task allocation to tasks completion to project completion. Provided technical guidance to Project Teams in assessing baseline conditions, identifying and quantifying the impacts and recommending appropriate mitigation and management measures.

<table>
<thead>
<tr>
<th>Technical Advisor</th>
<th>Updating of the Batumi Bypass Environmental Impact Assessment Report, 2016, Roads Department, Georgia and Asian Development Bank (ADB), Manila, Technical Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance to Air and Noise Baseline Measurements and Interpretation</td>
<td>The 81-km Poti–Batumi–Sarpi Road along the western coast of Georgia that is connected to the important towns Batumi, Poti and Kobuleti is heavily congested. The Government of Georgia plans to construct two roads around Batumi and Kobuleti to bypass the highway traffic from these towns as “Batumi Bypass.” An updated environmental impact assessment (EIA) was prepared for Batumi Bypass in continuation of the previous study already carried out for this section. However, wherever necessary new baseline data collection (including air, water and soil quality sampling and measurements of noise levels), stakeholder consultation, and assessment has been done, especially with regards to the new technology and scope of operation. The EIA process follows the relevant national (Georgian Laws) and international requirements (ADB safeguard policies).</td>
</tr>
<tr>
<td>Technical Support during Air and Noise Modeling</td>
<td>Provided technical guidance and direction to a multidisciplinary team of experts with focus on air and water quality, noise assessment and ecology, managed quality control and communication with stakeholders and lenders.</td>
</tr>
<tr>
<td>Review Air and Noise Assessments and Reports</td>
<td></td>
</tr>
<tr>
<td>Quality Assurance</td>
<td></td>
</tr>
</tbody>
</table>

| Cumulative Impact Assessment | Cumulative Impact Assessment of Faisalabad-Khanewal (M-4) Motorway, 2015-2016, Asian Development Bank (ADB), Manila, Team Leader |
| Team Leadership | The project developed a cumulative impact assessment (CIA) for 184-kilometer-long Faisalabad to Khanewal (M-4) motorway in consistent with the updated environmental assessment guidelines of the ADB. The CIA included scoping consultations with stakeholders, identification, and prioritization of valued environmental and social components (VECs), assessment of the impact of the project on VECs, and the establishment of mitigation measures for the management of such impacts. As a Team Leader was responsible for management and review of all expert studies conducted for the CIA. These included regulatory reviews, stakeholder consultations, specialist technical inputs to impact assessment; noise and air quality modelling and assessment, supervision of the assessment of ecological resources and VECs and devising mitigation measures to reduce the potential impact of the project. |
| Technical Guidance to Air Dispersion Assessment | |
| Report Review | |
| Quality Assurance | |

| Team Leadership | Environmental Assessment of 2x660 MW Coal-Fired Power Plant at Port Qasim, 2014-2015, Port Qasim, Karachi, Sinohydro (Hong Kong) Holding Limited, Hong Kong: Team Leader |
| Environmental Impact Assessment | Sinohydro (Hong Kong) Holding Limited, China, hired Hagler Bailly Pakistan’s services to undertake an environmental impact assessment (EIA) of a 2x660 MW coal-fired power plant at Port |
| Technical Support to Baseline Methodologies for air, water, noise, ecology and social | Qasim, Karachi. The proposed development also involved the construction of a short-term ash disposal yard inside the plant and a long-term ash disposal yard outside it; and a coal jetty at the project site with a 280 m-long berth and a capacity to handle a 70,000 DWT vessel. Hagler Bailly Pakistan's services included the preparation of baseline assessments, public disclosure and stakeholder consultations, impact assessment studies, analysis of alternatives, and preparation of environmental monitoring and management plans in accordance with Pakistan's environmental regulations. Impact assessment studies undertaken included an analysis of the impact of coal combustion and fugitive dust emissions from the ash yards on ambient air quality; and, the impact on marine ecological resources from land reclamation for the proposed project site and dredging works for the shipping lane from Port Qasim to the plant site. Mr Zakaria reviewed the scope, methodologies, and reports prepared for baseline assessments, public disclosure and stakeholder consultations, impact assessment studies, analysis of alternatives, and environmental monitoring and management plans in accordance with Pakistan's environmental regulations. Impact assessment studies included an analysis of the impact of coal combustion and fugitive dust emissions from the ash yards on ambient air quality: and, the impact on marine ecological resources from land reclamation for the proposed project site and dredging works for the shipping lane from Port Qasim to the plant site. |
| Supervision of Air Dispersion Modeling Methodologies and Outputs | | |
| Cumulative Impact Assessment | | |
| Report Review | | |
| Quality Control | | |
| ------ | | |
| Team Advisor | The International Finance Corporation (IFC), the private sector arm of the World Bank Group, planned on investing in the Elengy liquefied natural gas (LNG) terminal at Port Qasim near Karachi, Pakistan. Port Qasim Authority (PQA) plans to add another 11 jetties at the facility with possible IFC investments. As a strategic ESIA (SESIA) had not been undertaken during the earlier planning stage for the port, IFC contracted the services of Hagler Bailly Pakistan to conduct a priority ecosystem service review (PESR) and a cumulative impact assessment (CIA) for all current and planned operations at Port Qasim. The PESR and CIA were prepared according to local regulatory requirements, IFC Performance Standards and applicable WBG environment, health and safety (EHS) guidelines. Provided overall technical direction and guidance to the teams for assessing water quality, geochemistry, air quality, aquatic ecology, mangroves, ports and industrial design, socioeconomic and livelihood and gender and development of baseline status of VECs, cumulative impact assessment, mitigation and management planning. In addition, provided quality control for reporting and recommendations for investments, and designed frameworks and institutional development and financial management to ensure sustainability. |
| Team Advisor | Environmental Assessment and Resettlement Framework for Coal Transportation between Port and Railway Terminal, 2015-2016, Nippon Koei Company Ltd.: Team Advisor |
The Government of Pakistan planned to set up a 660 MW ultra-supercritical coal-fired power plant at Lakhra in the Jamshoro district of Sindh province in Pakistan, financed by the Japan International Cooperation Agency (JICA) and other international financial institutions. The project, upon completion, entails the transportation of two million tons of imported coal to the proposed power plant annually by railway after unloading at Port Qasim near Karachi. Although unloading facilities from ships, a coal stockyard, and a dedicated jetty with coal conveyor belt are under construction at the Pakistan International Bulk Terminal (PIBT), connection facilities to the Pakistan Railway mainline and loading facilities for railway wagons at the terminal do not currently exist.

JICA engaged Nippon Koei Company to carry out a feasibility study for coal transportation between the stockyard and nearby railway line, and acquired the services of Hagler Bailly Pakistan for developing an environmental impact assessment (EIA) and resettlement policy framework (RPF) for the proposed bulk coal transfer facility.

Provided overall technical direction and quality control, methodology development with focus on ecology, technical reviews, and management of technical team.

- **Team Leadership**
  - Environmental and Social Assessment of HUBCO Coal Transfer Jetty, 2015, Hub Power Station, Islamabad: Team Advisor

- **Cumulative Impact Assessment**
  - The Hub Power Company Limited (HUBCO), the owner of the 1,292 MW Hub Power Station located in Hub, Balochistan, planned to install a new 1,200 MW coal-fired power generation unit in the vicinity of its existing power plant. A coal jetty and trestle were planned as associated projects to unload imported coal from ships and transfer to the proposed power plant. As part of regulatory compliance requirements, HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental and social impact assessment (ESIA) of the proposed coal jetty and transfer facility. The ESIA was conducted in accordance with the Balochistan Environmental Protection Act, 2013 and best environmental practice. In the ESIA, a detailed assessment of various issues, such as predicted impacts on marine fish, migratory turtles, fishing, and coastal erosion, were undertaken.
  - Provided technical supervision and advisory, assisted impact assessment and reviewed monitoring reports

- **Technical Support and Guidance**
  - Strategic Environmental and Social Study for the Thar Block II Energy Park, 2014-2015, Sindh Engro Coal Mining Company, Pakistan: Team Advisor

- **Strategic Environmental Assessments**
  - Hagler Bailly Pakistan conducted a Strategic Environmental and Social Study to assess the potential environmental and social issues associated with an 'Energy Park' planned in Block II of the Thar Coalfields in Pakistan's Sindh province proposed multi-project park. The preliminary cumulative impact assessment, followed the International Finance Corporation (IFC) Good Practice Handbook on Cumulative Impact Assessment, including assessment of Valued Environmental and Social Components (VECs).
  - Provided technical supervision and advisory, assisted impact assessment and reviewed environmental assessment reports
<table>
<thead>
<tr>
<th>Technical Guidance</th>
<th>Environmental and Social Impact Assessment for Coal Mining and Coal-Fired Power Plant in Thar Coal Block IIIA and IIIB, 2015-2016, Asia Power Group, Perth, United Kingdom: Technical Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Assessment</td>
<td>Asia Power Limited (APL), part of the Asia Power Group (APG), intended to develop an open-pit coal mine and coal-fired power plant in Blocks IIIA and IIIB of the Thar Coalfields located in the Tharparkar district in southern Sindh, Pakistan. APL hired Hagler Bailly Pakistan (Pvt.) Ltd. to carry out the Environmental and Social Impact Assessment for the developments. Specialist studies on geochemistry and hydrogeology were carried out by SRK Consulting (SRK), United Kingdom. Provided technical supervision and advisory, assisted impact assessment and reviewed environmental assessment reports.</td>
</tr>
<tr>
<td></td>
<td><strong>Team Advisor</strong> <strong>Technical Assistance</strong> <strong>Cumulative Impact Assessment</strong></td>
</tr>
<tr>
<td></td>
<td>Environmental and Social Assessment of HUBCO Coal Transfer Jetty, 2015, Hub Power Station, Islamabad: Team Advisor</td>
</tr>
<tr>
<td></td>
<td>The Hub Power Company Limited (HUBCO), the owner of the 1,292 MW Hub Power Station located in Hub, Balochistan, planned to install a new 1,200 MW coal-fired power generation unit in the vicinity of its existing power plant. A coal jetty and trestle were planned as associated projects to unload imported coal from ships and transfer to the proposed power plant. As part of regulatory compliance requirements, HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental and social impact assessment (ESIA) of the proposed coal jetty and transfer facility. The ESIA was conducted in accordance with the Balochistan Environmental Protection Act, 2013 and best environmental practice. In the ESIA, a detailed assessment of various issues, such as predicted impacts on marine fish, migratory turtles, fishing, and coastal erosion, were undertaken. Provided technical supervision and advisory, assisted impact assessment and reviewed environmental assessment reports.</td>
</tr>
<tr>
<td></td>
<td><strong>Project Management</strong> <strong>Team Leadership</strong> <strong>Environmental Impact Assessment</strong> <strong>Air Dispersion Modeling Supervision</strong> <strong>Quality Assurance</strong></td>
</tr>
<tr>
<td></td>
<td>Engro PowerGen planned to install a 1,200 MW coal-fired power plant near Islamkot in Tharparkar district in southern Sindh, Pakistan. Engro hired the services of Hagler Bailly Pakistan to undertake an environmental and social impact assessment (ESIA) of the power project, in accord with the regulatory requirements of the Sindh Environmental Protection Agency. The ESIA was conducted in tandem with an on-going ESIA of the coal field development plan. The key issues that were addressed in the study included the impact of gaseous emission on ambient air quality, socioeconomic impact of the project, particularly that of the influx of labor from outside the area, effect on the area's ecological resources, impact of local cooling water sourcing and wastewater discharges, and issues related to noise and traffic expected to be generated. A detailed public consultation was...</td>
</tr>
</tbody>
</table>
conducted to identify major issues and stakeholder concerns which were incorporated and addressed in the ESIA report.

As a Project Manager, managed the complete project from client liaison to team allocation to tasks completion to project completion. Provided technical guidance to Project teams in assessing baseline conditions, identifying and quantifying the impacts and recommending appropriate mitigation and management measures.

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<tr>
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<tbody>
<tr>
<td>Technical Guidance</td>
<td>Saif Power Ltd (SPL) operates a 225 MW combined cycle thermal power plant in the Sahiwal district of Punjab province in Pakistan.</td>
</tr>
<tr>
<td>Review Baseline Measurement Methodologies</td>
<td>SPL engaged Hagler Bailly Pakistan to conduct an air quality assessment to evaluate the potential impact of a new power plant proposed by the Government of the Punjab close to the existing SPL plant. The assessment conducted included a baseline evaluation of existing concentrations of pollutants, including sulfur dioxide, nitrogen oxides and particulate matter, as well as predicted increase of these pollutants in ambient air in the event of the additional power plant becoming operational.</td>
</tr>
<tr>
<td>Supervise Air Dispersion Modeling</td>
<td>Provided technical supervision and advisory, assisted impact assessment methodologies and outputs and reviewed air dispersion modeling report for quality assurance.</td>
</tr>
<tr>
<td>Quality Control</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Team Advisor</th>
<th>Environmental Impact Assessment of Coal-fired Power Plant at Hub, 2013, Hub Power Station, Islamabad: Team Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Studies</td>
<td>HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) for installation of a new coal-fired power generation plant in the vicinity of its existing power plant (1,292 MW Hub Power Station) located in Hub.</td>
</tr>
<tr>
<td>Environmental Impact Assessment</td>
<td>Provided technical supervision and advisory, assisted impact assessment and mitigation and monitoring plans and reviewed environmental assessment report.</td>
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<tbody>
<tr>
<td>Team Leadership</td>
<td>The Asian Development Bank (ADB) hired Hagler Bailly Pakistan's services to undertake an environmental impact assessment (EIA) of a proposed 1,200 MW coal-fired thermal power plant at Jamshoro in Pakistan's Sindh province. These services included preparation of baseline assessments, public disclosure and stakeholder consultations, impact assessments, analysis of alternatives, and preparation of environmental monitoring and management plans, in accordance with the requirements of ADB safeguards and Pakistan's environmental regulations. A detailed air quality impact study was conducted based on the USEPA's AERMOD air dispersion model.</td>
</tr>
<tr>
<td>Cumulative Impact Assessment</td>
<td>Provided technical supervision and advisory, assisted impact assessment and mitigation and monitoring plans and reviewed environmental assessment report.</td>
</tr>
</tbody>
</table>
- **Team Leadership**
  - **Cumulative Impact Assessment**

  MJAM acquired the services of Hagler Bailly Pakistan, in association with SRK Consulting, Australia, to undertake an environmental and social impact assessment (ESIA) of the Aynak copper mines located south of Afghanistan's capital, Kabul.

  Managed and lead the overall project in completing the project. Provided technical guidance for hydrological surveys along the Logar River, socioeconomic studies, stakeholder engagement and consultation, and baseline studies for water quality and water use in the project area. Examined environmental and social issues key amongst which were impacts on hydrological resources in the basin, surface and groundwater modeling, socioeconomic environment, and issues associated with acid rock drainage and metal leaching.

- **Project Management**
  - **Impact Assessment**

  Tethyan Copper Company Pty Limited (TCC) procured the services of Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of Reko Diq Copper Mining Operations and associated developments, including extraction of water, transportation of refined products, and storage and handling of the products at the ports for export shipments. The services provided by Hagler Bailly Pakistan focused on establishment of an environmental and social baseline, conducting public consultation, carrying out resource assessment studies, advising on impact assessments and mitigation, and assisting the client in obtaining environmental permits and approvals.

  The services supervised by Mr Zakaria focused on development of the environmental (air, noise, water) and social baseline, conducting public consultation, carrying out resource assessment studies, advising on impact assessments and mitigation, and assisting the client in obtaining environmental permits and approvals. Mr Zakaria also supervised collection of data on ecological resources at Gwadar as well as Port Qasim where options for port terminals for export of copper concentrate were being considered.

13. **Certification**

   I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

   [Signature of Expert]
<table>
<thead>
<tr>
<th>1. <strong>Title</strong></th>
<th>Senior Technical Manager (Water and Environment Engineering)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. <strong>Name of Firm</strong></td>
<td>Hagler Bailly Pakistan</td>
</tr>
<tr>
<td>3. <strong>Name of Expert</strong></td>
<td>Bilal Khan</td>
</tr>
<tr>
<td>4. <strong>Date of Birth</strong></td>
<td>January 24, 1985</td>
</tr>
<tr>
<td>5. <strong>Education</strong></td>
<td><strong>Degrees</strong></td>
</tr>
<tr>
<td></td>
<td>BSc (Geology)</td>
</tr>
<tr>
<td></td>
<td>BEng (Environmental)</td>
</tr>
<tr>
<td>6. <strong>Membership in Professional Associations</strong></td>
<td>▪ Member, Institute of Engineers Australia (Civil, Environmental, Leadership and Management)</td>
</tr>
<tr>
<td></td>
<td>▪ Member, International Association for Impact Assessment</td>
</tr>
<tr>
<td>7. <strong>Other Training</strong></td>
<td>▪ ASTM RA and RBCA Webinar Certificate Track 2018 (ongoing)</td>
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<td></td>
<td>▪ Solute and Reactive Transport Modelling (MODFLOW, MT3DMS, PHREEQC), National Center for Groundwater Research and Training, Sydney, 2013</td>
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<td></td>
<td>▪ Second International (Mathematical) Optimization School, Canberra, 2013</td>
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<td>▪ Writing Technical Documents, Engineers Australia, 2012</td>
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<td></td>
<td>▪ Geological Modelling using Leapfrog Hydro, SRK Perth, 2011</td>
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<td>8. <strong>Countries of Project Experience</strong></td>
<td>Pakistan, Australia, Georgia, Nepal, South Africa, Papua New Guinea, Indonesia, Brazil, Russia</td>
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<td>2005</td>
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11. Task Areas

<table>
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<th>12. Details of Work Undertaken</th>
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<tbody>
<tr>
<td>▪ Project Management</td>
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<tr>
<td>▪ Report Review</td>
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<tr>
<td>▪ Hydrology</td>
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<tr>
<td>▪ Climate</td>
</tr>
<tr>
<td>▪ Public Health</td>
</tr>
<tr>
<td>▪ Water and environmental engineering</td>
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</tbody>
</table>
consensus on desirable outcomes in the long term for the Ravi river in the context of sustainable development, along with setting up an analytic decision support framework to decide among a catalogue of intervention options. Finally, a revitalization and resilience plan was developed for the basin, along with feasibility studies, and transaction technical assistance, for two priority projects.


- Strategic Environmental Assessment of Railway, Coal-fired power-plants, jetty
- Review of Air Dispersion Modeling of Power Plant and Railway
- Review of Noise Modeling of Railway
- Report Review
- Quality Control

Strategic Assessment of Power Plant and Port Development at Keti Bandar, 2018-2019, Keti Bandar, Indus Delta, Government of Sindh: Project Manager

The Government of Sindh intends to develop a coal-based power plant in the vicinity of the ancient port site of Keti Bandar. The development plan of the area includes a power park, a special economic zone for manufacturing units, port facilities, associated residential areas and infrastructure. Keti Bandar Project is the first step of the larger plan and consists of 1,320 MW coal fired power plant, railway track from Thar Coalfield to Keti Bandar Project site for the transportation of Thar coal and a jetty for import of equipment and machinery. Hagler Bailly Pakistan was part of the consortium that undertook technical, financial, economic, and environmental feasibility of the Keti Bandar Project. Hagler Bailly Pakistan conducted the Strategic Environmental Assessment (SEA) of the Keti Bandar development plan including the Keti Bandar Project. The objective of the SEA is to ensure that environmental and sustainability considerations are integrated into the planning and decision-making of the development plan and the Keti Bandar Project. The SEA included assessment of the regulatory and policy framework and obligations under international treaties; stakeholder analysis and consultations, development of environmental baseline including ecological, physical, social, and institutional aspects; identification and analysis of key environmental and social issues; identification of alternative development scenarios and their analysis; identification of various policy and regulatory measures required to ensure sustainability in future projects in the area; and, development of various management tools required for implementing the recommendations of the SEA.

As project manager, development of methodologies, reviews of baselines and impact assessments. Project includes scoping of potential issues associated with protected areas including Keti Bandar North Wildlife Sanctuary and Indus Swatch Marine Protected Area.
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Air and Noise Assessments Methodologies and Reviews</td>
<td>Engro Powergen Limited (EPL) contracted the services of Hagler Bailly Pakistan Ltd. to conduct the ESIA of a 660 megawatt (MW) lignite coal-based power plant located in Engro's Thar Block II Energy Park in Thar Coalfields in Sindh. The proposed Project will be based on CFB boiler technology with super-critical steam parameters and is being developed by Bhitra (Ltd).</td>
</tr>
<tr>
<td>as project manager, development of methodologies, reviews of baselines and impact assessments.</td>
<td></td>
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<tr>
<td>Environmental and Social Impact Assessment</td>
<td>ESIA of a 330-megawatt (MW) lignite coal-based power plant located in Engro’s Thar Block II Energy Park, 2018, Arif Habib Limited, District Tharparkar, Sindh, Water and Environment Engineer</td>
</tr>
<tr>
<td>Air and Noise Assessments Methodologies and Reviews</td>
<td>Arif Habib Limited contracted the services of Hagler Bailly Pakistan Ltd. to conduct the ESIA of a 330-megawatt (MW) lignite coal-based power plant located in Engro’s Thar Block II Energy Park in Thar Coalfields in Sindh. The power plant is being developed by Arif Habib Limited and is based on PC boiler technology with super-critical steam parameters.</td>
</tr>
<tr>
<td>as project manager, development of methodologies, reviews of baselines and impact assessments.</td>
<td></td>
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<tr>
<td>Environmental and Social Management System Development</td>
<td>Development of Environmental and Social Management System and Organizational Health and Safety Management System, 2018-2019, M3 Faisalabad Industrial Estate (FIE), Hyundai Nishat Motor (Pvt) Ltd.: Water and Environment Engineer</td>
</tr>
<tr>
<td>ESMS Implementation Support</td>
<td>Hyundai Nishat Motor (Pvt) Ltd., a joint venture of Sojitz Corporation, Japan and Nishat Group, Pakistan planned to establish a Plant to assemble and distribute vehicles of Hyundai Motor Corporation in Pakistan. The Plant will be built within Plot No. 172 to 208 in M3 Faisalabad Industrial Estate (FIE) developed by Faisalabad Industrial Estate Development and Management Company (FIEDMC). In order to comply with the applicable national environmental regulations, conditions of environmental approval granted by Punjab EPA, EMP and EIA of the Plant and best international practices such as Performance Standards (PS) of International Finance Corporation (IFC) and PS of Multilateral Investment Guarantee Agency (MIGA), the Client acquired the services of Hagler Bailly Pakistan (Pvt.) Ltd., for development of Environmental and Social Management System and Organizational Health and Safety Management System in conformity to ISO 14001 and OHSAS 18001 in mind for certification.</td>
</tr>
<tr>
<td>ISO14001, ISO 45001</td>
<td>as project manager developed multiple plans, and reviewed all plans. Supported client in implementation of the ESMS.</td>
</tr>
<tr>
<td>Environmental and Social Advisory and Support</td>
<td>Advisory and Support on Development of Environmental Management System for Power Cement Limited, 2018-2019</td>
</tr>
</tbody>
</table>
Management Systems Development (on-going), Power Cement Limited and Deutsche Investitions und Entwicklungsgesellschaft, Jamshoro, Sindh: Water and Environment Engineer

- ESMS Implementation Support
  Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooriabad Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL's investment into a new Plant. To support PCL's ability to comply with DEGs' environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an advisory, and provide support in development of an Environment and Social Management System, underlying plans and procedures.

As project manager developed multiple plans, and reviewed all plans. Supporting client on implementation of the ESMS. Carrying out audits of implementation for Deutsche Investitions und Entwicklungsgesellschaft.

- Water baseline and vulnerability

  Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooriabad Industrial Area, Jamshoro, Sindh. PCL plans to construct another cement plant (new Plant or the Project) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG is in a discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL's investment into a new Plant. To support PCL's ability to comply with DEGs' environmental and social requirements, DEG and PCL required the services of a consultant to carry out a Water Vulnerability Study to characterize the impacts of pumping of groundwater proposed, as well as evaluate potential water availability risks to PCLs operation in the medium term (20-30-year perspective).

As project manager baseline assessments (regional and local hydrology, hydrogeology, water use), water supply demand balances including characterization of community and industrial users nearby, review of bore drilling information and advisory on testing, public consultations.

- Environmental and Social Impact Assessment
  Environmental and Social Impact Assessment for Thar Block III, 2015 – 2016 (ongoing), Asia Power Limited, United Kingdom: Project Manager/Water and Environment Specialist
Compliance with IFC Performance Standards

Environmental Baseline Surveys Methodologies

Peer Review of Baselines and Impact Assessments

APL intends to develop Block III in the Thar Coalfields. APL contracted Hagler Bailly to carry out the Environmental and Social Impact Assessment for the Block III developments.

As project manager:

- Identification of key development risks in with respect to water availability (ground and diverted and treated canal water), water use and efficiency, and wastewater disposal;
- Devised baseline survey methodologies for the physical environment and socioeconomic surveys and an ecosystem service review, including a comprehensive groundwater use and quality characterization in over 40 villages at 100s of wells;
- Drafting and technical reviews on baselines for air quality, water quality and use, water resources, groundwater, indigenous peoples, ecosystem services, and cumulative impacts for baseline development;
- Led the community and institutional consultations.

Environment assessment for ports, shipping, power generation and industrial developments

Marine and physical environment baseline surveys (hydrodynamics, water quality, ecology)

Cumulative Impact Assessment under IFC Guidelines

Critical Habitat Assessment under IFC guidelines

Ecosystem Service Review under IFC guidelines

Social impact and livelihood assessment

Multi-stakeholder Engagement


Hagler Bailly conducted a priority ecosystem service review (PESR) and a cumulative impact assessment (CIA) for all current and planned operations at Port Qasim. The PESR and CIA were prepared according to local regulatory requirements, IFC Performance Standards and applicable WBG environment, health and safety (EHS) guidelines.

As project manager:

- Design of baseline sampling and monitoring (water quality in natural drainage channels, wastewater drains and outfalls and estuarine waters, marine sediment contamination, macroinvertebrates, socioeconomic and fish trawls);
- Qualitative and quantitative characterization of hydrological aspects including climate, estuarine and ocean dynamics, drainage channels (wastewater drains), land use, sediment, etc.;
- Design and implementation of methodologies for ecosystem service review and livelihood and vulnerability surveys;
- Coordination of technical specialists for various aspects e.g. water quality, geochemistry, air quality, aquatic ecology, mangroves, ports and industrial design, socioeconomic and livelihood and gender;
- Development of baseline status of VECs; cumulative impact assessment, mitigation and management planning with other specialists and supporting Technical Team Lead.
### Strategic Environmental and Social Study for the Thar Block II Energy Park (six 660 MW thermal power plants), 2014, Tharparkar, Thar Power Limited (Engro Powergen Limited): Team Leader/ESIA Specialist

Hagler Bailly conducted the Strategic Environmental and Social Study to assess the potential environmental and social issues associated with an 'Energy Park' planned in Block II of the Thar Coalfields in Pakistan's proposed multi-project park. As project manager:

- Developed baselines (climate, geology, water quality, hydrogeology, water resources, among others);
- Carried out physical impact analysis including a water resources impact assessment, social impact assessment and cumulative impact assessment; developed water supply-demand balances for region and development trajectories, including mine and power plants, to determine potential cumulative impact on water resources of the area (including impacts on local groundwater resources, regional groundwater flows due to development of ~ 10 mines, as well as surface water flows such as those in the Left Bank Outfall Drain);
- Peer review of specialist inputs and report compilation

### Preparatory Site Surveys for Thar Coal-Fired Power Plant Project, 2013-2014, Tharparkar, Sindh, Mitsui Consultants Co., Ltd., Tokyo, Japan: Reviewer/ESIA Specialist

The Government of Japan, under a bilateral agreement, provided assistance to Pakistan for developing the large Thar coalfield in Tharparkar, in the southeast of Sindh province. In this regard, the Japan International Cooperation Agency (JICA) initiated a study through Mitsui Consultants and Nippon Koei Company to develop the feasibility of setting up a supercritical coal-fired power plant utilizing lignite from the Thar coalfield. Mitsui Consultants acquired the services of Hagler Bailly Pakistan to undertake a preparatory survey for the coal-fired power plant project. This included initial survey of four feasible plant locations, assisting the Mitsui team in selecting one of the four proposed sites, detailed environmental and social surveys of the selected site, and air dispersion modeling of the proposed plant. Bilal carried out a technical peer review of the ESIA report, developed the environmental management plan, and carried out thermal plume modelling.


The Hub Power Company limited (HUBCO), the owner of the 1,292 MW Hub Power Station located in Hub, Balochistan, planned to install a new coal-fired power generation plant in the vicinity of its existing power plant. As part of regulatory compliance requirements, HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) of the proposed project. The EIA was
Air Quality Modeling Reviews conducted in accordance with the Balochistan Environmental Protection Act, 2013, and its subservient regulations, such as those regarding review of initial environmental examination and environmental impact assessment. The scope of the EIA included assessing the environmental and social impact of construction activities, including on-site civil works, installation of equipment, on-site coal yard, ash storage, and coal and ash transfer systems. It also considered the disposal of fly ash, bottom ash and gypsum, and the incremental impact of cooling wastewater disposal on the receiving water body. The EIA also considered the impacts of gaseous emissions on ambient air quality during the operation of the new plant. Air quality impact studies included baseline data assessment and modeling and impact assessments based on three different possible coal specifications, two different stack heights, and two different possible plant locations.

Bilal served as technical reviewer and editor for physical baseline and impact assessment sections including air quality modelling: and carried out water related impact assessment including thermal plume modelling of wastewater outfalls into the ocean.

Environmental Assessment of Boiler Retrofits at 1,200 MW Bin Qasim Power Plant, 2012, Karachi Electric Supply Company Limited (KESC), Karachi: Project Manager

Karachi Electric Supply Company (KESC) planned to replace four furnace oil-fired boilers with coal-fired boilers at its 1,200 MW Bin Qasim Power Plant located in Karachi. KESC hired services of Hagler Bailly Pakistan to conduct an environmental impact assessment of the project to comply with national legal requirements and the Equator Principles. The scope of work included environmental audit of existing plants, detailed stakeholder consultations, and baseline studies on socioeconomic, traffic, water quality, air quality and ecological conditions at the site.

As project manager, development of methodologies, reviews of baselines and impact assessments.

Environmental Assessment of Boiler Retrofits at 1,200 MW Bin Qasim Power Plant, 2012, Karachi Electric Supply Company Limited (KESC), Karachi: Project Manager


MJAM acquired the services of Hagler Bailly, in association with SRK Consulting, Australia, to undertake an environmental and social impact assessment (ESIA) of the Aynak copper mines located south of Afghanistan's capital, Kabul

Hydrogeological modelling (MODFLOW) of pit water and water supply bores

Hydrogeological modelling using MODFLOW to assess impact of groundwater pumping at water supply boreholes on aquifers as well as surface water resources utilized by downstream users e.g. agriculture and potable use

ESIA for the Reko Diq Copper Project, Baluchistan, Pakistan, 2010, Reko Diq, Balochistan, TCC Minerals Pty Ltd: Research Associate
Tethyan Copper Company Pty Limited (TCC), a company jointly owned by Barrick Gold Corporation and Antofagasta Minerals SA, intended to develop a large-scale open pit mining and ore processing operation for the production of copper from the world-class deposits found at Reko Diq, District Chagai, in Pakistan's western Balochistan province. To ensure that the activities envisaged by TCC complied with the relevant environmental legislation of Pakistan as well as the environmental guidelines of the International Finance Corporation (IFC), TCC procured the services of SRK Consulting (UK) Ltd. and Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of the proposed project and associated developments, including extraction of water, transportation of refined products, and storage and handling of the products at the ports for export shipments. The services provided by Hagler Bailly Pakistan focused on establishment of an environmental and social baseline, conducting public consultation, carrying out resource assessment studies, advising on impact assessments and mitigation, and assisting the client in obtaining environmental permits and approvals.

Bilal supported on the scoping of environmental impacts, and carried out the visual impact assessment as part of the ESIA.

13. Certification
I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature of Expert]
<table>
<thead>
<tr>
<th>Title</th>
<th>Physical Environmental Specialist</th>
</tr>
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<tbody>
<tr>
<td>Name of Firm</td>
<td>Hagler Bailly Pakistan</td>
</tr>
<tr>
<td>Name of Expert</td>
<td>Aziz Karim</td>
</tr>
<tr>
<td>Date of Birth</td>
<td>May 1, 1976</td>
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<td>Citizenship</td>
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<td>2002</td>
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<td>BSc (Biochemistry, Microbiology, Chemistry)</td>
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<td>Other Training</td>
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<tr>
<td>Environmental Safeguards Training of Trainers, Asian Development Bank (ADB), Islamabad, April 2012</td>
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<td>Environmental Risk Measures, Management &amp; Remediation, Chevron South Africa Pty Ltd., Cape Town South Africa, May 2011</td>
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<td>Environmental Management System, Barrick Gold (Canada) and Antafogosta (Chile), Dubai, UAE, August 2010</td>
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<td>Safe Work Practices, Chevron Pakistan Ltd., Lahore, Pakistan, August 2006</td>
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<td>Pakistan, Afghanistan</td>
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<td>Hagler Bailly Pakistan</td>
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<td>Position Held:</td>
<td>Manager, Environmental Technology</td>
</tr>
<tr>
<td>From: 2009</td>
<td>To: 2011</td>
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<td>Position Held:</td>
<td>Senior Associate</td>
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<td>From: 2005</td>
<td>To: 2009</td>
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<td>Position Held:</td>
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### Task Areas

**Environmental Studies, Services and Technical Assistance**

<table>
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<tr>
<th>Task Area</th>
<th>Details</th>
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<tbody>
<tr>
<td>Environmental Site Assessment</td>
<td>Phase II Soil and Groundwater Investigation at Polymer and Chemical Production Plant, Port Qasim, Karachi, 2018, Engro Polymer and Chemicals, Karachi</td>
</tr>
<tr>
<td></td>
<td>Engro Polymer &amp; Chemicals Limited (EPCL), a subsidiary of Engro Corporation, operates a production plant at Port Qasim, Karachi. EPCL conducts regular environmental investigations on the cause and extent of the possible impact of pollutants leaching into groundwater due to plant operations. These investigations confirmed the contamination of groundwater with ethylene dichloride and other pollutants. However, the investigations could not trace the contamination as emanating from within EPCL’s plant boundary limits. In order to establish the actual pollutant sources, types and dispersion pathways and recommend preventive and remedial measures, EPCL hired the services of Hagler Bailly Pakistan to carry out a detailed study. The assessment provided a delineation of contamination outside boundary limits, identified potential sources of chemical leaks into groundwater resources and identified monitoring wells, based on groundwater flow direction, which could be used for water pumping if adopted as remediation measure in the future. Managed the project team, lead technical assessment, maintained coordination with the client, executed fieldwork covering current and historical information collection on site operations, identifying sensitive receptors, off site impact sources, water bodies in surroundings of the site, monitoring well installation, groundwater sampling, field testing, sample handling and transport to overseas testing laboratory, establishing groundwater flow direction, and provided technical level inputs to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.</td>
</tr>
<tr>
<td></td>
<td>Environmental Site Assessment and Remediation Study at Bulk Oil Storage Terminal, 2018, Total Parco Pakistan Limited, Lahore</td>
</tr>
<tr>
<td></td>
<td>Total Parco Pakistan Limited (TPPL) acquired the services of Hagler Bailly Pakistan for conducting an environmental study of their terminal located at the Kemari Bulk Oil Terminal at Karachi port. A part of the study (Phase 1) was completed earlier by TPPL for determination of contamination status at the site. The study undertaken by HBP covered Phase 2 of the site assessment, and included characterization of groundwater and soil contamination, as well as determination of the mitigation and management measures required to remediate contamination at the site and protect the overall aquifer outside of the site area. The scope of work included replacement of exiting monitoring wells, installation of new monitoring wells, soil investigations, decommissioning of monitoring wells and soil bores, groundwater</td>
</tr>
</tbody>
</table>
investigations, and recommendations to prevent migration of contamination outside site limits.

Managed the project team, lead technical assessment, maintained coordination with the client, executed fieldwork covering current and historical information collection on site operations, identifying sensitive receptors, off site impact sources, water bodies in surroundings of the site, monitoring well installation, groundwater sampling, field testing, sample handling and transport to overseas testing laboratory, establishing groundwater flow direction, and provided technical level inputs to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.

- **Environmental Site Assessment**

  Phase I and Phase II DD at Brownfield Site in Karachi, Pakistan, 2018, Mitsubishi Corporation, Japan and Environmental Resources Management (ERM): Project Manager

  ERM acquired the services of HBP to conduct Phase I and Phase II Environmental Site Assessment (ESA) at brownfield site (Engro Polymer and Chemicals) located in Port Qasim in Karachi, Pakistan. The studies were completed following the methodology laid out in ASTM Standards and USEPA Guidelines.

  Collection of the Site related information covering current and historical events on the land use, plant operations, identifying sensitive receptors, off site impact sources, water bodies in surroundings of the site. In the second phase intrusive work was carried out including monitoring well installation, groundwater sampling, field testing (soil screening and water testing for physical parameters), soil samples, effluent water samples and groundwater samples collection, handling, storage and transport to overseas testing laboratory, establishing groundwater flow direction. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards, report writing and provide findings of the study and recommend future actions.

- **Environmental Site Assessment**

  Phase I and Phase II DD at Brownfield Site in Karachi, Pakistan, 2017, Avery Dennison and Environmental Resources Management (ERM):

  ERM acquired the services of HBP to conduct Phase I and Phase II Environmental Site Assessment (ESA) at brownfield site located in Korangi Creek in Karachi, Pakistan. The studies were completed following the methodology laid out in ASTM Standards and USEPA Guidelines.

  Managed the project team, maintained coordination with the client, executed fieldwork covering current and historical information collection on site operations, identifying sensitive receptors, off site impact sources, water bodies in surroundings of the site, monitoring well installation, groundwater sampling, field testing, sample handling and transport to overseas testing laboratory, establishing groundwater flow direction, and provided technical level inputs to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.
• Environmental and Social Impact Assessment
  IEE of Dera Ghazi Khan HPP, 2017, Engro PowerGen: Project Manager
  Engro PowerGen Limited intends to set up a small hydropower plant (HPP) on Dera Ghazi Khan Link-III Canal in the Dera Ghazi Khan District of Punjab province of Pakistan. Engro acquired the services of HBP to carry out IEE for regulatory approvals and as part of bankable feasibility report.
  Soil and water quality sampling (surface and groundwater), sample handling, storage and transport to the testing laboratory (microbial contaminants, heavy metals, major cations and anions). Performed field testing for physical parameters of water (pH, dissolved, redox potential, conductivity), identifying sensitive receptors within defined study area, data collection on the flood pattern of the area, also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards and completed reporting of the relevant section of the IEE.

• Environmental Monitoring
  Independent Environmental Monitoring Consultant for EPCL Expansion Project, 2019, Engro Polymer and Chemicals Ltd. (EPCL), Karachi
  EPCL hired services of HBP as Independent Monitoring Consultant (IMC) for carrying out environmental monitoring and reporting of PVC and VCM Plant Expansion Project at its polymer and chemicals production plant located in Port Qasim (PQ) in Karachi. The services covered are related to compliance check of implementation of mitigation measures recommended in Environmental Impact assessment (EIA) Report and conditions of environmental approval (NOC) granted by Sindh Environmental Protection Agency (Sindh EPA).
  Working for this project as project manager and lead technical team for undertaking monthly monitoring of implementation of EIA mitigation measures and field measurements, preparing monthly environmental monitoring report and liaison with Sindh EPA on submissions.

• Environmental Monitoring
  Second Power Transmission Enhancement Investment Program (MFF II), 2019, National Transmission and Dispatch Company (NTDC), Asian Development Bank (ADB)
  NTDC hired services of Facility Management Consultants (FMC) for technical support in executing ADB funded projects in Pakistan. I am currently working as National Environmental Expert in FMC setup for NTDC for the Second Power Transmission Enhancement Investment Program (MFF II) project.
  Working as Environmental Safeguard Specialist in portfolio of FMC for implementation of ADB safeguard requirements and the requirements of the IEE/EIA and environmental approval condition for the Projects. Conducts compliance monitoring visits and report to NTDC and ADB. Develop Bi-Annual Environmental Monitoring Reports (BAEMR). Providing hands-on training to contractors' staff in capacity building and for development of site specific plans including SSEPMs, Waste Management Plans, Emergency Response Plans, etc.
Environmental Monitoring

Environmental and Social (E&S) Compliance Monitoring of OPIC funded Projects in Pakistan, 2018, OPIC

OPIC, a funding and investment organization of US Government funds various organizations and projects in Pakistan such as Aga Khan University Hospital, Cinepax, TPL Trakker, etc. OPIC tasked Mr Jack Mozingo, an International Independent Consultant (IIC) for E&S monitoring of its funded projects in Pakistan against OPIC guidelines, loan agreements, IFC PS for Environmental and Social Compliance.

The IIC acquired services of Hagler Bailly under a subcontract for actual execution of the E&S Monitoring project. Acted as PM for this task. Recruit experts for social, health care, environet, safety and labor issues after screening, provide trainings on E&S Compliance Monitoring, directly supervised the experts for their performance, quality assurance of monitoring environmental and social monitoring reports, client and lender liaison, take care of contractual bindings and submission of reports.

Environmental Monitoring

Environmental Compliance Monitoring of Three Cement Manufacturing Plants, 2018, Client: Bestway Cement Ltd and D G Khan Cement Ltd.

Supreme Court of Pakistan (SCP) ordered, in a so-moto case, three cement manufacturing plants located in District Chakwal for producing reliable environmental monitoring reports to check if the plants are operating in compliance to PEQS and international guidelines.

Acted as PM for this study and directly lead the team collection of field monitoring data and development of environmental compliance monitoring reports in accordance to court orders and requirement of PEQS and IFC guidelines.

Environmental and Social Impact Assessment


TEL intends to set up a 50 MW Solar Photovoltaic Power Plant in Tehsil Kolachi of KP province. TEL acquired the services of HBP to carry out IEE for regulatory approvals and as part of bankable feasibility report.

Managed the project team, maintained coordination with the client, executed fieldwork covering current and historical information collection on site, identifying sensitive receptors, off site impact sources, water bodies in surroundings of the site, physical environment sampling including air, noise, water, groundwater, etc. field testing, sample handling and transport to testing laboratory and provided technical level inputs to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.

Environmental and Social Impact Assessment

Rapid Environmental Analysis (REA) of 106 MW Golen Gol Hydroelectric Power Project, Chitral, Pakistan, 2017, AA Associates-Techno Consult International (JV) and United States Agency for International Development (USAID): Project Manager

The USAID is considering USG funding for under-construction 106 MW Golen Gol Run of River Hydroelectric Project (the Project) located in Chitral district. AA Associates-Techno Consult International (JV) (the Client), who are implementing the USAID.
Monitoring, Inspection, Milestone Certification & Design Review (MIMDR) project, engaged Hagler Bailly Pakistan (HBP) to undertake a rapid environmental analysis (REA) to determine the potential adverse environmental and social impacts of the USAID-funded Golen Gol hydropower development project.

The scope of work of the REA include assessing compliance with USAID’s 22 CFR 216, national regulatory instruments, contractual obligations, agreed environmental mitigation and monitoring measures, and international best practices.

- **Environmental Audit**
  
  Environmental Compliance Assessment of Sulphuric Acid Production Plant, Multan, 2016, The Lahore High Court and South Chemicals (Pvt) Ltd.: Project Manager

The Honorable, Lahore High Court appointed Hagler Bailly Pakistan (HBP) as Environmental Consultant to conduct an assessment of environmental compliance of a sulphuric acid production plant (the Plant) located in Multan, owned and operated by South Chemicals (Pvt) Ltd.

- **Ground Water Assessment**
  
  Water Vulnerability Assessment of PepsiCo Snacks Plant, Lahore, 2016, Environmental Resource Management (ERM), India: Project Manager

Environmental Resources Management (ERM) was commissioned by Pepsi-Cola International Ltd (PepsiCo), for undertaking a Water Vulnerability Assessment (WVA or the study) for their snacks production plant (the Plant or the Site or the facility) located in Sundar Industrial Estate, Lahore in
Pakistan. ERM subcontracted Hagler Bailly Pakistan (HBP) for execution of the study.

Broadly, the work scope included a vulnerability evaluation of groundwater due to industrial activities at the site, identification of off-site contamination sources, compliances of site operations with standards for wastewater disposal, acquisition of groundwater data from secondary sources and projection of water stress and quality evaluation based on the future development in the area. A perception survey related to water quality issues was also conducted in communities covering a 5 km radius of the site.

Managed the project team, maintained coordination with the client, executed fieldwork covering current and historical information collection on site, identifying sensitive receptors, off-site impact sources, water bodies in surroundings of the site. Review of testing results provided by the company for physical environment including air quality, noise, water, groundwater, etc. and provided technical level inputs to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.

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<td>China Three Gorges South Asia Investment Limited (CSAIL) plans to develop, build, and own renewable power generation projects in Pakistan. CSAIL is developing the 1,100 megawatt (MW) Kohala Hydropower Project in Azad Jammu and Kashmir (AJK). The proposed KoHP is a run-of-river (RoR) hydroelectric power project on Jhelum River. CASIL acquired the services of Hagler Bailly Pakistan to undertake an environmental and social impact assessment (ESIA) of the hydropower project. Soil and water quality sampling (surface and groundwater), sample handling, storage and transport to the testing laboratory. Performed field testing for physical parameters of water (pH, DO, DO, Redox Potential, Conductivity), identifying sensitive receptors within defined study area, data collection on the flood pattern of the area, Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.</td>
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<td>The International Finance Corporation (IFC), the private sector arm of the World Bank Group, planned on investing in the Elengy liquefied natural gas (LNG) terminal at Port Qasim near Karachi, Pakistan. Port Qasim Authority (PQA) plans to add another 11 jetties at the facility with possible IFC investments. IFC contracted the services of Hagler Bailly Pakistan to conduct a priority ecosystem service review (PESR) and a cumulative impact assessment (CIA) for all current and planned operations at Port Qasim. The PESR and CIA were prepared according to local regulatory requirements, IFC Performance Standards and</td>
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applicable WBG environment, health and safety (EHS) guidelines.

As the physical environment assessment team leader, conducted baseline surveys. Perfumed conductivity, temperature testing at various depths in Arabian Sea in the study area, collected sediment and marine, fish samples, perform sample handling, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.

- **Environmental Assessment**
  
  Initial Environmental Assessment of Grid-connected Photovoltaic Power Project in Balochistan 2015, Uch Power Limited, a subsidiary of Engie: Project Manager

  Uch Power (Pvt.) Ltd. Pakistan (UPL), an entity of GDF Suez, planned to develop a 10 MW solar photovoltaic power generation project at Dera Murad Jamali in Pakistan's western Balochistan province under the Alternative Energy Development Board's (AEDB) 'feed-in' tariff policy. UPL engaged Hagler Bailly Pakistan to conduct an initial environmental examination (IEE) of the proposed project, to be submitted to the Balochistan Environmental Protection Agency (BEPA) as part of the AEDB's compliance requirements.

  As Project Manager, managed the project team, maintained coordination with the client, provided technical level inputs to focus efforts on priority areas, monitor quality control, and ensure objectives of the assignment and schedules are complied with.

  Also developed a waste management plan and environmental management plan for the construction and operation phases of the Project.

- **Environmental Audits and Training**
  
  Improving the Implementation of Environmental Safeguards in Central and West Asia - Environmental Safeguards Training and 3rd Party Auditor in Afghanistan, Asian Development Bank, Manila, Philippines, 2013 to Present: Consultant

  The Asian Development Bank (ADB) aims to improve the implementation of environmental safeguards in projects funded by the Bank in Central and West Asia. A program was launched for this purpose in which qualified consulting firms from selected countries in the region were provided with necessary guidelines to conduct training sessions on ADB environmental safeguard standards at borrowing organizations. Hagler Bailly Pakistan was selected, trained, and contracted by ADB for such capacity enhancement across all of its current projects under implementation in Pakistan and Afghanistan. Hagler Bailly Pakistan contacted the executing and implementing agencies of these projects in both countries to identify key personnel and contractor nominations for environmental safeguards training, and subsequently conducted a series of training sessions in various cities of Pakistan and Afghanistan for all designated staff. Between 10 to 15 project personnel participated in each of the two-day training sessions in which, using multimedia tools and examples from actual projects, they were comprehensively instructed on ADB's safeguard policies, recommended roles and responsibilities of executing and implementing agencies, and
provided documentation to help ensure proper compliance, risk assessment, and environmental monitoring. Hagler Bailly Pakistan also conducted on-site environmental audits of selected ADB-funded projects in both countries. All information on the training program and audits was compiled and made publicly accessible on the Internet.

As a member of HBP team responsible for conducting environmental audit visits to the project sites and reporting of audit findings to the Client. Additionally responsible for the arrangement and correspondences with stakeholders on training and facilitation during the execution of the training sessions.

- **Environmental Assessment**

  *Phase 1 and Phase 2 Environmental Site Assessment of Depots, Installations and Retail Outlets, Chevron Pakistan Ltd., 2005 to Present: Environmental Scientist*

Chevron, the parent company of Chevron Pakistan Limited (previously known as Caltex Oil (Pakistan) Limited), engaged Hagler Bailly Pakistan in two aspects of its oil marketing activities in Pakistan. First, Hagler Bailly Pakistan was contracted to manage contaminated soil at all Caltex gasoline stations in Pakistan, as part of Chevron’s global effort to upgrade underground storage tanks (USTs) installed at retail gasoline stations owned or operated by the company. This entailed sampling soil and water for hydrocarbon contamination, surveying the area surrounding the work site, inspecting tanks and piping for signs of leakage, and preparing an environmental condition report. Initially, during the first three years of the contract, UST tanks at 31 retail gasoline stations were investigated. Second, Hagler Bailly Pakistan conducts annual health, environment and safety (HES) assessments of service stations and depots marked by CPL for closure or sale, so that such issues can be identified and managed properly, consistent with Chevron's worldwide procedures.

CPL operating two projects worldwide. One of the projects is to upgrade the underground storage tanks (USTs) installed at retail gasoline stations owned or operated by the company. The second is an environmental assessment (Phase 1 and Phase 2) of the closed sites for safe handover to landowners and operating sites.

*In the capacity of manager for the projects, Mr Karim was responsible for initial preparatory works, managing field surveys all over Pakistan, team selection for data collection and soil and groundwater investigations, managing safe transportation of these samples to ALS Lab, Malaysia, collection of results from the lab, and compiling field data and laboratory results production of initial draft environmental assessment report. Other works include the management of contaminated soil at the work site, a sampling of soil and water to check or hydrocarbon contamination, survey of the surrounding areas, inspection off tanks and piping for signs of leakage, and preparing an environmental condition and environmental assessment report. Since the start of the projects more than 150 installations, depots and retail outlets have been assessed for environmental concerns and submitted the environmental report of each site to the client.*
Environmental Audits, Monitoring and Training


The Asian Development Bank (ADB) aims to improve the implementation of environmental safeguards in projects funded by the Bank in Central and West Asia. A program was launched for this purpose in which qualified consulting firms from selected countries in the region were provided with necessary guidelines for conduct training sessions on ADB environmental safeguard standards at borrowing organizations. Hagler Bailly Pakistan was selected, trained, and contracted by ADB for such capacity enhancement across all of its current projects under implementation in Pakistan. Hagler Bailly Pakistan contacted the executing and implementing agencies of these projects to identify their key personnel and contractor nominations for the environmental safeguard training, and subsequently conducted a series of training sessions in various parts of Pakistan for all designated staff. Between 10 to 15 project personnel participated in each of the two-day training sessions held in which, using multimedia tools and examples from actual projects, they were thoroughly briefed on ADB’s safeguard policies, recommended roles and responsibilities of executing and implementing agencies, and provided documentation to help ensure proper compliance, risk assessment and environmental monitoring. Hagler Bailly Pakistan also conducted environmental audits of selected ADB-funded projects in the country. All information on the training program and audits was compiled in the form of a database publicly accessible on the Internet.

As a member of HBP team responsible for conducting environmental audit visits to the project sites and reporting of audit findings to the Client. Additionally responsible for the arrangement and correspondences with stakeholders on training and facilitation during the execution of the training sessions.

Environmental Audits, Monitoring and Training


The United States Agency for International Development (USAID), through its contractor, Advanced Engineering Associates International (AEAI), USA, sought Hagler Bailly Pakistan's services to carry out a rapid environmental analysis of the Duber Khwar and Allai Khwar hydroelectric power project being built on Duber Khwar River, Kohistan and Allai Khwar River, Batagram, respectively, in northern Pakistan. The services provided by Hagler Bailly Pakistan included a review of relevant documentation, including feasibility studies, environmental impact assessments (EIAs), environmental monitoring and management plans (EMMPs), field visits to assess regulatory compliance, and independent social assessment for both power projects. Hagler Bailly Pakistan also suggested impact mitigation measures considered appropriate for implementation during the construction of the hydroelectric projects as per international environmental safeguards and guidelines.
Managed the project team, maintained coordination with the client, executed fieldwork include assessing compliance with USAID’s 22 CFR 216, national regulatory instruments, contractual obligations, agreed environmental mitigation and monitoring measures, and international best practices and provided technical level inputs in development of EMMP to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.

- Environmental Audits, Monitoring and Training

  Environmental Auditing and Compliance Monitoring of Thermal and Hydropower Plant Rehabilitation, USAID, Islamabad, Pakistan, 2012-2014: Environmental Expert

  The United States Agency for International Development (USAID) funded the rehabilitation of six power generation stations in Pakistan: three thermal and three hydropower plants. USAID tasked Advanced Engineering Associates International (AEAI), USA, to provide monitoring and implementation support for the six projects. Part of the assignment required AEAI to ensure that all rehabilitation and new construction work conducted was compliant with applicable US and Pakistan environmental regulations. AEAI acquired the services of Hagler Bailly Pakistan for monitoring project compliance with their respective environmental mitigation and monitoring plans (EMMPs). This was done through the development of an overall work plan for monitoring and auditing, periodic auditing of the projects, and visiting plant sites to document implementation of the EMMPs— including environmental mitigation measures, waste disposal and occupation safety measures, and preparing monitoring reports for each visit.

  Managed the project team, maintained coordination with the client, executed fieldwork include assessing compliance with USAID’s 22 CFR 216, national regulatory instruments, contractual obligations, agreed environmental mitigation and monitoring measures, and international best practices and provided technical level inputs in development of EMMP to focus efforts on priority areas, compiled the report, and ensured objectives of the assignment and schedules were met.

- Environmental Assessment

  Strategic Assessment of Environmental and Social Issues Associated with Thar Block II Energy Park, Sindh Engro Coal Mining Company, Karachi, 2014: Environmental Expert

  Thar Power Limited (TPL) undertook to develop an ‘energy park’ in its Concession Block II of the Thar coalfields in Pakistan’s Sindh province to accommodate up to six coal-fired power plants having a combined total generation capacity of about 3,960 MW. TPL acquired the services of Hagler Bailly Pakistan to conduct a study to assess the potential environmental and social issues associated with the proposed multi-project park. The scope of consultancy services provided included a review of secondary data and documentation necessary to prepare baseline assessments of the project area and conduct emissions dispersion modeling to determine the cumulative impacts of the six thermal power plants to be developed.

  As a member of the project team, worked on baseline surveys, impact assessment of the physical environment and reporting for
noise, traffic, water resources, soil and soil fertility, air quality, sensitive receptors that fall on the coal transport route.

### Environmental and Social Impact Assessment


The Government of Japan, under a bilateral agreement, provided assistance to Pakistan for developing the large Thar coalfield in Tharparkar, in the southeast of Sindh province. In this regard, the Japan International Cooperation Agency (JICA) initiated a study through Mitsui Consultants and Nippon Koei Company to develop the feasibility of setting up a supercritical coal-fired power plant utilizing lignite from the Thar coalfield. Mitsui Consultants acquired the services of Hagler Bailly Pakistan to undertake a preparatory survey for the coal-fired power plant project. This included initial survey of four feasible plant locations, assisting the Mitsui team in selecting one of the four proposed sites, detailed environmental and social surveys of the selected site, and air dispersion modeling of the proposed plant.

Collected soil and water quality sampling (surface and groundwater), sample handling, storage and transport to the testing laboratory. Performed field testing for physical parameters of water (pH, DO, DO, Redox Potential, Conductivity). Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.

### Environmental and Social Impact Assessment


Sinohydro (Hong Kong) Holding Limited, China, hired Hagler Bailly Pakistan's services to undertake an environmental impact assessment (EIA) of 2 x 660 MW coal-fired power plants at Port Qasim, Karachi. These services included the preparation of baseline assessments, public disclosure and stakeholder consultations, impact assessments, analysis of alternatives, and preparation of environmental monitoring and management plans in accordance with Pakistan's environmental regulations. Impact assessment studies included an analysis of the impact of coal combustion, particularly of expected sulfur emissions, on ambient air quality. They also looked into the effects of land reclamation for the proposed project site and the diversion of a natural rainwater course running through it. Potential impacts from ash storage, handling, and disposal during plant operation were not considered in the EIA, as potential sites for ash storage had not been identified by the client.

*As the physical environment assessment team leader, conducted baseline surveys. Performed conductivity, temperature testing at various depths in Arabian Sea in the study area, collected sediment and marine, fish samples, perform sample handling, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.*

The Hub Power Company limited (HUBCO), the owner of the 1,292 MW Hub Power Station located in Hub, Balochistan, planned to install a new coal-fired power generation plant in the vicinity of its existing power plant. As part of regulatory compliance requirements, HUBCO acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) of the proposed project. The EIA was conducted in accordance with the Balochistan Environmental Protection Act, 2013, and its subservient regulations, such as those regarding review of initial environmental examination and environmental impact assessment. The scope of the EIA included assessing the environmental and social impact of construction activities, including on-site civil works, installation of equipment, on-site coal yard, ash storage, and coal and ash transfer systems. It also considered the disposal of fly ash, bottom ash and gypsum, and the incremental impact of cooling wastewater disposal on the receiving water body. The EIA also considered the impacts of gaseous emissions on ambient air quality during the operation of the new plant. Air quality impact studies included baseline data assessment and modeling and impact assessments based on three different possible coal specifications, two different stack heights, and two different possible plant locations.

As a member of the project team, worked on baseline surveys, impact assessment of the physical environment and reporting for noise, traffic, water resources, soil and soil fertility, air quality, sensitive receptors that fall on the coal transport route.

Collected soil and water quality sampling (surface and groundwater), sample handling, storage and transport to the testing laboratory. Performed field testing for physical parameters of water (pH, DO, Redox Potential, Conductivity). Performed a well census survey in the area and measured depth, water quality and well construction details. Surface water samples from the Hub River was also collected and flow data was retrieved from secondary sources. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.

Environmental and Social Assessment for Industrial Site Selection, Coca-Cola Beverages Pakistan Limited, Lahore, 2014: Environmental Expert

Coca-Cola Beverage Pakistan Limited planned to construct a beverage manufacturing plant at Haripur in Khyber Pakhtunkhwa province, Pakistan. As part of site selection investigations, Hagler Bailly Pakistan was engaged to conduct air and soil quality assessments and public scoping in the vicinity of the proposed plant location. These services included up-wind and down-wind ambient air monitoring, soil sample collection and analysis and consultations with communities living around the site regarding perceived impacts of industrial activity in the area.

As project manager for this project, was responsible for client contact, scheduling field trips, reporting, and budgetary control.
and meeting milestones for project deliverables. Conducting up-wind and down-wind ambient air monitoring, soil sample collection and coordinating analysis and consultations with communities living around the site regarding perceived impacts of industrial activity in the area.

- **Social Impact Assessment, Environmental Assessment**
    
    Fauji Fertilizer Bin Qasim Limited (FFBL) planned to develop a coal-fired combined steam and power (CSP) project within the existing FFBL fertilizer plant complex located in the Eastern Industrial Zone of Port Bin Qasim, Karachi. In order to comply with environmental regulations and financing requirements, FFBL acquired the services of Hagler Bailly Pakistan to carry out an environmental impact assessment (EIA) of the proposed facility. The scope of the EIA included an environmental audit of the existing FFBL fertilizer plant, detailed stakeholder consultations, assessment of the impact on ambient air quality of coal combustion, particularly of expected sulfur emissions, traffic, noise and safety issues associated with road transportation of coal to the plant, project impact on local ecological and socioeconomic conditions, and the preparation of an environmental management plan to address CSP plant construction and operational issues, such as ash storage, handling, and disposal.

    As the physical environment assessment team leader, conducted baseline surveys. Performed water sample collection (surface and groundwater and effluent water), handle sample as per protocol, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.

- **Social Impact Assessment, Environmental Assessment**
    
    The Asian Development Bank (ADB) hired Hagler Bailly Pakistan’s services to undertake an environmental impact assessment (EIA) of a proposed 1,200 MW coal-fired thermal power plant at Jamshoro in Pakistan’s Sindh province. These services included preparation of baseline assessments, public disclosure and stakeholder consultations, impact assessments, analysis of alternatives, and preparation of environmental monitoring and management plans, in accordance with the requirements of ADB safeguards and Pakistan’s environmental regulations. A detailed air quality impact study was conducted based on the USEPA's AERMOD air dispersion model.

    As the physical environment assessment team leader, conducted baseline surveys. Conducted soil contamination assessment and drilled 30 boreholes. Collected soil samples at various depths. Performed soil screening for hydrocarbon contamination by using PID meter. Performed water sample collection (surface and groundwater and effluent water), handle sample as per protocol, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of
testing results received, draw conclusion after comparing with local and international standards.

- **Social Impact Assessment**, **Environmental Assessment**
  - Environmental Impact Assessment of Bamyan Provincial Hospital, Bamyan, Afghanistan, Aga Khan Foundation, Afghanistan (AKFA), 2013: Environmental Expert
    The Aga Khan Development Network (AKDN), in collaboration with the Government of Afghanistan, planned to develop new and upgraded premises for the Bamyan Provincial Hospital in Bamyan, Afghanistan. The Project was funded by the Canadian International Development Agency (CIDA), executed by AKDN's implementing agency Aga Khan Foundation Afghanistan (AKFA), and managed by the Aga Khan Planning and Building Services, Pakistan (AKPBS). AKPBS engaged Hagler Bailly Pakistan to undertake an environmental impact assessment (EIA) of the proposed hospital upgrade project. Services provided by Hagler Bailly Pakistan included the preparation of impact assessment study, public disclosure and stakeholder consultations, analysis of alternatives, and preparation of environmental monitoring and management plans in accordance with the regulatory requirements of the Government of Afghanistan and CIDA's environmental guidelines.
    *As physical environment assessment team lead, conducted baseline surveys. Performed water sample collection (surface and groundwater and effluent water), handle sample as per protocol, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.*

- **Environmental Assessment**
    Engro Fertilizers Limited (EFERT) completed expansion of its fertilizer plant at Daharki in the Sindh province of Pakistan in 2011. In order to comply with conditions of the environmental impact assessment, EFERT requested the services of Hagler Bailly Pakistan for noise mapping of the entire plant premises and measurement of noise levels at three adjacent receptors, in accordance with the International Finance Corporation's (IFC) noise management provisions.
    *Engaged intensively for the noise mapping of the entire plant premises and measurement of noise levels at three adjacent receptors, in accordance with the International Finance Corporation's (IFC) noise management provisions.*

- **Social Impact Assessment**, **Environmental Assessment**
  - Environmental Impact Assessment of Aynak Copper Project, Afghanistan, Metallurgical Corporation of China, 2009-2013: Environmental Expert
    MCC-JCL Aynak Mineral Company (MJAM), a subsidiary of Metallurgical Corporation of China, was awarded a contract to develop the Aynak copper mines by the Government of Afghanistan. Aynak is a world-class copper deposit located to the south of Afghanistan's capital, Kabul. MJAM acquired the services of Hagler Bailly Pakistan, in association with SRK Consulting, Australia, to undertake an environmental and social
The Environmental Impact Assessment (ESIA) of the proposed mining project. The ESIA is mandated under the regulatory requirements of Afghanistan as well as for meeting social and environmental performance standards of the World Bank. The baseline study conducted for the ESIA covers ecological surveys during the four annual seasons, hydrological surveys along the Logar River, socioeconomic study focusing on the area around the mine site and where resettlement is planned, and baseline studies for noise, traffic, air quality, and water quality at the project site. The ESIA examined environmental and social issues with the proposed project in detail, key amongst which were impacts on air quality, hydrological resources, socioeconomic environment, archeological resources, and issues associated with resettlement and acid rock drainage and metal leaching.

As the physical environment assessment team leader, conducted baseline surveys. Performed water sample collection (surface and groundwater and effluent water), handle sample as per protocol, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.

Conducted well census and spring census in the surrounding villages of the mine site. Collected flow data of Logger River and collected water quality samples for water quality analysis. Collected observations of groundwater pumping test by MJAM and collected recovery data of the groundwater reservoir.

- Social Impact Assessment
- Environmental Assessment

MCC-JCL Aynak Mineral Company (MJAM), a subsidiary of Metallurgical Corporation of China, was awarded a contract by the Government of Afghanistan to develop the Aynak copper mines in the northeastern Logar province of the country. In order to meet the requirements of electricity for mining operations, MJAM undertook to develop coal mines in nearby Bamiyan province for setting up a coal-based power plant of 450 MW at the mine site. MJAM acquired the services of Hagler Bailly Pakistan to undertake an environmental and social impact assessment (ESIA) of the mining and power project. The ESIA is mandated under the regulatory requirements of Afghanistan, as well as for meeting the social and environmental performance standards of the World Bank. The baseline study conducted for the ESIA covered ecological surveys during the four annual seasons, hydrological surveys along the Bamiyan River, a socioeconomic study focusing on the area around the project site and where resettlement was planned, and baseline studies for noise, traffic, air quality, and water quality at the project site. The ESIA examined the environmental and social issues associated with the project in detail and evaluated potential key impacts on air quality, hydrological resources, socioeconomic environment, archeological resources, along with matters pertaining to community resettlement.

As the physical environment assessment team leader, conducted baseline surveys. Performed water sample collection (surface and...
and groundwater and effluent water), handle sample as per protocol, storage and transport to the testing laboratory. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards.

Conducted well census and spring census in the surrounding villages of the mine site. Collected flow data of Khamard River and collected water quality samples for water quality analysis.

- **Social Impact Assessment**

- **Environmental Assessment**

  Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pakistan (Pvt.) Ltd. (TCC), Islamabad, 2007-2012: Environmental Expert

  Tethyan Copper Company Pty Limited (TCC), a company jointly owned by Barrick Gold Corporation and Antofagasta Minerals SA, intended to develop a large-scale open pit mining and ore processing operation for the production of copper from the world-class deposits found at Reko Diq, District Chagai, in Pakistan's western Balochistan province. To ensure that the activities envisaged by TCC complied with the relevant environmental legislation of Pakistan as well as the environmental guidelines of the International Finance Corporation (IFC), TCC procured the services of SRK Consulting (UK) Ltd. and Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of the proposed project and associated developments, including extraction of water, transportation of refined products, and storage and handling of the products at the ports for export shipments. The services provided by Hagler Bailly Pakistan focused on the establishment of an environmental and social baseline, conducting public consultation, carrying out resource assessment studies, advising on impact assessments and mitigation, and assisting the client in obtaining environmental permits and approvals.

  As a team member, worked on baseline surveys for noise, traffic, water resources identification and sampling, soil and soil fertility, air quality, sensitive receptors of the transport rote for ESIA.

  Played an active role in ESIA activities of the project, conducted baseline marine environmental studies at Port Qasim, Karachi Port and Gwadar Port. This included extensive sampling for marine water quality in different seasons as well as sampling of fish for heavy metals analysis. Seasonal sampling included sediment and fish tissue.

- **Environmental Assessment**

  Environmental Site Assessment Project of Selected Depots, Installations and Retail Outlets, Shell Pakistan Ltd., 2002 to 2005: Environmental Scientist

  Shell Pakistan engaged Hagler Bailly Pakistan to develop an environmental risk mitigation strategy for ten of its petroleum retail sites in the country where the latter had previously conducted on-site environmental assessments.

  Collection of the site related information covering current and historical events on the land use, identifying sensitive receptors, off site impact sources, water bodies in surroundings of the site. In the second phase intrusive work was carried out including monitoring well installation, groundwater sampling, field testing.
(soil screening and water testing for physical parameters), soil samples, effluent water samples and groundwater samples collection, handling, storage and transport to overseas testing laboratory, establishing groundwater flow direction. Also performed quality checks on laboratory results, compilation and analysis of testing results received, draw conclusion after comparing with local and international standards, report writing and provide findings of the study and recommend future actions.

- **Environmental Audits, Monitoring and Training**


  The Government of Pakistan awarded a contract to the Pak-Arab Refinery Company Limited (PARCO) to implement the White Oil Pipeline Project (WOPP), a 780 km long 26-inch diameter cross-country pipeline connecting the port at Karachi with a mid-country oil terminal. One section of the planned pipeline route crosses the Indus River near Ghazi Ghat in D I Khan district. The Indus River is home to a multitude of species, including much endangered fauna, particularly the rare Indus Dolphin. PARCO engaged Hagler Bailly Pakistan to undertake an environmental assessment of the Indus River pipeline crossing design and prepare an environmental management plan for its construction.

  As PM, responsibilities included field surveys, issue tracking and evaluating compliances with environmental monitoring, and reporting for the implementation of the environmental management plan (EMP) and environmental impact assessment (EIA)

- **Environmental Audits, Monitoring and Training**

  Stack Emissions Testing at Saba Thermal Power Plant, Saba Thermal Power Plant, 2005: Chemist

  Saba Power Company Pakistan contracted Hagler Bailly Pakistan to perform stack emissions testing at its IPP facility located in Farooqabad, near Sheikhpura, Pakistan. Hagler Bailly Pakistan performed stack emissions testing to determine the plant’s compliance with World Bank environmental standards. The parameters to tested were particulate matter, oxides of nitrogen, sulfur dioxide, and carbon monoxide, each measured at 80 to 100% plant operating loads.

  Assisted air emissions testing to determine the plant’s compliance with World Bank Standards for environmental performance. The tested parameters comprised of particulate matter, oxides of nitrogen (NOx), sulfur dioxide (SO2): and carbon monoxide (CO), each measured at 80 to 100% plant operating load.

- **Environmental, Health, Safety Plans and Training**

  Continual Improvement and Implementation of Health, Safety and Environmental (HSE) Policies, HBP Internal 2010 – on going

  As HSE Manager responsibilities include: maintaining a safe environment, implement and promote HSE programs, ensure workplace safety comply with health and safety policy, preparation site specific Health and Safety Plan- HASP and Emergency Response Plan- ERP, preparation of Job Loss Analysis- JLA and eliminate the risk during works, prepared Journey Management Plan- JMP, conduct regular site safety inspection and follow-up actions, assist in incident, near miss and unsafe act investigation and record conduct regular safety
trainings for crew like permit to work system, including cold and hot permits, confine space entry, work at height, personal protective equipment- PPE, Loss Prevention System- LPS, ergonomic, hand safety, gas testing, traffic management and etc.

13. **Certification**

I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

Signature of Expert
### Sadia Asghar

#### 1. Title
Specialist (Environmental Engineer)

#### 2. Name of Firm
Hagler Bailly Pakistan

#### 3. Name of Expert
Sadia Asghar

#### 4. Date of Birth
September 13, 1992

#### 5. Education
<table>
<thead>
<tr>
<th>Degree</th>
<th>Date</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSc (Environmental Engineering)</td>
<td>2014</td>
<td>University of Engineering and Technology, Lahore</td>
</tr>
</tbody>
</table>

#### 6. Membership in Professional Associations
Registered with Pakistan Engineering Council

#### 7. Other Training
NA

#### 8. Countries of Work Experience
Pakistan, Georgia, Kyrgyzstan

#### 9. Languages
<table>
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<tr>
<th>Language</th>
<th>Reading</th>
<th>Writing</th>
<th>Spoken</th>
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<tr>
<td>English</td>
<td>Excellent</td>
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<tr>
<td>Urdu</td>
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#### 10. Employment Record

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<tr>
<th>From:</th>
<th>To:</th>
<th>Employer</th>
<th>Position Held</th>
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<tbody>
<tr>
<td>Apr 2015</td>
<td>Present</td>
<td>Hagler Bailly Pakistan</td>
<td>Environmental Engineer</td>
</tr>
<tr>
<td>Jul 2013</td>
<td>Aug 2013</td>
<td>Environmental Protection Department, Punjab, Lahore</td>
<td>Internship</td>
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#### 11. Task Areas
- Documentation Review
- Compliance Assessment against IFC Performance Standards

#### 12. Details of Work Undertaken
Environmental and Social Due Diligence for Expansion of Engro Fertilizer Plants, 2019, Daharki, Sindh, CDC Group plc, London, United Kingdom: Physical Environment Specialist

CDC Group PLC considered a debt investment in fertilizer manufacturing plants owned and operated by Engro Fertilizer at Daharki in Pakistan’s Sindh province. The planned upgrades included replacing a waste heat boiler, which was required to increase energy efficiency for existing fertilizer plants. Hagler Bailly Pakistan was engaged as the lender’s independent environmental and social advisor to conduct environmental and social (E&S) due diligence against applicable local, national and international environmental and social legislation, IFC Performance Standards and World Bank Environmental, Health and Safety Guidelines. The E&S assessment included...
consideration of the entire operations of both plants as well as the planned upgrades.

Carried out detailed review of available information in conformance with IFC Performance Standards. Identified the non-compliances and the gaps in the management and monitoring systems of Engro Fertilizer Limited, Daharki and recommended the possible solutions to meet the requirements of IFC Performance Standards.

▪ Standards Compilation
▪ Development of Associated Plans

Advisory and Support on Development of Environmental Management System for Power Cement Limited, 2018-2019, Nooriabad Industrial Area, Jamshoro, Sindh, Deutsche Investitions-und Entwicklungsgesellschaft (DEG), Köln, Germany, Physical Environment Specialist

Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooriabad Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL’s investment into a new Plant. To support PCL’s ability to comply with DEGs’ environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an advisory, and provide support in development of an Environment and Social Management System, underlying plans and procedures.

Supported the project team in developing the environmental and social management system and its associated plans and standard operating procedures.

▪ Collected, Reviewed and Compiled Primary and Secondary Data
▪ Baseline Studies
▪ Impact Assessments of Physical Environment
▪ Environmental Management Plan
▪ Report Writing


Sapphire Electric Company Limited (SECL) is developing the 150-megawatt (MW) Sharmai Hydropower Project in Khyber Pakhtunkhwa (KP). The proposed Project is a run-of-river project located on Panjkora River in Upper Dir District. In order to assess the impacts of the Project on the surrounding environment and comply with the applicable national environmental regulations and International Finance Corporation sustainability safeguards, SECL acquired the services of Hagler Bailly Pakistan to carry out the Environmental and Social Impact Assessment of the proposed Project.

Prepared physical baselines using the primary and secondary data (air, water, visual character, climate, noise, and traffic). Identified and evaluated the potential impacts, qualitatively and quantitatively, of the project on community.
standards

Development of Associated Plans

Water Vulnerability Study for Cement Plant in Sindh, 2018-ongoing, Deutsche Investitions- und Entwicklungsgesellschaft, Environment Specialist

Power Cement Limited (PCL), a subsidiary of the Arif Habib Group, operates a cement manufacturing plant in the Noorabadi Industrial Area near Jamshoro in Pakistan's Sindh province. PCL plans to construct a second cement plant with a capacity of 7,700 tonnes per day within the premises of the existing facility. The Arif Habib Group is in discussions with Deutsche Investitions- und Entwicklungsgesellschaft (DEG), a German development finance institution, regarding debt financing for PCL's investment in the new plant. To support PCL's ability to comply with DEG's environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan to carry out a water vulnerability study to characterize the impact of pumping groundwater by the new project and to evaluate future water availability risks to PCL's operation in the medium term (20-30-year perspective).

Supported the project team in developing the environmental and social management system and its associated plans and standard operating procedures.

Collected, Reviewed and Compiled Primary and Secondary Data

Baseline Studies

Impact Assessments of Physical Environment

Environmental Management Plan

Report Writing


Shanghai Investigation Design & Research Institute Co., Ltd (SIDRI) is developing the 640 MW Mahl Hydropower Project on the Jhelum River. SIDRI contracted the services of Hagler Bailly Pakistan to update the Environmental and Social Impact Assessment (ESIA) for the Project to indicate the presence of valued terrestrial and aquatic biological resources, in the area that will be affected by the Project and facilitate its approval from the International Finance Corporation and national Environmental Protection Agencies.

Prepared physical baselines using the primary and secondary data (air, water, visual character, climate, noise, and traffic). Identified and evaluated the potential impacts, qualitatively and quantitatively, of the project on community, suggested appropriate mitigation measures and supported in the development of environmental management and monitoring plans.

Baseline Studies

Collected, Reviewed and Compiled Primary

Environmental and Social Impact Assessment of Balakot Hydropower Project, 2016-ongoing, Asian Development Bank (ADB), Khyber-Pakhtunkhwa, Physical Environment Specialist

The Asian Development Bank (ADB) under its Hydropower Investment Development Program is financing the 300
| and Secondary Data | megawatt (MW) run-of-river hydropower plant with related infrastructure at Balakot, Mansehra district of Khyber Pakhtunkhwa (KP), Pakistan. The ADB also intends to further explore multiple projects with individual plant capacity not exceeding 400 MW in KP. The ADB has contracted the services of Hagler Bailly Pakistan to carry out an ESIA of the 300 megawatt (MW) Balakot Hydropower Project and to establish safeguards frameworks for environmental review and land acquisition and resettlement for the successive projects. The services of Hagler Bailly included social and poverty analysis, resettlement plan, biodiversity management plan, and climate change risk assessment, and environmental flow assessment. |
| Impact Assessments of Physical Environment | Prepared physical baselines using the primary and secondary data (air, water, visual character, climate, noise, and traffic). Identified and evaluated the potential impacts of the project on community and suggested appropriate mitigation measures. |
| Report Writing | |
| Standards Compilation | Independent Environmental Monitoring of Polymer and Chemicals Production Plant Expansion, 2019-2020, Engro Chemicals Pakistan Limited, Physical Environment Specialist |
| Compliance Evaluation against Applicable Standards | Hagler Bailly Pakistan was commissioned by Engro Polymer & Chemicals Limited (EPCL), a subsidiary of Engro Corporation, as an independent monitoring consultant for carrying out environmental monitoring and reporting of its polyvinyl chloride (PVC) and vinyl chloride monomer (VCM) plant expansion project at Port Qasim near Karachi. Services provided related to compliance checks on the implementation of mitigation measures recommended in the project's environmental impact assessment (EIA) report and conditions specified in the environmental approvals granted by the Sindh Environmental Protection Agency. |
| Environmental Monitoring Analysis | Developed monitoring methodologies and plans, carried out the environmental monitoring analysis, evaluated compliance against EMMP and prepared and reviewed monthly monitoring reports. |
| Reporting | |
| Baseline Studies | Azad Pattan Power (Private) Limited (APPL) is developing the 700.7 megawatt Azad Pattan Hydropower Project in Azad Jammu and Kashmir (AJK). The proposed Azad Pattan Hydropower Project (APHP) is a run-of-river (RoR) hydroelectric power project on Jhelum River. APPL contracted the services of Hagler Bailly Pakistan (Pvt.) Ltd. to carry out an ESIA of the Project which meets international standards and conforms to environmental legislation of AJK. |
| Impact Assessments of Physical Environment | Prepared physical baselines using the primary and secondary data (air, water, visual character, climate, noise, and traffic). Identified and evaluated the potential impacts, qualitatively and quantitatively, of the project on community, |
| Environmental Management Plan | |
| Report Writing | |
suggested appropriate mitigation measures and supported in the development of environmental management and monitoring plans.

<table>
<thead>
<tr>
<th>Standards Compilation</th>
<th>Environmental Compliance Audit of 225 MW Combined Cycle Power Plant, 2018, Narowal Energy Limited, Lahore, Environment Specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance Evaluation against Applicable Standards</td>
<td>Narowal Energy Limited (NEL), a subsidiary of Hub Power Company Limited (HUBCO) operates a 225 MW combined cycle power plant (the Plant) near Narowal. NEL acquired the services of Hagler Bailly Pakistan to carry out an Environmental Compliance Audit (ECA) at its power production facility to check if the Plant operations are in compliance to national laws, applicable standards and environmental approval granted by Environmental Protection Agency (EPA), Punjab. Assessed compliance with applicable laws and conducted detailed analysis of gaps in the environmental and social impact assessment, previous monitoring being carried out and existing management plans.</td>
</tr>
<tr>
<td>Reporting</td>
<td></td>
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<table>
<thead>
<tr>
<th>Standards Compilation</th>
<th>Development of Environmental and Social Management System and Organizational Health and Safety Management System, 2018, Hyundai Nishat Motors (Pvt) Ltd, Lahore, Environment Specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of Associated Plans</td>
<td>Hyundai Nishat Motor (Pvt) Ltd., a joint venture of Sojitz Corporation, Japan and Nishat Group, Pakistan planned to establish a Plant to assemble and distribute vehicles of Hyundai Motor Corporation in Pakistan. The Plant will be built within Plot No. 172 to 208 in M3 Faisalabad Industrial Estate (FIE) developed by Faisalabad Industrial Estate Development and Management Company (FIEDMC). In order to comply with the applicable national environmental regulations, conditions of environmental approval granted by Punjab EPA, EMP and EIA of the Plant and best international practices such as Performance Standards (PS) of International Finance Corporation (IFC) and PS of Multilateral Investment Guarantee Agency (MIGA), the Client acquired the services of Hagler Bailly Pakistan (Pvt.) Ltd., for development of Environmental and Social Management System and Organizational Health and Safety Management System in conform to ISO 14001 and OHSAS 18001 in mind for certification. Supported the project team in developing the environmental and social management system and its underlying plans and specifically developed the hazardous material and waste management plan and contractor management plan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carbon footprint verification</th>
<th>Verification of Carbon Footprint, 2017-2018, Engro Fertilizers Limited, Daharki, Environment Specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Engro Fertilizer acquired the services of Hagler Bailly Pakistan to verify the carbon footprint of its fertilizer plant. Net emissions were calculated for the plant processes, capture and removal technologies.</td>
</tr>
</tbody>
</table>
Verified the carbon footprints for fertilizer manufacturing plant for Engro based on the raw data provided by Engro.

- Client Liaison
- Baseline Studies including Physical and Social
- Impact Assessments including Quantitative Modeling and Qualitative Studies
- Air Dispersion Modeling (AERMOD) and Assessment
- Report Writing, Compilation and Review


Engro Powergen Limited (EPL) contracted the services of Hagler Bailly Pakistan Ltd. to conduct the ESIA of a 350-megawatt (MW) lignite coal-based power plant located in Engro’s Thar Block II Energy Park in Thar Coalfields in Sindh. The proposed Project will be based on CFB boiler technology with super-critical steam parameters and is being developed by Bhitra Power Limited.

Prepared project description section in coordination with client and project team and compiling technical plant design data. Managed the fieldwork execution from preparing the physical environment survey plans to compiling and analyzing the field data. Also, developed the existing environment of the area including air, noise, water, topography, climate, seismicity, geology and soils. Prepared the dynamic air quality baseline with the predictive numerical modeling of air quality exposed to the receptors. Evaluated the project impact on the community regarding noise, air, water, GHGs. Conducted air dispersion modeling to calculate the plant incremental concentration of the plant over the baseline. Provided appropriate mitigation measures and management plans for the evaluated impacts. Conducted complete compilation, quality assurance and review of the report.
- Client Liaison
- Baseline Studies including Physical and Social
- Impact Assessments including Quantitative Modeling and Qualitative Studies
- Air Dispersion Modeling (AERMOD) and Assessment
- Report Writing, Compilation and Review


Liberty Power Tech Limited, through Engro Powergen Private Limited, contracted the services of Hagler Bailly Pakistan Ltd. to conduct the ESIA of a 660-megawatt (MW) lignite coal-based power plant located in Engro’s Thar Block II Energy Park in Thar Coalfields in Sindh. The power plant is being developed by Liberty Power Tech Limited and will be based on PC boiler technology with super-critical steam parameters.

Initial Environmental Examination of 158kW Solar Project, Ongoing, Engro Vopak Terminal Limited (EVTL), Karachi, Physical Environment Specialist

Engro Vopak Terminal (Pvt) Limited (EVTL) ("Client"), an entity of Engro Corporation, is planning to develop a Solar Photovoltaic (PV) Plant (the "Project") having total capacity of 158 kW in Port Qasim Karachi on its existing facility.

EVTL appointed Hagler Bailly Pakistan Pvt. Ltd (HBP) to conduct an Initial Environmental Examination (IEE) which will be submitted to the Sindh Environmental Protection Agency (SEPA) following the requirements for environmental approval.

Developed the existing environment of the area including air, noise, water, topography, climate, seismicity, geology and soils. Identified the project impacts, prepared the impact assessment methodology and suggested appropriate mitigation measures.


Pakistan Refinery Limited (PRL), owns and operates a hydro skimming refinery at Korangi, Karachi since 1960. Presently, the refinery has a capacity of processing 47,000 BPSD (barrels per stream day) of crude oil. PRL has initiated Refinery Expansion and Upgradation Project ("REUP") or the
### Modeling and Qualitative Studies

- **Report Writing, Compilation and Review**

  "Project") to increase the capacity to 100,000 BPSD. In order to comply with the environmental laws and meet the financing requirements, PRL intends to commission an environmental and social impact assessment (ESIA) of the proposed Project.

  Managed the fieldwork execution from preparing the physical environment survey plans to compiling and analyzing the field data. Also, developed the existing environment of the area including air, traffic, noise, water, topography, climate, seismicity, geology and soils using primary and secondary data. Prepared the dynamic air quality baseline with the predictive numerical modeling of air quality exposed to the receptors. Evaluated the project impact on the community regarding noise, air, traffic and water. Conducted air dispersion modeling to calculate the plant incremental concentration of the plant over the baseline. Provided appropriate mitigation measures and management plans for the evaluated impacts. Conducted complete compilation, quality assurance and review of the report.

### Physical Baseline Studies

- **Physical Baseline Studies**
  - EIA of Second Expansion Project of Engro Polymer and Chemical Plant, 2018, Engro Polymer and Chemicals Limited, Karachi, Physical Environment Specialist

  Engro Polymer & Chemicals Limited (EPCL) is planning an expansion in production of existing Plant located in Port Qasim, Karachi. Under the expansion Project, the production capacity of the PVC plant will be expanded from 150 ktpy to 250 ktpy and the EDC plant will be expanded from 230 ktpy to 245 ktpy. The Project will also include other modifications including the addition of an import line for EDC and installation of another VCM storage tank. EPCL acquired services of Hagler Bailly Pakistan for carrying out an EIA study in compliance with the applicable prevailing national laws, IFC Performance Standards and applicable WBG environment, health and safety (EHS) guidelines, as well as the subsequent submission to Sindh Environmental Protection Agency (SEPA) for getting the environmental approval for the Project.

  Managed the fieldwork execution from preparing the physical environment survey plans to compiling and analyzing the field data. Also, developed the existing environment of the area including air, noise, water, waste, topography, climate, seismicity, geology and soils. Evaluated the project impact on the community regarding noise, air, water, GHGs, accidental spills and releases. Provided appropriate mitigation measures. Conducted complete compilation, quality assurance and review of the physical environment sections.

### Client Liaison

- **Client Liaison**
  - Initial Environmental Examination of Hyundai Motor Company Vehicles, 2017-2018, Sojitz Corporation, Tokyo, Japan, Backup Manager

  Sojitz Corporation in partnership with Nishat Group (the "Proponents") are carrying out feasibility study to establish a facility to assemble and distribute vehicles of Hyundai Motor
- Physical Impact Assessments
- Air Dispersion Modeling (AERMOD) and Assessment
- Environmental Management Plans
- Report Writing and Compilation

Corporation (the "Project") in Pakistan. The proposed Project is planned to be built within Plot No. 172 to 208 (on an area of around 60 acres) in M3 Faisalabad Industrial Estate (FIE) developed by Faisalabad Industrial Estate Development and Management Company (FIEDMC). Sojitz Corporation has acquired the services of Hagler Bailly Pakistan to carry out Environmental Assessment of the Project to assess its impacts on the surrounding environment and comply with the applicable national environmental regulations.

Prepared project description section in coordination with client and project team and compiling technical plant design data. Managed the fieldwork execution from preparing the physical environment survey plans to compiling and analyzing the field data. Also, developed the existing environment of the area including air, noise, water, topography, climate, seismicity, geology and soils. Evaluated the project impact on the community regarding noise, air, water, GHGs qualitatively. Provided appropriate mitigation measures and management plans for the evaluated impacts. Being Backup Manager, Conducted complete compilation, quality assurance and review of the report.


The Siddiqsons Energy Limited intended to establish a 330 MW Thar lignite coal-based power plant in the Energy Park associated with Block II Thar Coalfields in Sindh. Hagler Bailly Pakistan was engaged to conduct an Environmental and Social Impact Assessment for the project for necessary regulatory compliance approvals.

Managed the complete project including client liaison, resource allocation, fieldwork execution, budget control, and meeting deliverables. Also, developed the existing environment of the area, evaluated the project impact on the community and provided appropriate mitigation measures.

Noise Modeling of Tbilisi-Rustavi Urban Road Link, Georgia, 2017, Asian Development Bank (ADB), Manila, Philippines: Noise Quality Expert

The Asian Development Bank (ADB) is assisting the Government of Georgia in upgrading the Tbilisi-Rustavi urban road link. A section of the road passes very close to several buildings whose occupants registered concerns about potential noise emanating from the road construction activities as well as the subsequent increased movement of vehicular traffic on the highway. ADB acquired the services of Hagler Bailly Pakistan to measure existing noise levels in the vicinity to establish a baseline and model noise levels from the planned road development activity.

Managed the overall project including client coordination, resource deployment, budget control, scheduling meetings...
and meeting the deadlines. Carried out noise modeling for the project. Evaluated the noise emissions of the project, compared with the standards and suggested the appropriate mitigation measures.

- **Baseline Studies**
  - Collected, Reviewed and Compiled Primary and Secondary Data
  - Impact Assessments of Physical Environment
  - Air Dispersion Modeling (AERMOD) and Assessment
  - Resettlement Studies
  - Report Writing

**Environmental and Social Impact Assessment of the Kohala Hydropower Project, 2016, Kohala Hydro Company Limited, Islamabad, Physical Environmental Specialist**

Chinese Three Gorges South Asia Investment Ltd. (CSAIL) is developing the 1,124 megawatt (MW) Kohala Hydropower Project in Azad Jammu and Kashmir (AJK). Hagler Bailly Pakistan undertook an environmental and social impact assessment (ESIA) of the project.

Prepared physical baselines using the primary and secondary data (air, water, visual character, climate, noise, and traffic). Identified and evaluated the potential impacts of the project on community and suggested appropriate mitigation measures. Coordinated in preparing resettlement related fieldwork and analyzed and reported the field results as Resettlement Action Plan.

- **Back up Management**
  - Collected, Reviewed and Compiled Primary and Secondary Data
  - Baseline Studies including Physical and Social
  - Impact Assessments including Quantitative Modeling and Qualitative Studies
  - Air Dispersion Modeling (AERMOD) and Assessment
  - Report Writing, Compilation and Review

**Environmental and Social Impact Assessment of 330 MW Coal-fired Power Project in Thar Block II Energy Park, 2016, HUBCO, Air Quality Expert**

The Hub Power Company Limited intended to establish a 330 MW lignite coal-fired power plant in the Energy Park associated with Thar Coalfields Block II in the Tharparkar district in southern Sindh, Pakistan. In order to comply with the applicable national environmental regulations, Hub Power engaged Hagler Bailly Pakistan to conduct an environmental and social impact assessment (ESIA) for the Project.

Prepared survey plans, background information document, and physical and social baselines using the primary and secondary data (air, water, visual character, climate, noise, traffic, demographics, physical and social infrastructure, local economy, livelihoods). Worked on public consultation section, reviewed consultation logs and prepared logs summary. Identified and evaluated the potential impacts of the project on community and suggested appropriate mitigation measures. Specifically conducted predictive air dispersion modeling to assess the incremental and cumulative impact on nearby receptors.

- **Back up Management**
  - Collected, Reviewed and Compiled Primary and Secondary Data


ThalNova Power Thar (Private) Limited intended to establish a 330 MW lignite coal-fired power plant in the Energy Park associated with Thar Coalfields Block II in the Tharparkar district in southern Sindh, Pakistan. In order to comply with
Hub Power engaged Hagler Bailly Pakistan to conduct an environmental and social impact assessment (ESIA) for the Project. Prepared survey plans, background information document, and physical and social baselines using the primary and secondary data (air, water, visual character, climate, noise, traffic, demographics, physical and social infrastructure, local economy, livelihoods). Worked on public consultation section, reviewed consultation logs and prepared logs summary. Identified and evaluated the potential impacts of the project on community and suggested appropriate mitigation measures. Specifically conducted predictive air dispersion modeling to assess the incremental and cumulative impact on nearby receptors.

Environmental and Social Impact Assessment of Coal Mining and Coal-fired Power Plant in Thar Coal Blocks IIIA and IIIB, Tharparkar, Sindh, 2015-ongoing, Asia Power Group, Perth, Australia: Air Quality and Climatology Expert

Asia Power Limited (APL), part of the Asia Power Group, Australia, intended to develop an open-pit coal mine and coal-fired power plant in Blocks IIIA and IIIB of the Thar Coalfields located in the Tharparkar district in southern Sindh, Pakistan. APL hired Hagler Bailly Pakistan to carry out the environmental and social impact assessment (ESIA) for the project. Specialist studies on geochemistry and hydrogeology were carried out in collaboration with SRK Consulting (SRK), United Kingdom.

Prepared physical baselines (air, water, climate, noise and traffic) for the project by compiling and collecting primary and secondary data.


The site of the proposed 102 MW Gulpur Hydropower project, financed by the Asian Development Bank (ADB) and the International Finance Corporation (IFC), is located in the Kotli District of Azad Jammu and Kashmir, at a distance of 167 kilometers from Islamabad. Mira Power Limited (MPL), the owners of the project, initiated construction in 2016. The project's major components include the main dam, intake structure, and powerhouse. MPL acquired the services of Hagler Bailly Pakistan to act as the project's independent social and monitoring consultant to ensure that ADB's involuntary resettlement safeguard requirements were met and that measures to address impacts on affected people were implemented and helped achieve desired results. Hagler Bailly Pakistan also independently monitored MPL's performance in implementing the Stakeholder Engagement Plan, the effectiveness of the project's grievance redress mechanism and the compliance of MPL, its contractors, and
subcontractors with applicable labor laws and IFC’s Performance Standards 2 on labor and working conditions. Reviewed Land Acquisition and Resettlement Plan (LARP) and carried out a gap analysis. Prepared LARP interim audit report and coordinated in conducting an audit. Preparing monitoring and evaluation plan for resettlement, stakeholder engagement plan and labor and working conditions.

- **Project Management**
- **Air Dispersion Modeling (AERMOD) and Assessment**
- **Noise Modeling (SoundPLAN) and Assessment**
- **Collected, Reviewed and Compiled Primary and Secondary Data**
- **Report Writing**

- **Baseline Studies**
- **Air Dispersion Modeling (AERMOD) and Assessment**
- **Noise Assessment**
- **Female Consultations**
- **Report Writing**

The Roads Department of the Government of Georgia acquired the services of the Hagler Bailly Pakistan to undertake a detailed environmental assessment of a Batumi Bypass road in western Georgia.

Managed the overall project including the client coordination, resource deployment, budget control, scheduling meetings and meeting the deadlines. Prepared baseline studies by collecting and compiling data (air, climate, and traffic) from primary and secondary sources. Carried out air dispersion modeling and noise modeling for the project. Evaluated the air and noise emissions of the project, compared with the standards and suggested the appropriate mitigation measures.

The Asian Development Bank (ADB) provided financing to Pakistan's National Highway Authority (NHA) for the construction of the 184 km Faisalabad to Khanewal (M-4) motorway. An environmental and social impact assessment (ESIA) for the project had been prepared in 2006. Consistent with the updated environmental assessment guidelines of the ADB, Hagler Bailly Pakistan prepared a cumulative impact assessment (CIA) of the project for the bank. The CIA included scoping consultations with stakeholders, identification, and prioritization of valued environmental and social components (VECs), assessment of the impact of the project on VECs, and the establishment of mitigation measures for the management of such impacts.

\[\text{Worked on physical baselines and identified potential impacts of the project on VECs and carried out an impact assessment for these. Conducted female consultations to see the social impact of the project on women. An assessment of greenhouse gases emissions and air dispersion modeling was carried out when the project is under construction and operation. Conducted noise modelling to see the noise impact from the project on VECs. Recommended mitigation measures for noise along with the description of constructing noise barriers.}\]
Engro Powergen Limited (EPL) planned to develop a 225 MW combined-cycle power plant based on Regasified liquefied natural gas at Port Qasim near Karachi, Pakistan. EPL acquired the services of Hagler Bailly Pakistan to conduct an environmental impact assessment (EIA) of the proposed project which would comply with the regulatory requirements of the Government of Sindh.

The scope of the EIA included conducting baseline studies to characterize the existing social and biophysical environment using primary and secondary data. Public consultations were held to ensure that project stakeholders were informed of the project development plan and provided an opportunity to influence it. As part of the EIA, the environmental and social impacts of the project, both negative and positive, were analyzed and mitigation, management, and monitoring plans were developed for the construction phase of the project.

Prepared baseline studies by collecting and compiling data from primary and secondary sources. Carried out air dispersion modeling and water quality assessment for the project. Evaluated the emissions of the project and suggested the appropriate mitigation measures.

Developed physical environment of the area. Identified project impacts, carried out air quality predictive modeling of conveyor belt used for the transportation of coal, evaluated the compliance against standards and suggested appropriate mitigation measures.
Baseline Studies
Collecting, Reviewing and Compiling Primary and Secondary Data
Air Dispersion Modeling (AERMOD) and Assessment for Combined Operations of all the development at Port Qasim Industrial Zones
Water Quality Assessment
Report Writing

The International Finance Corporation (IFC), the private sector arm of the World Bank Group, planned on investing in the Engen liquefied natural gas (LNG) terminal at Port Qasim near Karachi, Pakistan. Port Qasim Authority (PQA) plans to add another 11 jetties at the facility with possible IFC investments. As a strategic ESIA (SESIA) had not been undertaken during the earlier planning stage for the port, IFC contracted the services of Hagler Bailly Pakistan to conduct a priority ecosystem service review (PESR) and a cumulative impact assessment (CIA) for all current and planned operations at Port Qasim. The PESR and CIA were prepared according to local regulatory requirements, IFC Performance Standards and applicable WBG environment, health and safety (EHS) guidelines.

Prepared a physical baseline for the project by collecting secondary data. Conducted air quality impact assessment for anthropogenic sources (traffic on highways and railways, industrial activities in PQA and port activities including ships at berth and ships at sea) and natural sources (wind-blown dust from open areas) to evaluate the cumulative impact of the project and surrounding sources on the sensitive receptors. Carried out emission modeling analysis and prepared the impact assessment report.

13. Certification
I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

----------------------------------------------
Signature of Expert
<table>
<thead>
<tr>
<th><strong>Ramsha Fatima</strong></th>
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<tbody>
<tr>
<td><strong>1. Title</strong></td>
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<tr>
<td><strong>2. Name of Firm</strong></td>
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<td><strong>3. Name of Expert</strong></td>
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<td><strong>4. Date of Birth</strong></td>
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<td><strong>6. Membership in Professional Associations</strong></td>
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<td><strong>7. Other Training</strong></td>
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<tr>
<td>• Workshop on IFC Performance Standards and ES-OHS-MS, Hagler Bailly Pakistan, 2018</td>
</tr>
<tr>
<td>• 40 hours Safety Training (Emergency Response Plan, First Aid and CPR, HIRA, Incident Reporting and Investigation, Permit to Work System, PPE, Process Safety Management and Ergonomics), Attock Refinery Limited, 2017</td>
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<td>• In-house Technical Training on Process Hazard Analysis (HAZOP), Attock Refinery Limited, 2017</td>
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<td>• Monthly Live Fire Practice, Attock Refinery Limited, 2017</td>
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<td><strong>8. Countries of Work Experience</strong></td>
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<td>Urdu</td>
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## 11. Task Areas

- Documentation Review
- Gap Analysis
- Report writing on Due Diligence Findings and Recommendations for PS 1 and 4
- Development of Action Plan
- Backup Client coordination

## 12. Details of Work Undertaken

<table>
<thead>
<tr>
<th>Details of Work Undertaken</th>
<th>Description</th>
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<tbody>
<tr>
<td>Environmental and Social Due Diligence for Expansion of Engro Fertilizer Plants, 2019, CDC Group PLC, UK, Daharki, Sindh: Backup Project Manager</td>
<td>CDC Group PLC considered a debt investment in fertilizer manufacturing plants owned and operated by Engro Fertilizer at Daharki in Pakistan's Sindh province. The planned upgrades included replacing a waste heat boiler, which was required to increase energy efficiency for existing fertilizer plants. Hagler Bailly Pakistan was engaged as the lender's independent environmental and social advisor to conduct environmental and social (E&amp;S) due diligence against applicable local, national and international environmental and social legislation, IFC Performance Standards and World Bank Environmental, Health and Safety Guidelines. The E&amp;S assessment included consideration of the entire operations of both plants as well as the planned upgrades. Ramsha has contributed towards documentation review and identification of gaps for Environmental and Social Due Diligence of Engro Fertilizer Limited, Daharki against the World Bank IFC Performance Standards.</td>
</tr>
<tr>
<td>Advisory and Support on Development of Environmental Management System for Power Cement Limited, 2019, Deutsche Investitions und Entwicklungsgesellschaft, Nooribad Industrial Area, Jamshoro, Sindh; Environmental Engineer</td>
<td>Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooribad Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL's investment into a new Plant. To support PCL's ability to comply with DEGs' environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an advisory, and provide support in development of an Environment and Social Management System, underlying plans and procedures. Ramsha has contributed towards development of multiple underlying plans for an Environmental and Social Management System (ESMS) along with implementation support to comply with requirements of the International Finance Corporation for Power Cement Limited and Deutsche Investitions- und Entwicklungsgesellschaft mbH.</td>
</tr>
</tbody>
</table>
- Compilation of Community Hydrocensus
- Assessment of Water use and well characterization
- Analysis of baseline hydrology
- Water Balance Modelling

Water Vulnerability Study for Cement Plant in Sindh, 2018-ongoing, Deutsche Investitions- und Entwicklungsgesellschaft, Environment Specialist

Power Cement Limited (PCL), a subsidiary of the Arif Habib Group, operates a cement manufacturing plant in the Nooriabad Industrial Area near Jamshoro in Pakistan's Sindh province. PCL plans to construct a second cement plant with a capacity of 7,700 tonnes per day within the premises of the existing facility. The Arif Habib Group is in discussions with Deutsche Investitions- und Entwicklungsgesellschaft (DEG), a German development finance institution, regarding debt financing for PCL's investment in the new plant. To support PCL’s ability to comply with DEG's environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan to carry out a water vulnerability study to characterize the impact of pumping groundwater by the new project and to evaluate future water availability risks to PCL's operation in the medium term (20-30-year perspective).

Contributed in development of methodology and analysis of baseline hydrological data as well as water balance modelling.

- Water Quality
- Water sampling and analysis
- Liaison with laboratories for analysis reports
- Quality assurance of laboratories

Ecosystem Revitalization for River Ravi Basin, 2018-(ongoing), River Ravi, Lahore, Asian Development Bank, Philippines: Specialist Environmental Engineer

The Asian Development Bank acquired the services of Hagler Bailly Pakistan (Pvt) Ltd for a Technical Assistance to Punjab Environmental Protection Department on 'Revitalizing the Ecosystem of Ravi River Basin'. The objective of the assignment was to undertake a comprehensive assessment of the pollution situation in the river basin and develop a long-term, multi-sectoral plan to revitalize and build resilience in the basin, including recommendations for investment projects and institutional reforms. Outputs included comprehensive assessments of the water pollution and related health in the Ravi Basin; climate and hydrology of the Ravi, as well as Chenab and Jhelum basins that feed the irrigation network within the Ravi Basin, water quality institutions and capacity gaps, political economy and the aquatic ecosystem within the Ravi. Multi-stakeholder visioning was carried out to develop a consensus on desirable outcomes in the long term for the Ravi river in the context of sustainable development, along with setting up an analytic decision support framework to decide among a catalogue of intervention options. Finally, a revitalization and resilience plan was developed for the basin, along with feasibility studies, and transaction technical assistance, for two priority projects.

Involvement in Water Quality parameter finalization and costing of analysis, quality assessment and assurance of testing laboratories for analysis.

- Development of Environmental Framework

<table>
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<tr>
<th>Activity</th>
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<tr>
<td>Electric International Co., Ltd, China: Specialist and supporting Project Manager</td>
<td>Harbin Electric International Co., Ltd. is one of the Engineering, Procurement and Construction (EPC) bidder for the construction of the 1,320-megawatt (MW) coal-fired thermal power plant in Jamshoro District of Sindh province in Pakistan. Harbin Electric acquired the services of Hagler Bailly Pakistan for supporting the Company in the environmental management during project execution as envisaged in Environmental and Social Impact Assessment for the power project. Ramsha has contributed towards development of multiple plans for an Environmental and Social and Occupational Health and Safety Management System (ES-OHS-MS) to comply with requirements of the ADB, International Finance Corporation for the client.</td>
</tr>
<tr>
<td>Development of field Checklist</td>
<td>Environmental and Social Consulting Services for Mazar Independent Power Project, 2019, Mazar Sharif Afghanistan, Afghan Power Plant Company: Specialist Environmental Engineer Ghazanfar Group planned to establish a 50 megawatt (MW) natural gas fired power plant named Mazar Independent Power Project (IPP) near Mazar e Sharif, Balkh province in Afghanistan. The Project was financed by a group of financial institutions led by Internal Finance Corporation (IFC), the private arm of World Bank Group. Hagler Bailly Pakistan was hired as the Environment and Social Consultant to conduct a comprehensive review of the environmental and social aspects of the Project, identify gaps and inadequacies in the Project Environmental and Social Impact Assessment (ESIA), quantify the impact of these inadequacies (where possible) and recommend improvements to rectify these gaps. Hagler Bailly Pakistan also assessed compliance of the ESIA with national laws as well as IFC performance standards. Ramsha aided in development of the site checklist in light of IFC Performance Standards along with advisory on compliance of IFC Performance Standards.</td>
</tr>
<tr>
<td>Railway Noise Modelling Assessment and Reporting of Noise Modelling</td>
<td>Strategic Environmental Assessment of Keti Bandar Project, 2019, Sindh, Energy Department, Govt of Sindh, Karachi: Specialist Environmental Engineer The Government of Sindh intends to develop a coal-based power plant in the vicinity of the ancient port site of Keti Bandar. The development plan of the area includes power park, a special economic zone for manufacturing units, port facilities, associated residential areas and infrastructure. Keti Bandar Project is the first step of the larger plan and consists of 1,320 MW coal fired power plant, railway track from Thar Coalfield to Keti Bandar Project site for the transportation of Thar coal and a jetty for import of equipment and machinery. Hagler Bailly Pakistan was part of the consortium that undertook technical, financial, economic, and environmental assessment and reporting of noise modelling.</td>
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feasibility of the Keti Bandar Project. Hagler Bailly Pakistan conducted the Strategic Environmental Assessment (SEA) of the Keti Bandar development plan including the Keti Bandar Project. The objective of the SEA was to ensure that environmental and sustainability considerations are integrated into the planning and decision-making of the development plan and the Keti Bandar Project. The SEA included assessment of the regulatory and policy framework and obligations under international treaties; stakeholder analysis and consultations, development of environmental baseline including ecological, physical, social, and institutional aspects; identification and analysis of key environmental and social issues; identification of alternative development scenarios and their analysis; identification of various policy and regulatory measures required to ensure sustainability in future projects in the area; and, development of various management tools required for implementing the recommendations of the SEA.

Ms Ramsha carried out the noise modelling of the proposed railway line from Thar to Keti Bandar for different scenarios. She assessed and predicted the noise impacts along the railway corridor and proposed mitigation measures.

<table>
<thead>
<tr>
<th>Gap Analysis</th>
<th>Development of Environmental and Occupational Health and Safety Management Plans</th>
<th>Advisory on Implementation</th>
<th>Implementation Audit</th>
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<tr>
<td>Advisory and Support on Development of Environmental and Social Management System, 2018-(ongoing), Power Cement Limited (PCL) and Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG): Environmental Engineer</td>
<td>Power Cement Limited (PCL), a cement manufacturing plant in Jamshoro, Sindh, has planned to enhance the production capacity by installation of a new cement plant. Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution is providing debt financing for PCL’s investment into the new Plant and requires conformance with the Performance Standards of the private sector wing of the World Bank, i.e. International Finance Corporation (IFC). Hagler Bailly Pakistan (Pvt) Ltd has provided support and advisory services to PCL on its policies, plans and procedures to comply with the requirement of IFC Performance Standards. Ramsha has contributed towards development of multiple underlying plans for an Environmental and Social Management System (ESMS) along with implementation support to comply with requirements of the International Finance Corporation for Power Cement Limited and Deutsche Investitions- und Entwicklungsgesellschaft mbH. She was also</td>
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of underlying standard operating procedures for the motor vehicle manufacturing plant of Hyundai Nishat Motor Company (Private) Limited (HNMPPL). HNMPPL also employed the services of Hagler Bailly Pakistan to develop and implement training for its staff on the systems.

As a Project Manager, Ramsha has prepared all the training material in light of International Finance Cooperation Performance Standards 1 to 4 and managing associated tasks of the project.

- **Compilation of Community Hydrocensus**
- **Assessment of Water use and well characterization**
- **Analysis of baseline hydrology**
- **Water Balance Modelling**


Power Cement Limited (PCL) is constructing a new Cement Plant in Jamshoro, Sindh with enhanced cement production capacity of 7700 TPD. Deutsche Investitions und Entwicklungsgesellschaft (DEG), a German development finance institution is financing for PCL’s investment into a new Plant. To support PCL’s ability to comply with DEGs’ environmental and social requirements, DEG and PCL requested Hagler Bailly’s services to carry out Groundwater Study to characterize the impacts of pumping of groundwater, as well as evaluate the risks to PCLs operation in the medium term (20-30 year perspective).

Contributed in development of methodology and analysis of baseline hydrological data as well as water balance modelling.

- **Development of Environmental and Occupational Health and Safety Plans**

Development of Environmental and Social Management System and Organizational Health and Safety Management System, 2019, M3 Faisalabad Industrial Estate (FIE), Hyundai Nishat Motor (Pvt) Ltd.: Environmental Engineer

Hyundai Nishat Motor (Pvt) Ltd., a joint venture of Sojitz Corporation, Japan and Nishat Group, Pakistan planned to establish a Plant to assemble and distribute vehicles of Hyundai Motor Corporation in Pakistan. The Plant will be built within Plot No. 172 to 208 in M3 Faisalabad Industrial Estate (FIE) developed by Faisalabad Industrial Estate Development and Management Company (FIEDMC). In order to comply with the applicable national environmental regulations, conditions of environmental approval granted by Punjab EPA, EMP and EIA of the Plant and best international practices such as Performance Standards (PS) of International Finance Corporation (IFC) and PS of Multilateral Investment Guarantee Agency (MIGA), the Client acquired the services of Hagler Bailly Pakistan (Pvt.) Ltd., for development of Environmental and Social Management System and Organizational Health and Safety Management System in conform to ISO 14001 and OHSAS 18001 in mind for certification.

Provided support in development of multiple plans and procedures along with implementation support to the client.
Environmental Impact Assessment of MCR Revamp Project, 2017, Muzaffargarh, Pak Arab Refinery Limited (PARCO): Environmental Engineer

PARCO Mid Country Refinery was in process of enhancing its refining capabilities from 100,000-120,000 BPD to meet increasing demands of the country and to meet EURO III specifications of gasoline to produce more environment friendly fuel. For this, Installation of Isomerization Unit (Penex Unit) and Hydrogen Purification Unit (PSA) was planned to produce better quality and environment friendly fuel by reduction of Benzene and Aromatic contents; further enhancing RON number and decreasing Sulphur contents in HSD Product Specifications.

Ramsha led the technical development of the impact assessment and mitigation measures. Other responsibilities included client coordination along with NOC processing follow ups with EPA Punjab ensuring compliance requirements of the Project with national regulations and international best practices.

Environmental Monitoring and Auditing


Attock Refinery Limited (ARL) has recently installed two major units Isomerization Plant and De-Hydro Desulphurization Unit to upgrade the fuel refining capacity to EURO II specifications. During the construction phase of the project ARL requested NCPC to perform independent environmental health and safety audits of the construction site and also to audit HSE practices of the ECP Contractors.

Ms. Ramsha was involved in the monitoring of construction sites and effectively addressed the non-conformities. She provided valuable assistance to field representatives for environmental impacts mitigation and management.

Field Surveys

Initial Environmental Examination for Drilling of Khaur North-1 Exploratory Well in Khaur D&PL, District Attock, Punjab, 2017, Pakistan Oilfields Limited (POL): Environmental Engineer

Pakistan Oilfields Limited (POL) intended to conduct Drilling of Khaur North-1 Well at Khaur Development & Production Lease extending over an area of 90.70 kanal. POL holds a comprehensive D & P Lease at Khaur that is situated about 96 km southwest of Islamabad in Attock District, Punjab, Pakistan. The ultimate aim of this drilling activity is to explore untapped hydrocarbons and test the hydrocarbon potential of Eocene, Paleocene and Permian reservoirs of the Potwar Plateau. This prime objective of the drilling of North-1 Well is to increase the current level of oil and gas production as per increasing demand of the country to meet the energy crisis.

Carried out field surveys, collection of primary and secondary information and stakeholder consultations. She covered the assessment of physical impacts and monitoring plans for the study.
Collected, Reviewed and Compiled Primary and Secondary Data
Stakeholder Consultations
Baseline Studies
Report Writing
Client Liaison

Initial Environmental Examination Exploratory, Drilling and Production activities in Kulachi E.L (3170-8), 2016, Oil and Gas Development Company Limited (OGDCL): Environmental Engineer

Initial Environmental Examination (IEE) study was carried out for carrying out Exploration activities (Seismic & Drilling) in Kulachi Block No. 3170-8, District D.G Khan and D.I Khan. The block extended in two provinces, hence was a tricky project in terms of securing NOC from EPA Punjab and KPK. OGDCL entrusted National Cleaner Production Center to carry out the IEE of the project.

Ms. Ramsha worked on the IEE of the project for National Cleaner Production Center and covered major tasks of study.

Field Surveys
Compiled Primary and Secondary Data
Stakeholder Consultations
Baseline Studies
Impact Assessments of Physical Environment
Report Writing

Initial Environmental Examination for 3D Seismic Survey in Balkassar D&PL, 2017, Pakistan Oilfields Limited (POL): Environmental Engineer

Pakistan Oilfields Limited (POL) intends to conduct a 3D Seismic Data Acquisition survey at Balkassar Development & Production Lease at an area of 193.7 Sq. Km. POL holds a comprehensive D & P Lease at Balkassar that is situated about 105 km southwest of Islamabad in Chakwal District, Punjab, Pakistan. The aim of seismic data acquisition is to make a seismic image of the subsurface structural features that could serve as a conventional hydrocarbon trap. This information is used to accurately plan locations for wells, reducing the probability of drilling dry wells and consequently the need for further drilling, minimizing the environmental impact of the oil and gas exploration.

Ms. Ramsha worked on the IEE of the project for National Cleaner Production Center and covered major tasks of study.

13. Certification
I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature of Expert]
| 1. | Title | Specialist (Environment, and Occupational Health and Safety) |
| 2. | Name of Firm | Hagler Bailly Pakistan |
| 3. | Name of Expert | Muhammad Naveed |
| 4. | Date of Birth | October 18, 1987 |
| 5. | Citizenship | Pakistani |
| 6. | Education | |
| | Degree | Date | Institution |
| | MS in Environmental Sciences | 2012-2013 | Bahria University, Karachi Campus |
| | MSc. In Applied Chemistry | 2008-2009 | University of Karachi |
| | BSc. In Applied Chemistry | 2006-2008 | University of Karachi |
| 7. | Membership in Professional Associations | ▶ American Society of Safety Professionals (ASSP) |
| 8. | Other Training | ▶ International General Certificate (IGC) in Occupation Health & Safety from National Examination Board for Occupational Health & Safety |
| | | ▶ (NEBOSH) UK Managing Safely from Institution of Occupational health & safety (IOSH) UK |
| | | ▶ Environmental & Occupational Health (EOSH) from Agha Khan University |
| | | ▶ The Corporate Management for Pakistan – Energy conservation and corporate value, AOTS, Japan 2018. |
| | | ▶ ISO 14064 Essentials for GHG Inventory Management |
| | | ▶ Climate Change Reporting (ICLEI) OPCC, Karachi 2017 |
| | | ▶ Train the Trainer, Carnelian, Karachi 2017 |
| | | ▶ Carbon Footprint Verification, PITS, Karachi 2017 |
| | | ▶ Create a Culture of Success, Octara, Karachi 2017 |
| | | ▶ Incident Investigation & Reporting, Karachi 2016 |
| | | ▶ Workshop on Implementing Safety, PSTD Karachi, 2016 |
| | | ▶ Workshop on Managing HSE Systems, PSTD Karachi, 2016 |
| | | ▶ Respiratory Protection Training (SCBA), NBCD School PNA Karachi, 2015 |
| | | ▶ Hazard and Operability, Fire Engineering and Design Solution, Karachi 2013 |
| 9. | Countries of Work Experience | Pakistan |
9. Languages

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<th>Language</th>
<th>Reading</th>
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<td>2018</td>
<td>Present</td>
<td>Hagler Bailly Pakistan (Pvt.) Limited</td>
<td>EHS Manager</td>
</tr>
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<td>2014</td>
<td>2018</td>
<td>K-Electric Company</td>
<td>Corporate HSEQ - Assistant Manager</td>
</tr>
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<td>2011</td>
<td>2014</td>
<td>Pakistan State Oil Company Limited</td>
<td>HSE Coordinator – Zulfiqarabad Oil Terminal</td>
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<td>2010</td>
<td>2011</td>
<td>DHA Cogen Limited</td>
<td>Analyst</td>
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11. Task Areas

- **Implementation of EHS Management**
  - Implementation of EHS Management System, Hagler Bailly Pakistan
  - EHS Manager
  - As EHS Manager responsible for implementation of EHS Management System of Hagler Bailly Pakistan. Responsible to carry out project risk assessment and development of site-specific Health, Safety and Environmental Management Plan. Conduct site surveys to ensure compliance of Health, Safety and Environmental Management Plan at client site. Carrying out trainings on EHS policies and procedures for systems implementation.

- **Due Diligence of Process Safety and Occupational Health and Safety Management Systems**
  - Environmental and Social Due Diligence for Expansion of Engro Fertilizer Plants, 2019, Daharki, Sindh, CDC Group plc, London, United Kingdom.
  - Environmental Health and Safety Specialist
  - CDC Group PLC considered a debt investment in fertilizer manufacturing plants owned and operated by Engro Fertilizer at Daharki in Pakistan’s Sindh province. The planned upgrades included replacing a waste heat boiler, which was required to increase energy efficiency for existing fertilizer plants. Hagler Bailly Pakistan was engaged as the lender’s independent environmental and social advisor to conduct environmental and social (E&S) due diligence against applicable local, national and international environmental and social legislation, IFC Performance Standards and World Bank Group Performance Standards.
Bank Environmental, Health and Safety Guidelines. The E&S assessment included consideration of the entire operations of both plants as well as the planned upgrades.

**As Senior Environmental Health and Safety Specialist carried out due diligence of existing Process Safety Management and Environmental, Social and Occupational Health and Safety Management System against IFC performance standards and good international industry practices.**

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<tbody>
<tr>
<td>Senior Environment, Health and Safety Specialist</td>
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<td>Harbin Electric International Company Limited in consortium with Siemens, as an EPC Contractor of the construction of 2x660MW supercritical coal fired power plant, acquired the services of Hagler Bailly Pakistan (Pvt) Limited to provide technical services and support for site EHS work. This include development and implementation of Environmental, Social and Occupational Health and Safety Management System as per requirement of project owner and ADB.</td>
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<tr>
<td>As Senior Environmental Health and Safety Specialist developed multiple plans as per requirement of project. Responsible to provide training for EPC contractor management staff and oversee compliance of construction process with the EHS requirements of the project owner and ADB as described in ES-OHS-MS.</td>
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| Water quality survey |
| Compliance of EHS Management |
| Ecosystem Revitalization for River Ravi Basin, 2018-ongoing, River Ravi, Lahore, Asian Development Bank, Philippines |
| Environment, Health and Safety Specialist |
| The Asian Development Bank acquired the services of Hagler Bailly Pakistan (Pvt) Ltd for a Technical Assistance to Punjab Environmental Protection Department on 'Revitalizing the Ecosystem of Ravi River Basin'. The objective of the assignment was to undertake a comprehensive assessment of the pollution situation in the river basin and develop a long-term, multi-sectoral plan to revitalize and build resilience in the basin, including recommendations for investment projects and institutional reforms. Outputs included comprehensive assessments of the water pollution and related health in the Ravi Basin; climate and hydrology of the Ravi, as well as Chenab and Jhelum basins that feed the irrigation network within the Ravi Basin, water quality institutions and capacity gaps, political economy and the aquatic ecosystem within the Ravi. Multi-stakeholder visioning was carried out to develop a consensus on desirable outcomes in the long term for the Ravi river in the context of sustainable development, along with setting up an analytic decision support framework to decide among a catalogue of intervention options. Finally, a revitalization and resilience plan were developed for the |
basin, along with feasibility studies, and transaction technical assistance, for two priority projects.

Field team manager on water quality surveys, to ensure compliance of project specific Health, Safety and Environmental Management Plan and oversight activities of water quality sampling and analysis.

- **EHS Implementation during construction phase**
- **Compliance of EPA Review of EIA/IEE Regulation**

Advisory and Support on Development of Environmental and Social Management System, 2018, Power Cement Limited (PCL) and Deutsche Investitions- und Entwicklungsgesellschaft (DEG)

**Environment, Health & Safety Specialist**

Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Nooribad Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL's investment into a new Plant. To support PCL's ability to comply with DEGs’ environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an advisory and provide support in development of an Environment and Social Management System, underlying plans and procedures.

As EHS specialist carried out environmental and occupational health and safety systems and standard operating procedures training. Carried out audit of the Environmental and Social, and Occupational Health and Safety Management System.

- **EHS implementation during construction phase**
- **Compliance of EPA Review of EIA/IEE Regulation**
- **Project Completion Report**

Construction of 132 kV GIS Grid Station in the premises of Aga Khan Hospital University (AKUH), Karachi – 2014. K-Electric Limited

**Environment, Health & Safety Specialist**

K – Electric initiated a process of constructing 132 kV GIS Grid Station along with associated underground transmission lines at the far end of the premises of Aga Khan Hospital University (AKUH). The project is expected to cater to the future needs of AKUH, where demand is expected to grow from existing 5MW to 16 MW by the year 2022. The grid station is developed by Siemens Pakistan Engineering Company Limited.

Conducted site surveys to monitor EHS implementation during construction phase, review and recommend actions on contractors’ submittals conduct trainings and developed project completion report in accordance with the EMMP.

- **EHS implementation**

Environment, Health & Safety Specialist

KTCP consists of four gas turbines at the plant site from which heat was recovered from two turbines through Heat recovery Steam generator (HRSG). Extension project includes addition of HSRG on remaining two turbines with a steam turbine of 28 MW that recover heat from remaining two turbines and utilize it for electricity generation. The expansion project is contracted to Istro Energy Group which is a Slovakia based company.

Conducted site surveys to monitor EHS implementation during construction phase, review and recommend actions on contractors’ submittals conduct trainings and developed project completion report in accordance with the EMMP.

Environment, Health & Safety Specialist

KTGTPS & SGTPS consist of 64 gas powered generator sets which operates on open cycle. Extension project includes addition of 64 Heat Recovery Steam Generator (HRSG) units on 64 gas generators with a steam turbine of 20 MW that recover heat from these generators and utilize it for electricity generation.

Conducted site surveys to monitor EHS implementation during construction phase, review and recommend actions on contractors’ submittals conduct trainings and developed project completion report in accordance with the EMMP.

Environment, Health & Safety Specialist

Project comprises of installation of a new grid station near Razaqabad area in a semi-rural area settlement of Pir Sarhandi Goth namely new Grid Station at Port Qasim; erection of double circuit 220 kV transmission line from a future prospective power plant to be located at Industrial Export Zone of Port Qasim to the above mentioned proposed Grid Station having a route length of 26 kms along with erection of double circuit 220 kV transmission line from the proposed Grid Station at Port Qasim to KDA Grid Station located in KDA Scheme 33 having a route length of 23 kms.

Conducted site surveys to monitor EHS implementation during construction phase, review and recommend actions on contractors’ submittals conduct trainings and developed Annual Monitoring Report as part of reporting commitment to the Overseas Private Investment Corporation (OPIC) in compliance OPIC & IFC guidelines.
<table>
<thead>
<tr>
<th><strong>EHS implementation during construction phase</strong></th>
<th>132KV Underground Single Circuit Transmission Line from Creek City Grid Station to DHA Co-Gen Ltd (DCL) Grid Station</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compliance of EPA Review of EIA/IEE Regulation</strong></td>
<td>Environment, Health &amp; Safety Specialist</td>
</tr>
<tr>
<td><strong>Compliance of SEPA Review of EIA/IEE Regulation</strong></td>
<td>The project is installation of 132 kV Underground transmission line from an existing grid station namely Creek City Grid Station to DHA Co-Gen Ltd (DCL) Grid station. Conducted site surveys to monitor EHS implementation during construction phase, review and recommend actions on contractors’ submittals conduct trainings and developed Annual Monitoring Report as part of reporting commitment to the Overseas Private Investment Corporation (OPIC) in compliance OPIC &amp; IFC guidelines</td>
</tr>
</tbody>
</table>

| **Implementation of Global Harmonizing System** | Construction of 132KV Interconnection Scheme Loop In-Out from Existing Dhabeji-Gharo Circuit up to the Interconnection Point to Oursun Solar PV Power Project. |
|-------------------------------------------------| Environment, Health & Safety Specialist |
| **Risk Assessment of Installation Operations**  | The project includes installation of T-off Tower at the existing Dhabeji-Gharo circuit located along the national highway and 5.7 Km overhead transmission line connecting to Oursun’s Solar Plant located along the Sindh Coastal Highway. Conducted site surveys to monitor EHS implementation during construction phase, review and recommend actions on contractors’ submittals conduct trainings to promote safety culture at site. |

| **Implementation of GHS for standardizing and harmonizing the classification and labeling of chemicals** | Implementation of GHS for standardizing and harmonizing the classification and labeling of chemicals |
|-------------------------------------------------| EHS Specialist |
| **Central store** is the main hub of K-Electric Limited for handling, storage and transport of all the material required for routine and non-routine operations. Project includes listing of hazardous and non-hazardous substance, segregation of chemicals as per its health, physical and environmental hazard, defining means of hazard communication, as well as protective measures on labels and safety data sheet. Conducted survey to identify hazardous and non-hazardous material as per Hazardous substance Rule 2014; communicate OSHA requirements for segregation of chemicals; conduct training of management and non-management staff for detailing chemical hazards, GHS and storage requirements; | |

| **Risk Assessment of Zulfiqarabad Oil Terminal, Karachi 2011, Pakistan State Oil Limited** | Risk Assessment of Zulfiqarabad Oil Terminal, Karachi 2011, Pakistan State Oil Limited |
|-------------------------------------------------| HSE Coordinator |
| Zulfiqarabad oil terminal is Pakistan’s biggest oil terminal with oil storage capacity of more than 450,000 M ton and delivery of oil through, tank lorries, tank wagons, pipeline and barges. Project includes identification of hidden hazards related to health, safety and environment along with detailing mode of hazard communication and provides training to management | |
13. Certification

I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature]

Signature of Expert
Asid Ur Rehman

1. **Title**: GIS and Remote Sensing Specialist
2. **Name of Firm**: Hagler Bailly Pakistan
3. **Name of Expert**: Asid Ur Rehman
4. **Date of Birth**: March 11, 1984  **Citizenship**: Pakistan
5. **Education**
<table>
<thead>
<tr>
<th><strong>Degrees</strong></th>
<th><strong>Date</strong></th>
<th><strong>Institution</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MS (Remote Sensing &amp; GIsc)</td>
<td>2017</td>
<td>IST Pakistan</td>
</tr>
<tr>
<td>MSc (Space Science)</td>
<td>2008</td>
<td>Punjab University Pakistan</td>
</tr>
<tr>
<td>BSc (Math and Physics)</td>
<td>2005</td>
<td>Punjab University Pakistan</td>
</tr>
</tbody>
</table>
6. **Membership in Professional Associations**
   - Member, International Society of Remote Sensing and Photogrammetry (ISRSP)
   - Member, Digital Library, British Council Pakistan
7. **Other Training**
   - Analyzing Global Climate Datasets using Grid Analysis & Display System (GrADs), Allama Iqbal Open University, Islamabad, 3-4 April 2018
   - Earth Remote Sensing with Synthetic Aperture Radar, Institute of Space Technology, Islamabad, 10-28 July 2017
   - Installation and configuration of MS SQL Server 2008 R2 and ArcSDE 10 User Rights, Geodatabase Versioning, Advance Editing, Cartography and Representation, and Raster Data Management in Geodatabase, UN-Habitat Pakistan, Multan, 2-13 September 2013
   - Image Processing using ERDAS Imagine, Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), Karachi, 17-21 December 2012
   - Development and Harmonization of Land Cover Classification and District-wise Forest Cover Assessment of Pakistan, World Wide Fund for Nature (WWF Pakistan) and International Centre for Integrated Mountain Development (ICIMOD), Nepal, 31 May to 4 June 2010
8. **Countries of Work Experience**: Pakistan
9. **Languages**
<table>
<thead>
<tr>
<th><strong>Language</strong></th>
<th><strong>Reading</strong></th>
<th><strong>Writing</strong></th>
<th><strong>Spoken</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Urdu</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
10. **Employment Record**
    **From**: 2017  **To**: Present
    **Employer**: Hagler Bailly Pakistan, Islamabad
    **Position held**: GIS and Remote Sensing Specialist
From: 2011 To: 2017  
Employer: UN-Habitat Pakistan  
Position held: GIS Associate

From: 2008 To: 2011  
Employer: WWF Pakistan  
Position held: GIS/Remote Sensing Associate

<table>
<thead>
<tr>
<th>11. Task Areas</th>
<th>12. Details of Work Undertaken</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Developing map layouts</td>
<td>GSMA Mobile for Development Foundation, Inc. requested Hagler Bailly Pakistan to provide services to carry out GIS mapping of Mobile Money Network and Humanitarian Activities in the most vulnerable districts of Pakistan. The primary objective of this project is to map the mobile money presence and the key humanitarian activities in the 40+ most vulnerable districts identified by the National Disaster Management Authority (NDMA) of Pakistan in order to identify opportunities for collaboration between mobile network operators and humanitarian organizations.</td>
</tr>
<tr>
<td>▪ Project management</td>
<td></td>
</tr>
<tr>
<td>▪ Compiling and analyzing collected data</td>
<td></td>
</tr>
<tr>
<td>▪ Linking tabular data with GIS layers</td>
<td></td>
</tr>
<tr>
<td>▪ Developing GIS layouts</td>
<td></td>
</tr>
<tr>
<td>▪ Creating district-wise GIS atlas</td>
<td></td>
</tr>
<tr>
<td>▪ Delivering GIS training to project partners</td>
<td></td>
</tr>
<tr>
<td>▪ Surface interpolation</td>
<td>Environmental Site Assessment and Remediation Study at Bulk Oil Storage Terminal, 2018-Present, Total Parco Ltd., Karachi: GIS and Remote Sensing Specialist</td>
</tr>
<tr>
<td>▪ Liquid flow analysis</td>
<td>Characterization of groundwater and soil contamination, as well as determination of the mitigation and management measures required to remediate contamination at the site and protect the overall aquifer outside of the site and generated the potentiometric contours and groundwater flow.</td>
</tr>
<tr>
<td>▪ Map layouts composition</td>
<td>▪ Generated interpolated raster surfaces and carried out mapping of liquid water column, phase-separated hydrocarbons depth and density.</td>
</tr>
<tr>
<td>▪ Developed map layouts for report</td>
<td></td>
</tr>
<tr>
<td>▪ Wastewater parameters loads calculations and mapping</td>
<td>The objective of the assignment was to undertake a comprehensive assessment of current pollution levels in the river basin and develop a long term, multisectoral plan to revitalize and enhance the basin's ecological resilience,</td>
</tr>
<tr>
<td>Task</td>
<td>Details</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>River geomorphological and habitat mapping</td>
<td>Undertook land cover/land use analysis for Ravi basin</td>
</tr>
<tr>
<td>Pollution source inventory compilation</td>
<td>Calculated and mapped basin-wide wastewater parameter loads from industry, agriculture and municipals</td>
</tr>
<tr>
<td>GIS support in various models</td>
<td>Carried out geomorphological and habitat mapping on selected sections of river Ravi</td>
</tr>
<tr>
<td></td>
<td>Compiling GIS-based pollution source inventory</td>
</tr>
<tr>
<td></td>
<td>Supporting climate change expert in data preparation for climate change modelling</td>
</tr>
<tr>
<td></td>
<td>Supervising GIS component in various types surveys like water quality survey, health survey, fish survey and agriculture/pesticide survey.</td>
</tr>
<tr>
<td>Water channel delineation</td>
<td>Objectives of the project were carrying out a water vulnerability study to characterize the impact of pumping groundwater by the new project and to evaluate future water availability risks to PCL's operation in the medium term (20-30 year perspective).</td>
</tr>
<tr>
<td>Spatial analysis</td>
<td>Performed regional scale land cover/land use mapping</td>
</tr>
<tr>
<td></td>
<td>Carried out regional scale industries mapping to analyze water extraction intensity</td>
</tr>
<tr>
<td></td>
<td>Delineated water channel at a regional scale to analyze seasonal water flow directions and water utilization by various sources.</td>
</tr>
<tr>
<td></td>
<td>Undertook GIS mapping of large and small dams</td>
</tr>
<tr>
<td></td>
<td>Under took spatial analysis to access ground water vulnerability level</td>
</tr>
<tr>
<td>Baseline mapping</td>
<td>Objectives of the project was carrying out an environmental and social impact assessment (ESIA) and to develop a resettlement action plan (RAP) for the project that meets with applicable federal and provincial laws as well as the environmental performance standards of the International Finance Corporation (IFC) and safeguards of the Asian Development Bank (ADB).</td>
</tr>
<tr>
<td>Watershed analysis</td>
<td>Performed land use/land cover analysis for Arkari Gol basin</td>
</tr>
<tr>
<td>Report section writing</td>
<td>Developed various types of baseline maps and charts for topography, geology, seismology and climate</td>
</tr>
<tr>
<td></td>
<td>Undertook watershed analysis for dam and powerhouse</td>
</tr>
<tr>
<td></td>
<td>Composed topography, land cover, and climate baseline sections of report.</td>
</tr>
</tbody>
</table>
- Land cover/land use analysis
- Baseline mapping
- Watershed analysis


Objectives of the project was carrying out the Environmental and Social Impact Assessment to assess the impacts of the Project on the surrounding environment and comply with the applicable national environmental regulations and International Finance Corporation sustainability safeguards.
- Performed land use/land cover analysis
- Developed various types of baseline maps and charts for topography, geology, seismology and climate
- Undertook watershed analysis for dam and power house.

- Datasets validation
- Baseline climate
- Climate change risk assessment


Objectives of the project was carrying out an ESIA of the 300-megawatt (MW) Balakot Hydropower Project and to establish safeguards frameworks for environmental review and land acquisition and resettlement for the successive projects. The services of Hagler Bailly included social and poverty analysis, resettlement plan, biodiversity management plan, and climate change risk assessment, and environmental flow assessment.
- Undertook validation of various climate (rain, temperature) related gridded datasets like WorldClim2.0, APHRODITE, CRU4.0, with in-situ climate data and prioritized the best datasets for climate and climate change analysis
- Undertook climate baseline analysis and mapping
- Contributed in Climate Change Risk Assessment (CCRA).

- Digital terrain modelling
- Digital terrain data assimilation
- Data and error analysis
- Development of high-resolution river bathymetry


Shanghai Investigation Design & Research Institute Co., Ltd (SIDRI) is developing the 640 MW Mahl Hydropower Project on the Jhelum River. SIDRI contracted the services of Hagler Bailly Pakistan to update the Environmental and Social Impact Assessment (ESIA) for the Project to indicate the presence of valued terrestrial and aquatic biological resources, in the area that will be affected by the Project and facilitate its approval from the International Finance Corporation and national Environmental Protection Agencies. The Project will have unavoidable impacts on terrestrial and aquatic biodiversity, particularly on the aquatic biodiversity when the connectivity of the river is broken due to the
construction of the dam. Other major potential impacts to be considered are those associated with the creation of dam reservoir upstream and variations in flows downstream. To minimize all these and other impacts development of Biodiversity Management Plan (BMP) is recommended in the updated ESIA of the Project.

- Analyzed digital terrain data from satellite sources, as well as ground-bathymetric surveys;
- carried out analysis of errors in datasets and applied various geodetic techniques to fix the errors;
- carried out assimilation of terrain and bathymetric river data to develop a fine resolution terrain dataset for utilization in hydraulics model.

**GIS Analysis**


The project developed a strategy to minimize the negative environmental and social impacts of multiple hydropower projects in the Jhelum-Poonch basin. Investigations and analysis included mapping of climate, hydrology, water quality, and sediment profiles, aquatic and terrestrial ecological resources, socio-economic profiles, zoning based on ecological and/or socio-economic similarities, and assessment of impact of developments on ecological resources and ecosystem services using DRIFT modelling, outlining good practice measures to minimize the negative impact including recommendations for government and developers.

- Visually analyzed moderate spatial resolution Landsat images in ERDAS Imagine to identify land cover changes in Jhelum-Poonch basin;
- Modelled remote sensing indices (NDVI, NDWI, NDSI) to extract different land cover features;
- Used pixel-based and object-based satellite image classification algorithms to developed land cover maps for years 1993 and 2014;
- Quantified changes in land cover;
- Assessed accuracy of classified land cover maps

**GIS Analysis**

**Strategic Environmental Assessment of Keti Bandar Project, 2017, Keti Bandar, Sindh, Energy Department, Government of Sindh: GIS and Remote Sensing Specialist**

The Government of Sindh intends to develop a coal-based power plant in the vicinity of Keti Bandar. The development plan for the area includes a power park, a special economic zone for manufacturing units, port facilities, associated residential areas, and infrastructure. HBP is part of the consortium undertaking technical, financial, economic, and environmental feasibility of the Keti Bandar Project.
Analyzed and utilized remote sensing datasets and methods to extract water temperature and quality for utilization in ocean dynamic models;

- analyzed bathymetric remote sensing datasets for utilization in ocean dynamic models
- Analyzed remote sensing datasets including gridded climate datasets for variables including temperature and precipitation…
- Analyzed bathymetric remote sensing datasets for utilization in ocean dynamic models
- Analyzed water temperature and quality datasets for utilization in ocean dynamic models

- City wise temporal growth analysis
- Population density analysis
- Infographics and GIS atlas development
- Team coordination

**State of Pakistan Cities Report (SPCR), 2016-17, Australian Agency for International Development (AusAID), Pakistan: GIS & Remote Sensing Specialist**

The State of Pakistan Cities is a knowledge product which presents a well-informed and action-oriented analysis of the state of urbanization across Pakistan with quantitative and qualitative city-based data to promote evidence-based urban policies, strategies and plans improving the living conditions and well-being of citizens in Pakistan’s cities and contribute to stabilization and economic growth.

Provided technical inputs in terms of urban indicators based GIS mapping. Used satellite imagery and digitized thematic maps to develop urban land use maps for better urban planning and management, used land scan data to approximate population density, developed GIS maps, provided support in infographics development for narrative report, developed GIS atlas, worked closely with national as well international experts to identify needs to provide them GIS as well as other relevant technical support.

- Performed urban indicators based GIS mapping;
- Developed temporal growth maps by using satellite imagery and data;
- Used LandScan data to approximate population density

**Supporting Government in Developing more Synergized, Cohesive and Inclusive DRM Policies, 2015, United Nations Trust Fund (UNTF), Khyber Pakhtunkhwa, Pakistan: GIS & Remote Sensing Specialist**

The main objective of this MHVRA exercise was to provide a dynamic planning tool for the DRM officials within government and humanitarian/development agencies at federal, provincial and district levels for improved and informed DRR, preparedness and contingency planning.

Provided technical inputs to analyze climate induced hazards, vulnerability of the area and anticipated risk to the people using GIS and remote sensing techniques. Compiled and analyzed primary data (survey data) and secondary data (reports, maps, satellite images) to develop graphics and vulnerability and risk maps for
knowledge management products like online risk atlas. Moreover, participated actively in skill-enhancement of public employees.

- Coordination with implementing partner;
- Assisted to analyze climate-induced hazards, vulnerability of the area and anticipated risk to the people by using GIS and remote sensing techniques;
- Supported in analyzing primary data (survey data) and secondary data (reports, maps, satellite images) to develop vulnerability and risk maps

- Survey and secondary data compilation
- Flood vulnerability analysis
- GIS atlas development

Flood Disaster Vulnerability Assessment on Policy Options for Adaptation, 2014, Department of Foreign Affairs, Trade and Development (DFATD), Baluchistan, Pakistan: GIS and Remote Sensing Specialist

The project aimed to conduct a vulnerability assessment, quantitative and qualitative, randomly in some villages of two districts of Baluchistan for studying solutions and delivering policy advice that could help local/provincial policymakers in planning better adaptation and building resilience of communities that were extremely vulnerable to impacts of climate change and wide-ranging hazards. Provided technical inputs to develop survey questionnaires, encoded and analyzed surveyed data and supported team to undertake vulnerability analysis. Utilized satellite images for physical vulnerability assessment of project areas and developed GIS based vulnerability atlas.

- Aided in development of flood vulnerability survey methodologies and questionnaires;
- Analyzed surveyed data and performed flood vulnerability analysis in GIS system;
- Developed GIS-based vulnerability atlas

Study of existing land revenue system
Identify gaps in existing system
Develop a systematic process to translate hard copy cadastral maps to GIS vector data

Digitization of Land Revenue Records (Pilot), 2014, Government of Japan, Pakistan: GIS & Remote Sensing Specialist

UN-Habitat Pakistan provided technical support to Khyber Pakhtunkhwa government to digitize land revenue records. During pilot phase, revenue cadastral maps were georeferenced and digitized by using state of the art GIS and remote sensing technology.

- Evaluated existing land revenue system and gaps, identified requirements of client to propose new system, developed systematic process to convert cadastral hard copy maps to GIS maps, scanned and digitized cadastral maps within given accuracy limit, developed new cadastral maps by using georeferenced vector data.

Project lead
Survey questionnaire development
Building vulnerability analysis

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIS profiles development and report compilation</td>
<td>A pilot project to map and analyze the vulnerability of critical administrative government buildings in urban areas against two major hazards i.e. flood and earthquake, in the most vulnerable districts of Pakistan.</td>
</tr>
</tbody>
</table>
|                                              | • encoded surveyed data for input into GIS systems  
  • undertook buildings vulnerability analysis  
  • aided in development of survey questionnaires and survey methodologies  
  • developed districts wise vulnerability profiles for government buildings.                                                                                           |
|                                              | The purpose of this project was to upgrade the existing Pakistan Bureau of Statistics (PBS) GIS labs and to enhance knowledge/skills of the GIS staff in geo-referencing the whole country at lower geographical levels & maintain geo-databases to support the census of Pakistan. |
|                                              | Deployed Enterprise GIS structure, Supported senior GIS officer to link Multan GIS node with parent GIS node at Islamabad, Administered and maintained ArcSDE Census Geo-database, Assisted PBS staff translate Census sketch maps/Revenue Moza maps into GIS environment, Provided technical input in GPS survey methodology for census activities, supervised PBS GIS lab for technical activities along with geo-spatial data management. |
|                                              | • Deployed and maintained enterprise GIS structure;  
  • Supported senior GIS officer to link Multan GIS node with parent GIS node at Islamabad;  
  • Trained PBS staff to staff translate Census sketch maps/revenue moza maps into a visual GIS environment;  
  • Assisted in development of GPS survey methodology for census block boundary demarcation.                                                                      |
| Map project interventions                    | Pakistan Settlements Flood Recovery Project (PSFRP) was designed in response to the heavy monsoon destructions in Pakistan in 2010. The affectees were provided shelters and WASH facilities. |
| GIS based reporting of project interventions  | Managed GIS at provincial level and coordinated at national level, represented UN-HABITAT in GIS related coordination meetings, contributed towards GIS components in project proposals and ensured their implementation, conceptualized and developed standard formats and methodologies for reporting and for spatial data collection. |
|                                              | • Managed GIS at the provincial level and coordinated at the national level;                                                                                                                                  |
- Represented UN-HABITAT in GIS related coordination meetings;
- Performed 4W mapping in emergency humanitarian clusters;
- Tracked project intervention progress by using GIS mapping;
- Analyzed satellite imagery to extract flood extents for floods inundation mapping

- Satellite image analysis
- Land cover and use analysis
- Conduct field surveys for ground referencing
- Training for GIS and remote sensing
- Flood mapping
- Bathymetry mapping
- DGPS surveys and mapping
- Database development

Pakistan Wetlands Programme (PWP), 2008-2011, United Nations Development Programme (UNDP) and others, Pakistan: GIS & Remote Sensing Expert

Pakistan Wetlands Programme’s aim was to create and maintain a positive, enabling national environment for wetlands conservation through policy development, training, capacity and awareness building; and to provide replicable working samples of wetlands conservation and management in the form of community based management plans for four wetlands complexes, each representing a specific eco-region in Pakistan.

- Processing remote sensing data for nature conservation and environmental protection studies including mapping of genetic, species and ecosystem diversity;
- Procuring and archiving satellite images; interpretation and analysis of remote sensing data; conducting training and/or workshops in applying remote sensing and use of GIS for natural resource management;
- Conducted surveys for ground reference data, and compiled related documents and reports of the projects;
- Developed Pakistan Water-bird Census Database (PWCD);
- Land Cover/Land Use Mapping and Temporal Change Detection of Kallar Kahar Wetland, Punjab;
- Bathymetrical Depth Mapping and 3D Modelling of Wetlands (30 wetlands in Pakistan);
- GIS/RS Based Post-Flood Ecological Damage Assessment of District Swat;
- Demarcation of Murree Forest Boundary Using DGPS

13. Certification

I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature of Expert]
Muhammad Tahir

1. Title  
   Environmental Engineer

2. Name of Firm  
   Hagler Bailly Pakistan

3. Name of Expert  
   Muhammad Tahir

4. Date of Birth  
   March 10, 1997  
   Citizenship  
   Pakistan

5. Education  
   Degree  
   BSc, Environmental Engineering  
   Date  
   2018  
   Institution  
   University of Engineering & Technology, Lahore

6. Membership in Professional Associations  
   NA

7. Other Training  
   AERMOD

8. Countries of Work Experience  
   Pakistan

9. Languages  
   Language  
   English  
   Reading  
   Excellent  
   Writing  
   Excellent  
   Spoken  
   Good  
   Urdu  
   Reading  
   Excellent  
   Writing  
   Excellent  
   Spoken  
   Excellent

10. Employment Record  
    From: June 2018  
    To: Present  
    Employer: Hagler Bailly Pakistan (Pvt.) Ltd., Islamabad  
    Position Held: Environmental Engineer

11. Task Areas  
    ▪ Water Quality  
    ▪ Data Analysis  
    ▪ Water Sampling and Analysis  
    ▪ Climate  
    ▪ Compliance of EHS Management during field visits

12. Details of Work Undertaken  
    Ecosystem Revitalization for River Ravi Basin, 2018(ongoing), River Ravi, Lahore, Asian Development Bank, Philippines: Field analyst, consultant and environmental engineer
    The Asian Development Bank acquired the services of Hagler Bailly Pakistan (Pvt) Ltd for a Technical Assistance to Punjab Environmental Protection Department on Revitalizing the Ecosystem of Ravi River Basin. The objective of the assignment was to undertake a comprehensive assessment of the pollution situation in the river basin and develop a long-term, multi-sectoral plan to revitalize and build resilience in the basin, including recommendations for investment projects and institutional reforms. Outputs included comprehensive assessments of the water pollution and related health in the Ravi Basin; climate and hydrology of the Ravi, as well as Chenab and Jhelum basins that feed the irrigation network within the Ravi Basin, water quality institutions and capacity gaps, political economy and the aquatic ecosystem within the Ravi. Multi-stakeholder visioning was carried out to develop a consensus on desirable outcomes in the long term for the Ravi river in the context of sustainable development, along with setting up an analytic decision support framework to decide among a catalogue of intervention options. Finally, a revitalization and resilience plan were developed for the basin,
along with feasibility studies, and transaction technical assistance, for two priority projects.

Involvement in Water Quality parameter finalization and their analysis. As the field analyst and environmental engineer, worked with the team for collection and on-site analysis of some parameters of water samples from surface water sites (river, canals and drains), groundwater sites and sediment samples from both banks of river sites. Collected the data from Punjab Irrigation Department regarding the historical flows and irrigation network on rivers Ravi, Chenab, Jhelum, Indus and Sutlej River. Analyzed historical flows data and prepared this for further analysis and water balances using Goldsim Model. Also analyzed the climate data. Also provided input in the development of field-specific Health, Safety and Environmental Management Plan and ensured that it is properly implemented during work activities including field visits.

- Baseline Studies
- Air Dispersion Modeling (AERMOD) and Assessment
- Air Modeling Results Compilation and Analysis

Strategic Environmental Assessment for Keti Bandar Project, 2017 (ongoing), Government of Sindh: Air quality modeling expert

The Government of Sindh intends to develop a coal-based power plant in the vicinity of the ancient port site of Keti Bandar. The development plan of the area includes a power park, a special economic zone for manufacturing units, port facilities, associated residential areas and infrastructure. Keti Bandar Project is the first step of the larger plan and consists of 1,320 MW coal fired power plant, railway track from Thar Coalfield to Keti Bandar Project site for the transportation of Thar coal and a jetty for import of equipment and machinery. Hagler Bailly Pakistan was part of the consortium that undertook technical, financial, economic, and environmental feasibility of the Keti Bandar Project. Hagler Bailly Pakistan conducted the Strategic Environmental Assessment (SEA) of the Keti Bandar development plan including the Keti Bandar Project. The objective of the SEA was to ensure that environmental and sustainability considerations are integrated into the planning and decision-making of the development plan and the Keti Bandar Project. The SEA included assessment of the regulatory and policy framework and obligations under international treaties; stakeholder analysis and consultations, development of environmental baseline including ecological, physical, social, and institutional aspects; identification and analysis of key environmental and social issues; identification of alternative development scenarios and their analysis; identification of various policy and regulatory measures required to ensure sustainability in future projects in the area; and, development of various management tools required for implementing the recommendations of the SEA.

Being an Environmental Engineer and Air quality modeling expert, evaluated the project impact on the community regarding air quality. Conducted air dispersion modeling to calculate the incremental concentration of the plant over the baseline. Provided appropriate mitigation measures and
management plans for the evaluated impacts. Conducted complete compilation, quality assurance and analyzed the obtained results.

- Baseline Studies
- Air Dispersion Modeling (AERMOD) and Assessment
- Air Modeling Results Compilation and Analysis

Environmental and Social Impact Assessment of TransAsia Refinery at Port Qasim Karachi 2019(ongoing), TransAsia Refinery Ltd: Air quality modelling expert

TransAsia Refinery Ltd. is planning to relocate an existing, shutdown refinery from Naples, Italy to Pakistan to be installed at Port Qasim in the east of Karachi. The nominal throughput of the refinery will be 100,000 BPSD. The Mobil Refinery, Naples was incorporated in the late 1950s. The Crude Distillation Unit of the refinery was originally installed in 1964 with capacity of 75,000 bbd. It was revamped to 100,000 bbd and an air preheater was installed at the combined stack of the original and new furnace in 1981. The Naphtha Hydro Desulfurizer and Reforming Unit were installed in 1958 with capacity of 13,500 bbd while the Gas Plant of the unit was revamped in 1986. The Gas Oil Desulfurizer was installed in 1958 and a second reactor was added in 1986. A new Vacuum Flash Tower was installed in year 1989 while Liquid Petroleum Gas (LPG) and Kero/JPI Merox units were installed in 1982. The Visbreaker unit was installed in 1986, a 70 ton per hour Sulfur Recovery Unit was installed in 1980 and the Vacuum Distillation Unit (VDU) was revamped in 1985. The Kuwait Refinery Company purchased the plant from Mobil Oil in 1986. The plant was shut down in 1993. TRL bought the plant from its owners for up-gradation and relocation to Pakistan. Prior to the purchase, the plant was inspected by Bureau Veritas, Italy to assess the structural integrity and ensure that it meets technical and safety standards. The dismantling works of Refinery has been completed by an Italian contractor.

Being an Environmental Engineer and Air quality modelling expert, evaluated the project impact on the community regarding air quality. Conducted air dispersion modeling to calculate the incremental concentration of the plant over the baseline. Provided appropriate mitigation measures and management plans for the evaluated impacts. Conducted complete compilation, quality assurance and analyzed the obtained results.

13. Certification

I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature of Expert]
Syed Ali Imam Tahir

1. **Title**
   Environmental Engineer

2. **Name of Firm**
   Hagler Bailly Pakistan

3. **Name of Expert**
   Syed Ali Imam Tahir

4. **Date of Birth**
   July 23, 1995
   **Citizenship**
   Pakistan

5. **Education**
   **Degree**
   BE (Environmental Engineering)
   **Date**
   2018
   **Institution**
   National University of Science and Technology, Islamabad, Pakistan

6. **Membership in Professional Associations**
   ▪ NA

7. **Other Training**
   ▪ Internal training ES-OHS-MS, EHS-training on field visits that includes reporting of hazards during field visits, safety measures to be exercised, etc.

8. **Countries of Work Experience**
   Pakistan

9. **Languages**
   **Language**
   English
   **Reading**
   Excellent
   **Writing**
   Excellent
   **Spoken**
   Excellent
   **Language**
   Urdu
   **Reading**
   Good
   **Writing**
   Average
   **Spoken**
   Good

10. **Employment Record**
    **From:** 2018
    **To:** Present
    **Employer:** Hagler Bailly Pakistan (Pvt.) Ltd., Islamabad
    **Position Held:** Environmental Engineer
    **From:** 2017
    **To:** 2017
    **Employer:** Emerging Business Solutions
    **Position Held:** Team Leader, Social Media Marketing

11. **Task Areas**
    ▪ **Water Quality Literature and Database**
    ▪ **Health Surveys Literature**
    ▪ **DRIFT: DSS Modelling**
    ▪ **Pesticide Survey Methodology, Report and Field Visit**
    ▪ **Food and Vegetable Sampling field visits.**
    
12. **Details of Work Undertaken**
    *Ecosystem Revitalization for River Ravi Basin, 2018-ongoing, River Ravi, Lahore, Asian Development Bank, Philippines: Field analyst, consultant and environmental engineer*
    
    The Asian Development Bank acquired the services of Hagler Bailly Pakistan (Pvt) Ltd for a Technical Assistance to Punjab Environmental Protection Department on 'Revitalizing the Ecosystem of Ravi River Basin'. The objective of the assignment was to undertake a comprehensive assessment of the pollution situation in the river basin and develop a long-term, multi-sectoral plan to revitalize and build resilience in the basin, including recommendations for investment projects and institutional reforms. Outputs included comprehensive assessments of the water pollution and related health in the Ravi Basin; climate and hydrology of the Ravi, as well as
Chenab and Jhelum basins that feed the irrigation network within the Ravi Basin, water quality institutions and capacity gaps, political economy and the aquatic ecosystem within the Ravi. Multi-stakeholder visioning was carried out to develop a consensus on desirable outcomes in the long term for the Ravi river in the context of sustainable development, along with setting up an analytic decision support framework to decide among a catalogue of intervention options. Finally, a revitalization and resilience plan were developed for the basin, along with feasibility studies, and transaction technical assistance, for two priority projects.

Involvement in literature review and water quality parameter justifications in the Water Quality Methodology Report. Developed Pesticide Sampling Report and performed the required field visits. Developed the Water Quality Databases for Industrial Pollution in the River Ravi and existing water quality through review of all existing relevant literature. Further worked on the Pesticide Survey Report and all related aspects of report including design of study, field visit, design of survey forms, consolidation of survey form data and its interpretation within the report.

Additionally, developed and implemented various Social and Health related indicators within the DRIFT: DSS model as well as development and generation of output scenarios through the DRIFT model. Also provided support to field staff for Food and Vegetable sampling.

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<tr>
<th>Development of Energy Audit Guidelines</th>
<th>Development of Training Material and Training for IFC Performance Standards, ESMS, OHSMS and Associated Plans, 2018 (ongoing), M3 Faisalabad Industrial Estate (FIE), Hyundai Nishat Motor (Pvt) Ltd.: Field analyst, consultant and environmental engineer</th>
</tr>
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<tr>
<td>Development of Supply Chain Management Plan</td>
<td>Hagler Bailly Pakistan developed an Environmental and Social (ES), Occupational Health and Safety (OHS) and Human Resources Management (HRM) System and a range of underlying standard operating procedures for the motor vehicle manufacturing plant of Hyundai Nishat Motor Company (Private) Limited (HNMP). HNMP also employed the services of Hagler Bailly Pakistan to develop and implement training for its staff on the systems. Development of Energy Audit Guidelines which would enable the client to carry out a preliminary Level-I audit in compliance with the requirements of ISO 50001 as well as IFC Performance Standard 3. Further, Development of Supply Chain Management plan which would enable the client to conform to IFC Performance Standard 2 and IFC Performance Standard 6 and evaluate Primary Suppliers as a whole in terms of suitability.</td>
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</table>
13. **Certification**
   I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature of Expert]
Ali Amin

1. Title: GIS Analyst

2. Name of current Firm: Hagler Bailly Pakistan

3. Name: Ali Amin

4. Date of Birth: September 21, 1992

5. Education:
   - Degrees:
     - MS (Remote Sensing & GISc) 2017 NUST Pakistan
     - B.Sc (Space Science) 2015 University of the Punjab, Lahore, Pakistan

6. Other Training:
   - Big Data and GIS, Allama Iqbal University Islamabad, Pakistan, December 2015.
   - Inventory Development of Glaciers and Glacial Lakes in Upper Indus Basin (UIB) Pakistan, January 2015 – April 2015

8. Countries of Work Experience: Pakistan

9. Languages:
   - Language: English
   - Reading: Good
   - Writing: Good
   - Spoken: Good

10. Employment Record:
    - From: 2018 To: Present
      - Employer: Hagler Bailly Pakistan, Islamabad
      - Position held: GIS and Remote Sensing Analyst
    - From: 2017 To: 2018
      - Employer: Pakistan Railways
      - Position held: GIS Supervisor
    - From: 2015 To: 2015
      - Employer: BitBricks Pakistan
      - Position held: GIS/Remote Sensing Associate

11. Task Areas:
    - Land cover/land use mapping
    - Worker accommodation plan map
    - Plant layout

12. Details of Work Undertaken:
    - Environmental and Social Due Diligence for Expansion of Engro Fertilizer Plants, 2019, Daharki, Sindh, CDC Group plc, London, United Kingdom: GIS Analyst
    - CDC Group PLC considered a debt investment in fertilizer manufacturing plants owned and operated by Engro
    - Fertilizer at Daharki in Pakistan's Sindh province. The planned upgrades included replacing a waste heat boiler,
which was required to increase energy efficiency for existing fertilizer plants. Hagler Bailly Pakistan was engaged as the lender’s independent environmental and social advisor to conduct environmental and social (E&S) due diligence against applicable local, national and international environmental and social legislation, IFC Performance Standards and World Bank Environmental, Health and Safety Guidelines. The E&S assessment included consideration of the entire operations of both plants as well as the planned upgrades.

- Land cover/land use mapping,
- Worker accommodation plan and plant layout maps,
- Canal and drain network analysis

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<td>Power Cement Limited (PCL), a subsidiary of Arif Habib Group (AHG), operates a cement manufacturing plant in Noorabid Industrial Area, Jamshoro, Sindh. The plant comprises of two production lines and has a total production capacity of 3,000 tons per day (tpd). PCL planned to construct another cement plant (new Plant) with capacity of a 7,700 tpd to be built within the premises of the existing cement plant. AHG was in discussion with Deutsche Investitions und Entwicklungsgesellschaft (DEG) a German development finance institution regarding DEG debt financing for PCL’s investment into a new Plant. To support PCL’s ability to comply with DEGs’ environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan (Pvt) Ltd as an independent environmental and social consultant to carry out an advisory, and provide support in development of an Environment and Social Management System, underlying plans and procedures.</td>
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<tr>
<td>▪ Helped towards development of multiple underlying plans for an Environmental and Social Management System (ESMS) along with implementation support to comply with requirements of the International Finance Corporation for Power Cement Limited</td>
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| Land cover/land use mapping | Water Vulnerability Study for Cement Plant in Sindh, 2018-2019, Jamshoro, Sindh, Deutsche Investitions-und Entwicklungsgesellschaft (DEG), Köln, Germany: GIS Analyst |
| Water channel delineation | Power Cement Limited (PCL), a subsidiary of the Arif Habib Group, operates a cement manufacturing plant in the Noorabid Industrial Area near Jamshoro in Pakistan’s Sindh province. PCL plans to construct a second cement plant with a capacity of 7,700 tonnes per day within the premises of the existing facility. The Arif |
Habib Group is in discussions with Deutsche Investitions- und Entwicklungsgesellschaft (DEG), a German development finance institution, regarding debt financing for PCL’s investment in the new plant. To support PCL’s ability to comply with DEG’s environmental and social requirements, DEG and PCL acquired the services of Hagler Bailly Pakistan to carry out a water vulnerability study to characterize the impact of pumping groundwater by the new project and to evaluate future water availability risks to PCL’s operation in the medium term (20-30 year perspective).

- Helped in land cover/land use and industrial mapping on regional scale, analyze regional flows and other spatial analysis to assess groundwater vulnerability level.

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<td>Hyundai Nishat Motors, a joint venture of Sojitz Corporation of Japan and Nishat Group in Pakistan, planned to establish a Plant to assemble and distribute vehicles of Hyundai Motor Corporation in Pakistan. In order to comply with the applicable environmental laws and regulations, conditions of environmental approval granted by Punjab Environmental Protection Agency (EPA), an EPA approved Initial Environmental Examination, and best international practice, required under the agreed Environmental and Social Action Plan (ESAP) agreed between the Multi-Lateral Investment Guarantee and the Client, including the Performance Standards of International Finance Corporation (IFC), the Client acquired the services of Hagler Bailly Pakistan for development of an Environmental and Social Management System and Occupational Health and Safety Management System (ES-OHS-MS). The system was developed to conform to the requirements of ISO 14001 and ISO 45001.</td>
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Supported the project team in developing the environmental and social management system.

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<td>Snow Runoff Modeling</td>
<td>The Asian Development Bank acquired the services of Hagler Bailly Pakistan (Pvt) Ltd for a Technical Assistance to Punjab Environmental Protection Department on 'Revitalizing the Ecosystem of Ravi River Basin'. The objective of the assignment was to undertake a comprehensive assessment of the pollution situation in the river basin and develop a long-term, multi-sectoral</td>
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<tr>
<td>Carrying out Pesticide Sampling, Water Quality and Health survey fields</td>
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<tr>
<td>Mapping</td>
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</tbody>
</table>
plan to revitalize and build resilience in the basin, including recommendations for investment projects and institutional reforms. Outputs included comprehensive assessments of the water pollution and related health in the Ravi Basin; climate and hydrology of the Ravi, as well as Chenab and Jhelum basins that feed the irrigation network within the Ravi Basin, water quality institutions and capacity gaps, political economy and the aquatic ecosystem within the Ravi. Multi-stakeholder visioning was carried out to develop a consensus on desirable outcomes in the long term for the Ravi river in the context of sustainable development, along with setting up an analytic decision support framework to decide among a catalogue of intervention options. Finally, a revitalization and resilience plan were developed for the basin, along with feasibility studies, and transaction technical assistance, for two priority projects.

Involvement in hydrological modeling of Chenab and Ravi basins using Goldsim and WEAP models, and also cover the Remote Sensing and GIS aspects which involve Evapotranspiration calculation using Thornthwaite and Penman methods, Urban area extraction using satellite imagery and literature, delineation of canal and Drains network and calculation watershed based on canals and drains network.

- Railway Noise Modelling
- Data preparation
- Built up delineation and Mapping

Strategic Environmental Assessment of Keti Bandar Project, 2019, Sindh, Energy Department, Govt of Sindh, Karachi: Specialist Environmental Engineer

The Government of Sindh intends to develop a coal-based power plant in the vicinity of the ancient port site of Keti Bandar. The development plan of the area includes power park, a special economic zone for manufacturing units, port facilities, associated residential areas and infrastructure. Keti Bandar Project is the first step of the larger plan and consists of 1,320 MW coal fired power plant, railway track from Thar Coalfield to Keti Bandar Project site for the transportation of Thar coal and a jetty for import of equipment and machinery. Hagler Bailly Pakistan was part of the consortium that undertook technical, financial, economic, and environmental feasibility of the Keti Bandar Project. Hagler Bailly Pakistan conducted the Strategic Environmental Assessment (SEA) of the Keti Bandar development plan including the Keti Bandar Project. The objective of the SEA was to ensure that environmental and sustainability considerations are integrated into the planning and decision-making of the development plan and the Keti Bandar Project. The SEA included assessment of the regulatory and policy framework and obligations under international treaties; stakeholder analysis and consultations, development of environmental baseline including ecological, physical, social, and institutional aspects; identification and analysis of key environmental
and social issues; identification of alternative development scenarios and their analysis; identification of various policy and regulatory measures required to ensure sustainability in future projects in the area; and, development of various management tools required for implementing the recommendations of the SEA.

Helped in carry out noise modeling and preparing Digital Elevation data, delineating building units, compiling results and mapping of final results.

- **Compilation of Community data**
- **Mapping**
- **Water Balance**

Groundwater Vulnerability Study, 2018-(ongoing), Power Cement Limited (PCL): Environmental Engineer

Power Cement Limited (PCL) is constructing a new Cement Plant in Jamshoro, Sindh with enhanced cement production capacity of 7700 TPD. Deutsche Investitions- und Entwicklungsgesellschaft (DEG), a German development finance institution is financing for PCL’s investment into a new Plant. To support PCL’s ability to comply with DEGs’ environmental and social requirements, DEG and PCL requested Hagler Bailly’s services to carry out Groundwater Study to characterize the impacts of pumping of groundwater, as well as evaluate the risks to PCLs operation in the medium term (20-30-year perspective).

Helped in carrying out community survey, compilation of data, water balances and mapping.

- **Survey and data compilation**

Ambien Air Quality Measurement, Fatima Fert Sheikhupura.

*Carry out Ambient Air Quality Measurement for metals and ions present in ambient air using High Vol and Mini Vol within the Fatima Fertilizer Complex near Sheikhupura.*

- **Survey and secondary data compilation**

Land Management and Information System (LMIS) Pakistan Railways.

Objectives of the assignment were;
- Surveying and compilation of land data owned by Pakistan railways.
- Georeferencing old revenue record
- Landcover classification of railway land
- Development of a dashboard

- **Digital Surface Model**

Development of Digital Surface Model (DSM) for Lahore division for Lahore Development Authority (LDA): GIS and Remote Sensing Associate

Objective of the project was to provide a DSM to LDA for planning and development purposes. Project involves extensive georectification, color balancing and digitization of the high-resolution satellite imagery.
13. **Certification**

I, the undersigned, certify that the information provided herein is correct to the best of my knowledge and belief:

[Signature of Expert]