ADB

Technical Assistance Report

Project Number: 51249-003
Transaction Technical Assistance (TRTA)
November 2017

Islamic Republic of Pakistan: Khyber Pakhtunkhwa Water Resources Development Project

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Asian Development Bank

CURRENCY EQUIVALENTS
(as of 24 October 2017)

Currency unit	–	Pakistan rupee/s (PRe/PRs)
PRe1.00	=	$0.00949
$1.00	=	PRe105.34

ABBREVIATIONS

ADB	–	Asian Development Bank
CCI	–	climate change impact
CCR	–	climate change risk
EMP	–	environmental management plan
ha	–	hectare
KPAD	–	Khyber Pakhtunkhwa Agriculture Department
KPID	–	Khyber Pakhtunkhwa Irrigation Department
KPP	–	Khyber Pakhtunkhwa Province
m^3/s	–	cubic meter per second
NGO	–	nongovernment organization
O&M	–	operation and maintenance
PMC	–	Pehur Main Canal
TA	–	technical assistance
WUA	–	water users' association

NOTE

In this report, "$" refers to US dollars.

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TRANSACTION TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data — **Project Number:** 51249-003

Project Name	Khyber Pakhtunkhwa Water Resources Development Project	**Department /Division**	CWRD/CWER
Nature of Activity	Project Preparation	**Executing Agency**	Khyber Pakhtunkhwa Irrigation Department
Modality	Regular		
Country	Pakistan		

2. Sector

	Sector	Subsector(s)	ADB Financing ($ million)
✓	Agriculture, natural resources and rural development	Agricultural production	0.25
		Irrigation	0.95
		Total	**1.20**

3. Strategic Agenda

Strategic Agenda	Subcomponents	Climate Change Information	
Inclusive economic growth (IEG)	Pillar 2: Access to economic opportunities, including jobs, made more inclusive	Climate Change impact on the Project	High
Environmentally sustainable growth (ESG)	Environmental policy and legislation Natural resources conservation		

4. Drivers of Change

Drivers of Change	Components	Gender Equity and Mainstreaming	
Governance and capacity development (GCD)	Civil society participation	Some gender elements (SGE)	✓

5. Poverty and SDG Targeting

		Location Impact	
Geographic Targeting	Yes	Rural	High
Household Targeting	No		
SDG Targeting	Yes		
SDG Goals	SDG2, SDG6, SDG8		

6. Risk Categorization Complex

7. Safeguard Categorization Safeguard Policy Statement does not apply

8. Financing

Modality and Sources	Amount ($ million)
ADB	**1.20**
Transaction technical assistance: Technical Assistance Special Fund	1.20
Cofinancing	**0.00**
None	0.00
Counterpart	**0.10**
Government	0.10
Total	**1.30**

I. THE ENSUING PROJECT

1. Khyber Pakhtunkhwa Province Irrigation Department (KPID) has identified three subprojects forming the Khyber Pakhtunkhwa Water Resources Development Project. The first subproject will comprise the construction of the Mulkoh irrigation distribution system (IDS) and its command area development (CAD) in Chitral district in the north of KPP. Its construction will cover an intake structure, a 5-km long water tunnel, 33-km long two main canals, a 5-km long pressure pipeline, and associated structures to distribute water to new irrigated agriculture area of 6,100 ha with estimated beneficiaries of 32,500.[1] Wheat and maize are the major crops, and the other crops are fruits and fodder. The performance of the agriculture production in target areas is very low mainly because the agriculture in the project area is dependent on rainfall only. Current crop intensity is estimated at only 38% (17% for *kharif* and 21% for *rabi*).[2] After the completion of the subproject, the cropping intensity is expected to increase to 130% and crop yields are expected to increase by 140%–200%, depending on the crop.

2. The second subproject will comprise the modernization of the Tanda IDS and its CAD in Kohat district in the central valley plain of KPP. It will extend IDS service area to 13,520 ha and increase the agriculture production in the existing and extended irrigated areas, with estimated beneficiaries of 123,500. The current main crops are vegetables, wheat, maize, rice, and fruits. With the subproject, the cropping intensity is expected to increase from 63% to 110%. The proposed modernization will include the raising of the height of Tanda dam from current 35 m to 40 m, and remodeling or reconstruction of a spill way, an intake tower, a 260-m long water tunnel, a main canal, distributaries, and minors. The capacity of Tanda dam constructed in 1967 has reduced from 96 million m^3 to 61 million m^3 due to sediment deposits, which resulted in the reduced IDS service area from about 12,141 ha to only 8,094 ha. Permanent obstructions were constructed by the farmers individually along IDS to raise the water level, and these have disrupted the hydraulic regime of the system with subsequent siltation and capacity reduction of IDS. The tail reaches of the command area are worst hit by the shortages.

3. The third subproject will comprise the modernization of the Pehur main canal (PMC) IDS and its CAD in Swabi district in the central valley plain of KPP. PMC IDS, with estimated beneficiaries of 180,000, commissioned in 1957 constitutes a 60-km long main canal, 2 distributaries, and 10 minors with the total length of 72-km, and associated structures to distribute water to the irrigated area of 18,200 ha. It has a discharge capacity of about 7 m^3/s and off-takes from the pond of Ghazi Barotha Barrage downstream of Tarbela dam on the Indus River. The principal crops are maize, wheat, tobacco, and vegetables. Due to high conveyance losses and increased water demand, the lower reaches suffer water shortages. Seepage from some sandy reaches in the upper canal has resulted in waterlogging, flood flow enters the canal during floods and often results in breaches in some other reaches, and floating weeds obstruct the flows, resulting in water shortages at the tail end. It is proposed to increase the canal capacity to about 9 m^3/s through remodelling of the main canal and associated structures. The distributaries and minors will also be remodeled as necessary. With the subproject, cropping intensity is expected to increase by about 20.0% to 122.8% from the estimated 102.3% (59.9% in *kharif* and 42.4% in *rabi*) at present while the command area of 18,200 ha will remain the same.

4. A monitoring and evaluation (M&E) system using satellite remote sensing technology will be developed for each IDS to assess irrigation performance, crop-growing, water productivity,

[1] Mulkoh irrigation scheme comprises Mulkoh, Kosht, Kagh, and Lasht sub-schemes.

[2] *Kharif* refers to crops grown during the period from about June to November and *rabi* refers to crops grown during the period from about December to May.

and *abiana*.[3] Staff from KPID will be trained to use the systems. To ensure sustainable O&M of each IDS, a guideline and sustainable O&M plan will also be developed.

5. CAD in each subproject will include (i) formation of water users' associations (WUAs) and capacity developments of newly formed and existing WUAs for efficient O&M of watercourses and their organizations; (ii) constructions or repairs of watercourses and outlets through WUAs' participations; (iii) trainings to farmers and WUAs for improved water use skills and climate-smart irrigation practices including promotion of high efficient irrigation systems (e.g. drip irrigation, sprinkler irrigation) and associated land management (e.g. precise land levelling); (iv) formation of demonstration plots; (v) conducting of farmer field schools training to improve irrigated agriculture practices and profitable farming system through demonstration activities including promotion of growing high value crops.

6. Food security in Chitral is classified as "stressed" while Kohat and Swabi are classified as "minimal;"[4] and 37% (Chitral), 32% (Kohat), and 40% (Swabi) of children under the age of five were underweight.[5] Food insecurity and poverty are expected to be reduced by (i) Output 1: IDS' established or modernized covering Mulkoh IDS in Chitral, Tanda IDS in Kohat, and PMC IDS in Swabi; and (ii) Output 2: water-use and farm-management capacities increased in the three subproject areas through CADs. These outputs will result in the following outcome: agriculture production increased in project areas. The project will be aligned with the following impact: food security in KPP ensured for the decade 2010–2020.[6]

7. KPP's security concerns have been addressed when selecting the subprojects from "medium" or "low" security risk districts.[7] Community participatory approach for proposed watercourse constructions reflected the lessons learnt in the country assistance program evaluation, 2002–2012.[8,9]

8. The project is estimated to cost $130 million. ADB will finance $100 million through concessional ordinary capital resources loan. The government will finance (i) taxes and duties; (ii) required costs for environmental and social mitigation; and (iii) required cost for land acquisition, resettlement, and compensation for crop losses during the project implementation, as cash contribution, all of which are estimated at $30 million.[10] The ensuing loan and the transaction technical assistance (TA) are included in ADB's country operations business plan 2018–2020.[11]

II. THE TECHNICAL ASSISTANCE

A. Justification

9. The transaction TA will help the government to design and prepare the project.

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[3] The *abiana* is the irrigation service fee assessed based on expected crop production.
[4] World Food Programme. 2015. *Pakistan Food Security Bulletin*. Islamabad.
[5] United National Development Programme. 2011. *Khyber Pakhtunkhwa Millennium Development Goals*. Peshawar.
[6] Khyber Pakhtunkhwa Government. 2009. *Comprehensive Development Strategy 2010–2017*. Peshawar.
[7] United Nations Department of Safety and Security Pakistan. 2017. *Travel Modalities.* Islamabad.
[8] ADB. 2013. *Country Assistance Program Evaluation for Pakistan*. Manila.
[9] These are (i) past projects were often successfully facilitated by community-based organizations; and (ii) ADB's desired shift to infrastructure operations should take into account that certain types of projects may lead to more complete development outcomes when community-based organizations are involved.
[10] This includes farmers' in-kind and/or cash contributions for the construction of watercourses and their land donation for watercourses, and some for CADs.
[11] ADB. 2017. *Country Operations Business Plan: Pakistan, 2018–2020.* Manila.

B. Outputs and Activities

10. The output of the TRTA will prepare the investment project through the following activities: (i) verify the engineering and agriculture outputs of the already available feasibility studies (one for Mulkoh subproject and another for Tanda subproject), and update these where necessary; (ii) conduct fresh feasibility study of the PMC subproject; and (iii) conduct due diligence covering (a) climate change risks (CCRs) and climate change impacts (CCIs); (b) economic and financial including the development of the guidance note to develop sustainable O&M plan for each IDS; (c) governance; (d) poverty, social, and gender; (f) social and environment safeguards; and (g) assessment of risks associated in implementation of the ensuing project. The activities will also include the preparation of two consultant service packages (one for the detailed design and another for the project implementation support) for KPID to recruit them. The detailed design consultants will be financed by KPP government's own resources and therefore it will be recruited following Government's guidelines. The terms of reference and cost estimates for the detailed design consultants are expected to be prepared by end of July 2018 based on the midterm inputs from TRTA consultants. The project implementation support consultant, to be financed under the ensuing project, will be recruited following ADB Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time).

C. Cost and Financing

11. The TA is estimated to cost $1.3 million, of which $1.2 million will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF-6). The key expenditure items are listed in Appendix 1. The government will provide counterpart support in the form of counterpart staff, logistical support, provisions of available feasibility studies, and facilitation of consultation with stakeholders during the feasibility study, which is estimated at about 10% of the total TA cost. The government was informed that approval of TA does not commit ADB to finance any ensuing project.

D. Implementation Arrangements

12. ADB will administer the TA. ADB's Environment, Natural Resources, and Agriculture Division of Central and West Asia Department will recruit, supervise, and evaluate the TA consultants. KPID will be the TA executing agency. A representative appointed by KPID will serve as Project and TA Director, to communicate with ADB and assist the TA consultant team in preparing the ensuing project. A representative appointed by the KPP Agriculture Department (KPAD) will serve as Deputy Project and TA Director and assist the Project and TA Director. A TA Steering Committee chaired by a representative from the Planning and Development Department will be established to review TA progress and render project-specific decisions as necessary. The TA will be implemented over 24 months from January 2018 to December 2019. Disbursements will be made in accordance with ADB's Technical Assistance Disbursement Handbook (May 2010, as amended from time to time). The implementation arrangements are detailed in Table 1.

Table 1: Implementation Arrangements

Aspects	**Arrangements**		
Indicative implementation period	January 2018 – December 2019		
Executing agency	Khyber Pakhtunkhwa Irrigation Department		
Implementing agency	Environment, Natural Resources, and Agriculture Division of Central and West Asia Department, ADB		
Consultants	To be selected and engaged by ADB		
	QCBS 90:10	9.0 person-months international 74.5 person-months national	$998,000
	ICS	6.0 person-months international	$202,000
Disbursement	The TA resources will be disbursed following ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time)		
Asset turnover or disposal arrangement upon TA completion	None		

ADB = Asian Development Bank, ICS = individual consultant selection, QCBS = quality- and cost-based selection, TA = technical assistance.
Source: Asian Development Bank.

13. **Consulting services.** The TA will require (i) one consulting firm providing 9 person-months (international) and 74.5 person-months (national) to undertake the TA output, recruited using the quality-and-cost based selection procedure at 90:10 quality-cost ratio and simplified technical proposals; and (ii) four individual consultants (international) with 1.5 person-months each. The TA consultant will organize the technical panel of experts composed of the individual consultants and key specialists from the TA consultant for critical proposals and/or decisions on economic, engineering, and/or environmental matters with the invitations of representatives from key departments of the government of KPP and other stakeholders as necessary. The consultants will be engaged by ADB in accordance with ADB Procurement Policy (2017, as amended from time to time) and the associated Project Administration Instructions/TA Staff Instructions. Indicative expertise and corresponding person-months of the consultants are presented in Appendix 1 below, and the terms of reference for the consultants is accessible from the list of linked documents in Appendix 2.

COST ESTIMATES AND FINANCING PLAN

($'000)

Item	Amount (Firm)	Amount (Individual)	Total
A. **Asian Development Bank**[a]			
1. Consultants			
a. Remuneration and per diem			
i. International consultants (9 person-months for firm 6 person-months for individual)	226	150	376
ii. National consultants	447	0	447
b. Out-of-pocket expenditures			
i. International and local travel	54	10	64
ii. Office space rental and equipment[b]	20	0	20
iii. Surveys	100	0	100
iv. Training, seminars, and conferences[c]	40	0	40
v. Reports and communications	28	6	34
vi. Miscellaneous administration and support costs	4	6	10
vii. Transport and Vehicle Hire	19	0	19
2. Contingencies	60	30	90
Total	**998**	**202**	**1,200**

[a] Financed by the Asian Development Bank's Technical Assistance Special Fund (TASF-6).

Note: The technical assistance (TA) is estimated to cost $1.3 million, of which contributions from the Asian Development Bank are presented in the table above. The government will provide counterpart support in the form of office space for TA consultants, counterpart staff, logistical support, provisions of available feasibility studies, and facilitation of consultation with stakeholders during the feasibility study, which is estimated at about 10% of the total TA cost.

[b] Any equipment purchased would be turned over to the executing agency/implementing agency upon completion of the TA.

[c] Seminars, conferences, panels, or workshops for a total of two with 30 participants each are expected for each subproject in each of the three districts.

Source: Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/LinkedDocs/?id=51249-003-TAReport

1. Terms of Reference for Consultants

TERMS OF REFERENCE FOR CONSULTANTS

A. Consulting Firm

1. **Scope of work**. The firm will develop and prepare the proposed investment project for Khyber Pakhtunkhwa Province Water Resources Development Project in line with ADB and government requirements, including all necessary studies and documentation for ADB Board consideration. Aside from the feasibility level study, the scope of due diligence outputs is provided below.

Due Diligence Outputs
Development coordination
Economic and financial analysis including the guidance note to develop sustainable O&M plan for each IDS
Financial management and procurement risk assessments of KPID and KPAD
Gender analysis, collection of socio-economic, poverty, agriculture, irrigation baseline data, and gender action plan
Project administration manual
Climate change risk vulnerability and adaptation assessment
Risk assessment and management plan
Safeguard documents on environment, involuntary resettlement, and/or indigenous peoples
Sector assessment
Summary poverty reduction and social strategy

2. **Deliverables.** The firm will submit the following reports: (i) Inception Report; (ii) Midterm Report, (iii) Draft Final Report, and (iv) Final Report. All reports are expected to be in English.

3. **Contract amount and type.** The maximum budget for the TA consultant contract is $998,000. The contract will be a partial lump-sum contract with provision for reimbursable expenditures. The payment schedule for the lump-sum portion is as follows: (i) 20% after contract signing, (ii) 20% following approval of Inception Report, (iii) 20% following approval of Midterm Report, (iv) 25% following submission of Draft Final Report, and (v) 15% following approval of Final Report incorporating comments of ADB and the government.

4. **Consultant's Qualifications**. The firm must have proven experience in designing and preparing ADB or World Bank-financed projects in the irrigation subsector, preferably in the West Asia region. The team leader must have at least 15 years' experience in similar assignments, and other key staff, 7–15 years' experience.

5. **Detailed Terms of Reference**. The schedule of indicative consulting service inputs is in Table 1.

Table 1: Indicative Consulting Service Inputs for Consulting Firm

Position	(person-months)	
	National	International
Irrigation Water Management Specialist/Team Leader	17.0	
Irrigation Engineer	6.0	
Tunnel Engineer	3.0	
Dam Engineer	4.0	
On-farm Irrigation Water Use Specialist	2.0	
Agriculture Development Specialist	4.0	
Institution and O&M Specialist	3.0	
Procurement/Contracts Specialist	3.0	
Project Economist	5.0	
Financial Management Specialist	2.0	
Climate Change Specialist	2.0	
Environmental Safeguard Specialist	6.0	6.0
Social Safeguard Specialist	6.0	3.0
Social and Gender Specialist	4.0	
Geotechnical Specialist	2.5	
Hydraulic Structures Engineer	2.5	
River Morphologist and Hydrologist	2.5	
Total	74.5	9.0

6. The terms of reference for the TA consultants are outlined in paragraphs 7 to 29.

7. **Irrigation Water Management Specialist/Team Leader (national, 17 person-months)**. The specialist will, as the team leader, provide overall direction and manage TA relationships with Khyber Pakhtunkhwa Irrigation Department (KPID), Khyber Pakhtunkhwa Agriculture Department (KPAD), Planning and Development Department (PD&D) in KP Government, ADB, and other stakeholders, to ensure effective coordination and synergies between all concerned. The expert, as the team leader, will be overall responsible for preparing the project to address all subprojects, projects' outputs, manage all experts' inputs, activities and outputs, and ensure the consistencies between project outputs, and the quality of the initial system wide planning exercises, feasibility studies (FSs), engineering designs, and reports. He/she will also (i) prepare preliminary estimates of investment costs for each subproject to meet economic criteria with project economist; (ii) review the working of current institutional relationships between KPID, KPAD, potential water use institutions, and farmers in each subproject, and recommend ways to improve effectiveness and efficiencies; (iii) ensure compliance of project outputs with ADB guidelines; (iv) manage the entire TA team, and integrate all TA outputs into an ADB investment project; (v) with other TA experts, prepare sub-contracts for the necessary services associated with geotechnical testing(s), ecological, [1] engineering and topographic survey(s), socio-economic baseline survey(s), resettlement enumeration(s), assessment(s) of the distribution of project effects and the impact on poverty reduction and inclusive growth, gender action plan(s), and others as necessary, in keeping with national standards, and acceptable to KPID, KPAD, and ADB; (vi) with other TA experts, identify relevant departments of the government of KPP and ministries of the government of Pakistan, international and local non-governmental organization(s) and their focal points to

[1] Ecological survey will be prerequisite for baseline data collection to assess environmental impacts to Mulkoh IDS, and will be also prerequisite for baseline data collection to assess environmental impacts to the raising of Tanda dam if no fresh data is available. The cost of the ecological survey for each (i.e. Mulkoh IDS and Tanda dam) is estimated at the cost equivalent to recruit 1 person-month each for the following national specialists: terrestrial fauna, aquafauna, ornithologist, botanist.

present and discuss TA consultant's preliminary products on critical engineering and environmental aspects (e.g. raising Tanda Dam, controlling sediment intrusion to Tanda Lake, new construction of Mulkoh IDS) and organize workshops and the panel of experts by inviting these focal points for critical TA consultant's proposals and/or decisions; (vii) review all aspects of implementation in previous and ongoing donor-funded projects to identify constraints, bottlenecks, concerns, and synergies; and (viii) ensure timely delivery of TA outputs, and of other outputs, in accordance with contract requirements.

8. He/she will, as irrigation water management specialist, lead in (i) verifying the first subproject (i.e., Mulko IDS and its CAD) and the second subproject (i.e., Tanda IDS and its CAD), their water balances, current agriculture practices, and irrigated agriculture plans, their feasibility designs and preliminary engineering designs, all of which were assessed and/or produced in already available FSs, and update these where necessary including possible updates by incorporating the adaptation of CCRs and CCIs; (ii) the comprehensive review and assessment of the PMC subproject's irrigation system, its water balance, and irrigated agriculture; (iii) the assessment of climate change risks (CCRs) and climate change impacts (CCIs) in each subproject, and (iv) the identification of development constraints and priorities in each subproject. Based on the above, propose priority technically feasible physical and non-physical investment packages covering IDS construction/remodelling/reconstruction and CAD for each subproject. He/she will be overall responsible for the preparation of feasibility studies and preliminary engineering designs for each subproject by verifying already available FSs for the first and second subprojects (i.e., Mulko and Tanda IDSs and CADs), and by developing the third subproject (i.e., PMC IDS and its CAD). The expert will be responsible for preparing two request for proposals for recruitment of the consultants (one for a detailed design consultant and another for a project implementation consultant).

9. **Irrigation Engineer (national, 6 person-months)**. He/she is responsible for (i) verifying the plan including alignment, feasibility level design, and preliminary engineering design, of the entire irrigation system, including intake structures, dams, main canals, distribution canals, and minors in available FSs for Mulkoh and Tanda irrigation scheme subprojects, and update these where necessary including possible updates by incorporating the adaptation of CCRs and CCIs; and (ii) preparing the alignment, feasibility level design, and preliminary engineering design, of the entire irrigation system, including intake structures, dams, main canals, distribution canals, and minors for the PMC irrigation scheme subproject, with technical inputs from relevant specialists. He/she should also develop project implementation schedule with subdivided detailed schedule in each required activity and identify the amount for climate change adaptation to be included in each subproject with the help of other relevant specialists. The specialist will be required to participate in the panel of experts as a key expert from the consultant team and propose any reviews, results, and/or proposals as necessary.

10. **Tunnel Engineer (national, 3 person-months).** The specialist is responsible for (i) conducting geotechnical evaluation and/or review; (ii) conducting underground structural analysis of underground structures; (iii) propose (a) tunnel structure design, (b) safety and emergency response plan, (c) preparation plan including ventilation, and (d) practical and efficient tunnel construction method and plan; and (iv) prepare drawings, cost estimate, and bill of quantities. The specialist is conducting these items following internationally acceptable standards, and by verifying these in FS for Mulkoh and Tanda subprojects, and comparing appropriate samples carried out in Pakistan under similar geographic and geotechnical conditions. The specialist will be required to participate in the panel of experts as a key expert from the consultant team and propose any reviews, results, and/or proposals as necessary.

11. **Dam Engineer (national, 4 person-months).** The specialist is responsible for designing the raising of Tanda Dam. The specialist will (i) identify the current structural design and characteristic of the foundation, and foundation design and treatment; (ii) assess the level of the stability of the dam; (iii) asses the weakness of the stability of the dam where raising the dam height with identifying missing and/or deteriorating structures/facilities/devices which will require newly-construction or rehabilitation in meeting current international dam standard; (iv) identify the strengthening options with rehabilitation/reconstruction/new-construction of associated dam structures/facilities with structural analyses and designs; and (v) decide practical and least-cost strengthening option. The specialist will identify the options for raising dam with structural analyses and designs, and decide practical and least-cost raising option by including costs for all associated structures/facilities/devices and for improving foundation. In identifying the least-cost option; (i) the available soil and rocks forming impervious and pervious zones for filling will be surveyed; (ii) the dam zoning plan will be developed based on the available soil; and (iii) the layout of the spillway, outlet, and other structures/facilities will be incorporated. Seismic assessment, foundation and geotechnical assessment, slope stability analysis, and dam stability analysis will also be carried out as necessary. Depending on the foundation and geotechnical assessment, the specialist will develop foundation design including treatment and improvement, consolidation and curtain grouting, cut-offs, and abutment stability. The specialist will be conducting above items by verifying FS for Tanda subproject where necessary. Based on the above, the specialist will develop feasibility level design of raising dam with strengthening current dam body, prepare drawings, cost estimate, and bill of quantities. The specialist will also carry out dam break analysis and dam failure impact assessments, and will develop the emergency plan. The specialist will be required to participate in the panel of experts as a key expert from the consultant team and propose any reviews, results, and/or proposals as necessary.

12. **On-Farm Irrigation Water Use Specialist (national, 2 person-months).** The specialist is responsible for preparing the physical and non-physical investment package in relation to on-farm water management in each subproject's CAD. He/she should (i) verify Mulkoh and Tanda irrigation systems with their geographical conditions and these water balances based on available FSs, and update these where necessary; (ii) assess PMC subproject irrigation system with their geographical conditions and their water balances; and (iii) develop feasibility studies covering at least a plan for (a) introduction of on-farm level efficient water use packages such as high efficiency irrigation systems and land levelling, (b) conjunctive water use, and (c) on-farm water storage facilities of subprojects. He/she, in each subproject area, will (i) estimate (verify and update where necessary for Mulkoh and Tanda subproject areas in available FSs) existing crop water requirements (with Agriculture Development Specialist), irrigation water requirements at on-farm level, irrigation practices; (ii) work with the Economists, Engineers, and Agricultural Development Specialist in making projections (verify projections and update where necessary for Mulkoh and Tanda subprojects) for modified irrigated land areas, crop water requirements (with Agriculture Development Specialist), irrigation water requirements, irrigation practices that would be applicable under "with-the-project" scenario considering CCRs and CCIs; (iii) propose improved climate adaptive on-farm land and water management technologies in line with best practices; and (iv) support the development of schedule of irrigation requirements based on the above analyses. He/she should materialize all items above in the form of physical and non-physical investment package including estimation of the input, cost, and schedule, all of which will be implemented under the proposed project in each subproject. The expert, in close coordination with Agriculture Development Specialist will also identify suitable NGO(s) to engage them to conduct community consultation activities for subprojects with regard to CAD in each subproject, if appropriate, and then prepare: (i) terms of reference (ToRs), (ii) schedule implementation arrangement to engage NGO for community consultation activities, and (iii) supervise them to make them produce relevant reports timely and with acceptable outputs.

13. **Agriculture Development Specialist (national, 4 person-months).** The specialist, in each subproject area, will (i) collect and analyze all relevant data and estimate existing agricultural land areas, cropping patterns, cropping intensity, crop water requirements (with the On-Farm Irrigation Water Use Specialist), yields, agricultural practices, livestock, incomes in agriculture sector (with Economists), and land ownership (with the Social and Gender Specialist) in the PMC irrigation system, (ii) verify items listed in item (i) from the available FSs for Mulkoh and Tanda irrigation subprojects, and update these where necessary; (iii) analyze (verify the analysis and update where necessary in available FSs for Mulkoh and Tanda subprojects) ratio of existing landed owners and peasants and existing income distributions by categories; (iv) assess (verify the analysis and update where necessary in available FSs for Mulkoh and Tanda subprojects) the existing farm inputs, input costs, and benefits for the farmers' production system including crops, range, livestock; (v) work with the Economists and Engineers in making projections (verify developed projections and update where necessary in the available FSs for Mulkoh and Tanda subprojects) for (a) modified irrigated land areas, cropping patterns, cropping intensity, yields, crop water requirements (with the On-Farm Irrigation Water Use Specialist), agricultural practices, livestock, incomes in agriculture sector, and land ownership; and (b) modified farm inputs, input costs, and benefits for the modified farmers' production system including crops, range, and livestock, that would be applicable under "with-the-project" scenario considering CCRs and CCIs; (vi) assess the benefits of the proposals with the Economists; and (vii) propose profitable farm management practices and climate adaptive on-farm agricultural practices and/or technologies.

14. He/she should also suggest suitable value chain and value addition mechanism and materialize items (vi)-(vii) above, in the form of physical and/or non-physical investment packages including estimation of the input, cost, and schedule, all of which will be implemented under the proposed project as part of CAD in each subproject. The expert will assist the On-Farm Irrigation Water Use Specialist in (i) identifying suitable NGO(s) to engage them to conduct community consultation activities for subprojects; (ii) preparing the ToRs, schedule, and implementation arrangement to engage NGO for community consultation activities; and (iii) supervising them to make them produce relevant reports timely and with acceptable outputs.

15. **Institution and Operation and Maintenance Specialist** (**national, 3 person-months**). The specialist is responsible for preparing institutionally feasible and legitimate physical and non-physical investment package in each subproject. He/she will (i) review ongoing reform principles and practices in the light of KP Irrigation and Drainage Authority (IDA) Act 1997; and (ii) develop institutional structure to implement each subproject, and operate and maintain assets to be developed under each subproject to be consistent with KPIDA Act to the degree possible with the help of other experts.

16. He/she will conduct institutional gap analyses to identify the needs of physical and non-physical interventions to be implemented in both IDS and CAD of each subproject. Then, the expert will divide the needs for interventions into the immediate interventions which should be undertaken under the TA and the interventions which should be undertaken under the implementation of the project for institutional and O&M points of views. For immediate interventions which have to be undertaken under the TA, the expert has to, at least, produce the following: (i) institutional and implementation arrangements with possible participation from communities for the conduct of each subproject and O&M in each subproject; (ii) sustainable O&M plan including cost recovery mechanism to be implemented under the proposed institutional arrangement upon the completion of physical interventions in each subproject; (iii) capacity building package and its implementation schedule in each subproject to strengthen institutional arrangement to be implemented during project implementation; and (iv) the cost estimation of

non-physical investment package. He/she also has to (i) assess institutional capacity (excluding their financial sustainability) and develop assessment reports of KPID, KPAD, KPIDA, and other relevant institutions which will be involved in the project management and O&M of the assets to be developed or improved under each subproject; and (ii) assess the adequacy of institutional arrangements and potential risks, and suggest corresponding mitigation measures for institutional strengthening.

17. **Procurement/Contracts Specialist (national, 3 person-months).** The specialist will (i) conduct procurement risk assessment for KPID, KPAD, and KPIDA, develop assessment report, and propose measures to mitigate procurement management risks for them and develop mitigation report; (ii) identify all procurement requirements for the project and develop procurement plan following ADB requirements; (iii) develop the ToRs of the project implementation consultants; (vi) develop two draft request for proposals (one for recruitment of the detailed design consultants and another for project implementation consultants) including required documents for the issuance of the expressions of interest for the two advertisements; and (vii) develop tender documents for the first major civil work contract among all subprojects, all of which following ADB Procurement Policy (2017, as amended from time to time), Procurement Regulations for ADB Borrowers (2017, as amended from time to time), and ADB's Standard Bidding Documents (SBDs), and other ADB requirements. The task of the item (i) above will be conducted with the Financial Management Specialist, and the other tasks will be conducted in coordination with relevant experts.

18. **Project Economists (national, 5 person-months).** They will (i) review economic and financial viability for each subproject, and revise a project proposal, if necessary; (ii) develop cost estimation with and/or without the project in consultation with other relevant experts for each subproject; (iii) prepare a project financing plan in consultation with ADB and the government; (iv) identify project benefits in each subproject; (v) develop financial sustainability reports for each subproject; (iv) develop relevant assumptions and criteria and analyze relevant investment scenarios for each subproject; (vii) analyze financial ability of farmers in each subproject; (viii) compute economic internal rate of return by conducting sensitivity analysis for each subproject; and (ix) prepare relevant reports. The economic analysis will be carried out in line with ADB's Guidelines for the Economic Analysis of Projects (2017).

19. **Financial Management Specialist (national, 2 person-months).** Following ADB's Guidelines for Financial Management Systems, Financial Analysis and Financial Performance Indicators (OM Section G2), and ADB's policy on governance, and ADB's updated technical guidance note (TGN) for Financial Management Assessment (2015), and other relevant financial due diligence guidance material,[2] the specialist will (i) assess financial management and financial sustainability capacities of KPID, KPAD, and KPIDA; (ii) undertake their financial management and sustainability assessments utilizing ADB's financial management assessments questionnaire and other methods; (iii) review audited and unaudited financial statements of KPID, KPAD, and KPIDA, if applicable; and (iv) assess the adequacy of financial management and sustainability arrangements and potential risks, and suggest mitigation measures strengthening institutional capacities.

20. **Climate Change Specialist (national, 2 person-months).** The specialist will carry out, in each subproject, detailed climate vulnerability assessment, identify CCRs and CCIs, propose required non-physical and physical adaptation measures, and estimate incremental cost for proposed adaptation measures with relevant specialists, particularly with the irrigation engineer.

[2] Available at https://www.adb.org/about/financial-management-resources

To carry out above activities, the specialist will carry out historical analysis using recorded meteorological and hydrological data, and use global circulation model projections (GCMPs), and available downscaling of GCMPs. If deemed necessary, carry out statistical downscaling model projections and glacier melting simulation using mass balance assessment. The scope of climate-related parameters that the specialist has to review will include, air temperature, precipitation including its intensity, evapotranspiration, and river and flood flow regime.

21. **Environmental Safeguard Specialist (2 international, 3.5 person-months for the second subproject and 2.5 person-months for the first and third subprojects; national, 3.5 person-months for the second subproject and 2.5 person-months for the first and third subprojects).** The specialists will, following ADB's Safeguard Policy Statement (SPS, 2009), (i) assess and compare government resettlement legislation, policies, and frameworks with those of ADB, identify gaps, differences, or conflicting areas, and recommend modifications to content and/or mechanisms to promote compatibility; (ii) identify survey requirement, prepare plan and oversee the collection of relevant data (footnote 1); (iii) review all components to be considered in each subproject, and prepare environmental impact assessment (EIA) or initial environmental examination (IEE) with environmental management plan (EMP) needed to mitigate environmental impacts and their corresponding costs, all of which are in accordance with national environmental laws and SPS in each subproject, depending on environment category; (iv) confirm the ADB environment categorization of each proposed subproject; (v) assume overall responsibility for obtaining approval of the above documents by the relevant agency and for submission of the EIAs/IEEs and Summary EIAs/IEEs to ADB for public disclosure; (vi) propose any environmental mitigation measures deemed necessary, prepare the requisite EMP, and provide full details of the cost of monitoring, management, and mitigation measures; (vii) prepare the Environmental Assessment and Review Framework (EARF); (viii) assist KPID and KPAD to carry out public consultation following SPS for preparing EIAs/IEEs/EARF; (ix) assess the institutional capacity of KPID and KPAD in (a) undertaking scoping of potential environmental impacts, (b) preparing and supervising environmental assessment studies, (c) implementing measures recommended in IEEs/EIAs/EARF, and (d) recommend detailed implementation arrangements, and essential staffing and training requirements; and (x) identify environmental issues related to the features of the project requiring loan covenants to ensure appropriate management and compliance.

22. The specialists should be aware that (i) the Tanda Dam, which is proposed to be raised under one of the subprojects, is categorized as "large dam" in accordance with International Commission on Large Dams, and thus careful environment impact assessment is required; (ii) the Tanda Lake has serious issues on many aspects on reduced storage capacity due to the continued sediment deposition; (iii) the raising of the Tanda Dam in Kohat district under one of the subproject can pose high environmental risks to Tanda Lake wetlands protected under the international convention: "Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat" since 1976; and (iii) the area surrounding Tanda Lake is in Tanda Wildlife Park, one of Seven (7) Wildlife Parts in KPP. In assessing risks and impacts and in developing EMP, an integrated water resources management (IWRM) approach combining the aspects of irrigation, fisheries, environment, tourism, and livelihoods with the involvements of various stakeholders will be required to ensure maximum benefits. Further, an increase in the dam height of the reservoir may inundate habitat for wildlife, including migratory birds. This needs to be carefully assessed and the specialists will undertake a pre-feasibility assessment based on the ecological constraints. As part of the assessment, the specialists will undertake the following:

a. Gather existing literature on the protected area;
b. Gather existing baseline information and assess information gaps. If not available, then primary baseline data (at least wet and dry seasons) for all key species will be collected (footnote 1);

c. Undertake a baseline assessment of existing habitat types, condition utilization by species surrounding the reservoir, covering at least 2 seasons (wet and dry);
d. Based on hydrological data, combined with digital terrain models and reservoir bathometry, construct a model that assess the inundated and seasonally wetted area of vegetation. This would include modelling changes in depth within the ecotone between the aquatic and terrestrial habitat areas. The model should include the analysis of different scenarios (baseline situation without project, compared to one of more project design alternatives);
e. Undertake consultations with the government authorities involved with the management of the protected area. Gather baseline information, including information on the management plan for the area, operational priorities, budget and financial sources, staff levels and capacity, monitoring systems, key management challenges; and views on potential impacts and management measures associated with the project;
f. Consult with conservation NGOs on the protected area management and key management challenges; and views on potential impacts and management measures associated with the project;
g. Assess if the project area contains critical habitat as per the SPS definition. Assessment should include application of the IFC Performance Standard 6 critical habitat thresholds; and
h. Identify potential impacts of the project on modified, natural, and critical habitat. Prepare management options. For the project to be feasible, we need to show that that there would be at least no net loss of biodiversity and preferably a net gain. When defining management options, we should include measures that would enhance the conservation objectives of the protected area (as per SPS requirements). Options might include support for management planning, monitoring, habitat restoration, etc.

23. In this connection, one of the specialists' tasks is to (i) identify relevant departments of the government of KPP and ministries of the government of Pakistan, international and local non-governmental organization(s), and their focal points to present and discuss TA consultant's preliminary products on critical engineering and environmental aspects (e.g. raising Tanda Dam, controlling sediment intrusion to Tanda Lake, new construction of Mulkoh IDS); (ii) assist the team leader in organizing workshops and the panel of experts by inviting these focal points for critical consultant's proposals and/or decisions; and (iii) participate in the workshops and the panel of experts as key experts from the consultant team and propose any environmental assessment results and their mitigation and management plans.

24. The specialists should also be aware that the first subproject (Construction of Mulkoh IDS and its CAD) will require the water assessment from a diversion tunnel that will also service hydropower energy generation. The assessment will need to consider cumulative impacts in terms of the water diversion for both purposes and integrate an ecological flows assessment and assessment of instream biodiversity impacts in the downstream areas from the water diversion.

25. **Social Safeguards Specialists (international, 3 person-months; national, 6 person-months).** The specialists will (i) assess and compare government resettlement legislation, policies, and frameworks with those of ADB, identify gaps, differences, or conflicting areas, and recommend modifications to content and/or mechanisms to promote compatibility; (ii) review resettlement and indigenous peoples' reports, if available, in FSs for Mulkoh and Tanda subprojects; (iii) identify gaps and survey requirements, prepare, plan, and oversee the collection of relevant data; (iv) assess all potential resettlement and indigenous peoples' impacts from each

subproject, confirm the categorizations of the proposed project; (v) prepare a due diligence report describing the potential impacts from each subproject confirming which subproject would require the preparation of draft land acquisition and resettlement plans (LARPs) and which activities will not involve any LAR impacts; (vi) undertake consultations potentially displaced people, especially vulnerable groups that may be disproportionately affected by the project interventions; (vii) conduct socioeconomic surveys and census with appropriate socioeconomic baselines data to identify all potential DPs and assess the project impacts on them; (viii) prepare LARP for each subproject with LAR impacts consistent with ADB SPS; (ix) in case adverse impacts on indigenous peoples (IPs) are noted, prepare a combined LARP/IP plan to address both involuntary resettlement and IP impacts from subprojects; (x) in case of land acquisition, assess the stage of the acquisition planning process under the LAA 1894 and link it with the LARP preparation, updating and implementation; (xi) coordinate with the provincial and district revenue departments and brief them on ADB SPS requirements that should be considered in the compensation process; (xii) assist KPID and KPAD in establishing a grievance redress mechanism for the preparation, updating, and implementation of the LARPs; (xiii) assess the capacity of KPID and KPAD to update and implement the resettlement plan, brief them on the ADB safeguards requirements and gap filling measures needed to comply with ADB requirements and prepare a capacity development program for resettlement for implementation in the loan project.

26. **Social and Gender Specialist (national, 4 person-months)**. The specialist will (i) collect data and documents (verify these and update where necessary for Mulkoh and Tanda subprojects) about (a) households' income by sectors (agriculture and non-agriculture) and crop land areas, (b) share of poor by areas and stakeholders (if available), and (c) households' information such as number of household members, their education levels, and sex; (ii) analyze (verify and update where necessary for Mulkoh and Tanda subprojects) correlation between land areas and income levels, distributions of poor by land areas and income levels; (iii) develop a plan for livelihoods' improvement; (iv) develop a gender action plan; (v) assess all civil works and operations impacts; and (vi) develop a poverty reduction and social strategy based on ADB's requirements to reduce poverty rates in target subproject areas and districts. The specialist will also collect (i) the number of households in the command areas of each of the 3 subprojects; (ii) percentage of women farmers, and total number of men and women farmers in each of the subproject; (iii) number of WUAs per subproject, currently existing, and to be formed; (iv) percent of women membership of WUAs per subproject; and (v) current gender balance in the staffing of KPID and KPAD.

27. **Geotechnical Specialist (national, 2.5 person-months)**. The specialist will conduct geological/geotechnical review (or verify available reviews in FSs for Mulkoh and Tanda subprojects and update where necessary) of dams, tunnels, diversion structures, weirs, headworks and other critical structures that are proposed to be rehabilitated, constructed, or used in each subproject, and conduct supplementary geological/geotechnical investigations, if needed. These reviews and investigations should follow the relevant international standard requirements. These supplementary investigations could be sub-contracted to a specialized firm(s) under the consultant's supervision, depending on the nature and the extent of investigations. This will cover the following items but not limited to (i) assessment of the geological condition of (a) the dam foundation, abutment, the proposed reservoir area, and dam axis; and (b) canals, siphons, pressure pipelines, weirs, head-works and/or other forms of diversion structures, bridges, as deemed necessary; (ii) conduct a series of geological investigations/tests, such as seismic refractions, bore-holing/logging, trial pits, in-site and laboratory tests for measuring soil/rock type classification, shear stress, permeability, grouting procedures, etc.; (iii) locate borrow pit and quarry areas and investigate the suitability and volume of dam construction materials; (iv) conduct

seismology assessment of the dam site and surrounding areas for determining seismic loads for dam design. The geotechnical specialist provides these outputs and his/her technical judgments and/or views in the structural deigns to be prepared by the relevant TA specialists. The specialist will be required to participate in the panel of experts as a key expert from the consultant team and propose any geological/geotechnical results as necessary.

28. **Hydraulic Structure Engineer (national, 2.5 person-months).** The specialist will (i) carry out hydraulic and/or gated structural design (or verify available designs in FSs for Mulkoh and Tanda subprojects and update where necessary) for canals, tunnels, pressure pipelines, siphons, offtakes, intakes, weirs, headworks and/or other forms of diversion structures, dams with associated structures such as spillways, emergency hydraulic escapes, bridges; (ii) prepare drawings (or verify available drawings and update where necessary); and (iii) cost estimate, develop bill of quantities, and provide relevant specialist with them, in each subproject with possible reference to and with necessary updates of already available feasibility studies. Hydraulic design works should also include (i) the assessment of discharge capacity of above structures; and (ii) the safety assessment of dams, headworks, and/or other forms of diversion structures against floods with CCIs and earthquakes, following international standard requirements, and/or verify items (i) and (ii) if these are available in FSs for Mulkoh and Tanda subprojects. The Engineer will obtain necessary inputs from the team leader, Geotechnical Specialist, Irrigation Engineer, On-Farm Irrigation Water Use Specialist, and River Morphologist and Hydrologist in designing the structures. The specialist will be required to participate in the panel of experts as a key expert from the consultant team and propose any hydraulic structural designs as necessary.

29. **River Morphologist and Hydrologist (national, 2.5 person-months).** The specialist will conduct hydrological and river-morphological review of target Rivers (or verify available reviews in FSs for Mulkoh and Tanda subprojects and update where necessary) where any cross-river structures (e.g. dam, weir, intake structure, head-work, canals) are proposed to be constructed or strengthened in each subproject with the use of relevant available morphologist and hydrological data. Based on his/her review, he/she will conduct supplementary hydrological assessment in the following areas, if needed, (i) assess historical records of rainfall and runoff flow regime of the target rivers including records of the newly installed gauging and weather stations to check the present and future water availability and prepare a rainfall-runoff model; (ii) conduct flood analysis including frequency analysis and calculation of Probable Maximum Flood (PMF) to determine design flood and spillway capacity of dams and headworks; (iii) review sediment load, determine dead storage volume, and propose scour and flushing arrangements if required, both of which are applicable to dams and headworks; and (iv) assess possible impacts of the CCRs and CCIs on the hydrological characteristics using some scenarios (without CCI, low CCI, and high CCI) drawing from existing available information and projections provided by the Climate Change Specialist. He/she will assess potential positive and negative environmental impact of dam and/or headwork developments and provide necessary technical inputs to Environmental Specialists. The expert will provide technical inputs for feasibility level design and engineering designs to be developed by the relevant TA experts. The specialist will also (i) conduct the contour survey of the Tanda Lake where raising dam; (ii) confirm if water leakage occurs, subject to the level of the raising; (iii) drawing expanded Tanda Lake; (iv) identify the cause for continuous soil deposition in the Tanda Lake; and (v) propose remedial measures to control soil deposition. The specialist will be required to participate in the panel of experts as a key expert from the consultant team and present any river morphological and/or hydrological reviews as necessary.

B. Individual Consultant

30. **Civil Engineer (international, 1.5 person-months).** The specialist will be engaged on an intermittent basis to (i) review the TA consultant's proposed engineering designs of critical hydraulic and other structures (e.g. tunnel, dam, pipelines, barrage); (ii) identify technical issues and constraints in designs; and (iii) provide technical guidance and propose practical solutions to resolve identified issues to the consultant firm for their starting redesigning and/or adjusting designs. The specialist will participate in the panel of experts as a key specialist, present and discuss items (i)–(iii) above with the TA consultant, KPID, and other stakeholders to overcome these technical deficiencies in the project design.

31. **Environment Specialist (international, 1.5 person-months).** The specialist will be engaged on an intermittent basis to (i) review the TA consultant's assessments of environmental impacts to the raising of the Tanda Dam and continued silt/soil deposition to the Tanda Lake, and to the construction of Mulkoh IDS and others; and (ii) review the TA consultant's proposed mitigation and management plans for the item (i) above; (iii) identify issues and constrains in these assessments and plans; and (iv) provide guidance and proposed practical solutions to resolve identified issues and constraints to the consultant firm for their reassessments and re-planning. The specialist will participate in the panel of experts and the workshops related to environment aspects as a key specialist, present and discuss items (i)–(iv) above with the TA consultant, KPID, and other stakeholders to overcome these issues.

32. **Dam Specialist (international, 1.5 person-months).** The specialist will be engaged on an intermittent basis to (i) review the TA consultant's analyses on the cause of the continued silt/soil deposition to the Tanda Lake; (ii) review the TA consultant's proposed solution to ensure designed water volume to convey Tanda IDS service area; (iii) address continued silt /soil deposition and other dam structures (e.g. spill way, water tower); (iv) identify technical issues and constraints in the proposed solution; and (v) provide technical guidance and propose practical solutions to resolve identified issues to the consultant firm for their starting redesigning and/or adjusting designs. The specialist will participate in the panel of experts and the workshops related to dam aspects as a key specialist, present and discuss items (i)–(v) above with the TA consultant, KPID, and other stakeholders to overcome these technical deficiencies in the project design.

33. **Project Economist (international, 1.5 person-months).** The specialist will be engaged on an intermittent basis to: (i) review the economic and financial analyses for each subproject drafted by the TA consultants; (ii) identify gaps to meet ADB requirements; (iii) provide guidance to the TA consultants to produce quality economic and financial analyses; and (iv) if necessary, work together with the national Project economist, a member of the TA consultants and produce quality economic and financial analysis acceptable to ADB.