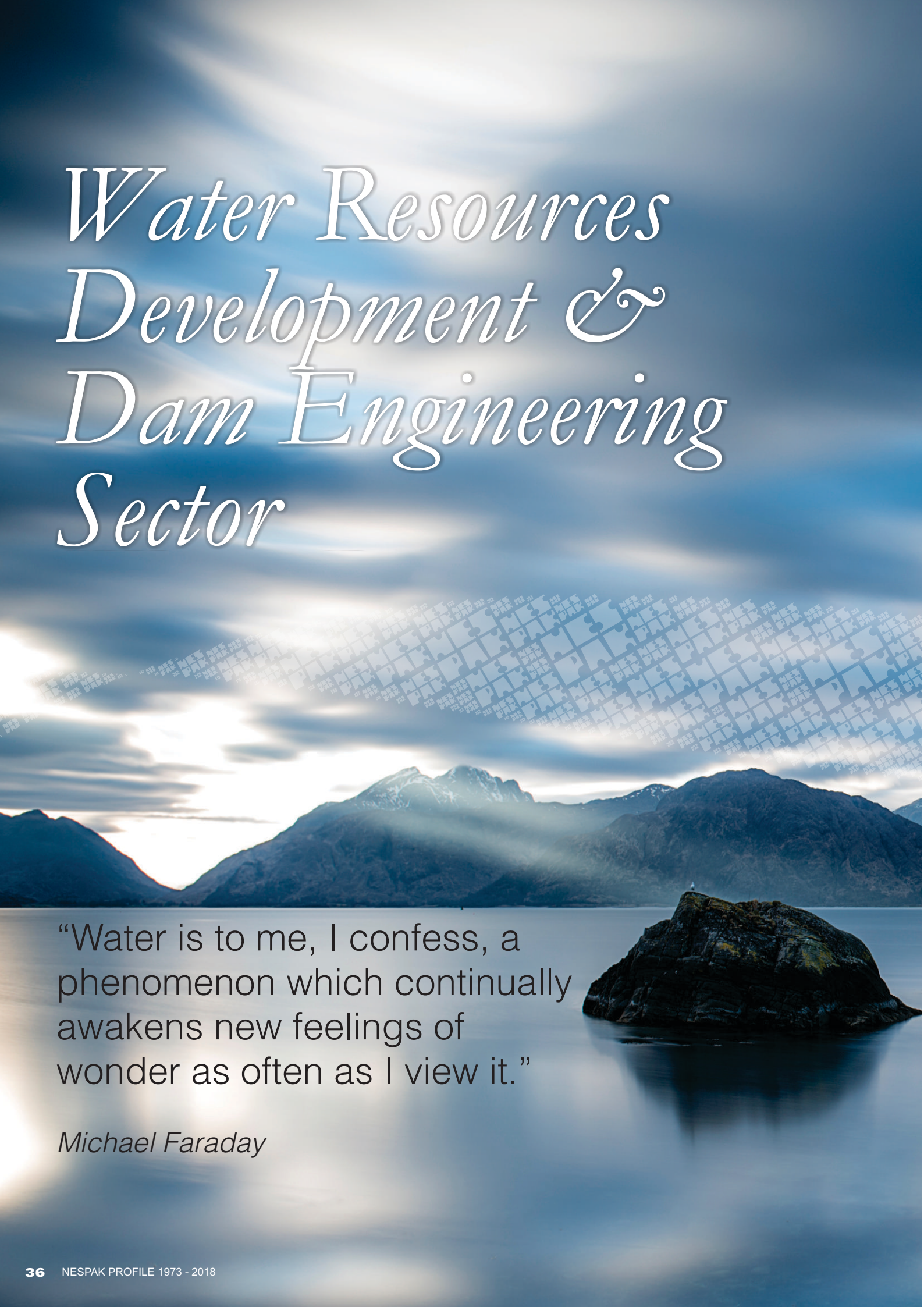
Water Resources Development & Dam Engineering Sector



"Water is to me, I confess, a phenomenon which continually awakens new feelings of wonder as often as I view it."

Michael Faraday

Amid the threat that the next wars would be fought over water, the importance of water is increasing with every coming day. Over the years, the water availability in Pakistan has fallen drastically with statistics pointing a sharp fall from 5,000 cubic metres per capita in the 1950s to less than 1,000 cubic metres per capita currently. It is to be pointed out that the international benchmark of being water scarce stands at 1,000 cubic metres per capita.

As the world in general and Pakistan in particular are facing the paucity of this priceless and life-saving commodity, NESPAK is fully alive to the problem and is making its contribution to improve the situation by rendering remarkable consultancy services for many mega projects.

The Mangla Dam Raising Project, Diamer-Basha Dam, Wadi Dayqah Dam, Oman, Punjab Irrigated Agriculture Investment Programme, Sindh Water Sector Improvement Phase-I Project, Kachhi Canal Project Phase-I, Punjab Irrigation System Improvement Project and Rehabilitating Lower Chenab Canal System Project are few examples of NESPAK's outclass performance in the field of water consultancy services.

In July 2010, flash floods devastated the country. In this hour of crisis, NESPAK did not remain behind and played its role in the rehabilitation and reconstruction work by carrying out the flood-related projects of national importance.

Another hallmark of NESPAK is that it is serving the Government of Pakistan as consultant to resolve water disputes with India. The recently addressed projects are Wullar Barrage, Kishan Ganga Hydropower Project, Tulbul Navigation Project, Nimo Bazgo, etc.

Monitoring and evaluation is a new arena where NESPAK is providing services for the Water Sector Improvement Project-I assigned by the Government of Sindh. The objective of the consultancy is to give continuous feedback to the Government and its associated agencies on the project's performance and impact since its establishment in 1973. NESPAK has left no stone unturned in giving cost-effective, practicable and realistic solutions to its clients. The Company won many projects on the basis of competition, while some were awarded to it on account of good performance. NESPAK made its debut in the Water Resources and Dam Engineering Sector with the design and construction supervision of the Left Bank Irrigation Tunnel of Tarbela Dam Project in 1973 and since then, the Company has provided services for more than 545 water resources projects worth Rs. 2,320 billion within Pakistan and abroad. By virtue of more than 44 years of valuable experience, NESPAK is now capable of offering comprehensive services in all fields related to the Water Resources and Dam Engineering Sector.
The services for Water Resources Development and Dam Engineering Sector are being provided within and outside Pakistan by a largely qualified and well-experienced team of more than 587 personnel including water resources planners and engineers, hydrologists, dam engineers, geotechnical engineers, agriculture specialists, geologists, irrigation and drainage experts, hydrogeologists, hydraulic engineers, soil and water quality scientists, flood management specialists, GIS experts, environmentalists, institutional development experts, sociologists, economists, construction specialists and contract managers.
A review of NESPAK's expertise and experience in the Water Resources Development and Dam Engineering Sector is given below:

SCOPE OF SERVICES

Water Resources Planning: Studies for evaluation of water resources, establishing planning criteria, water allocation and distribution among various sectors, water use optimisation, identification of potential projects, development of procedures and criteria for evaluating projects and programmes, ranking and prioritisation of projects, preparation of rolling plans and investment programmes within the overall resource constraints along with inter-sectoral integration with other development programmes. Studies for assessment and management of environmental and social impacts of water resources development programmes as well as for institutional reforms and capacity building for their implementation and sustainability. State-of-the-art integrated water resources and environmental management also falls within the purview of services.

Dams and Barrages: Site selection, layout planning, topographic surveys, geological mapping, geo-technical and geo-physical investigations, seismotectonic and seismic risk evaluation, hydrological studies, design of embankments, filters, abutment protection works, seepage control measures, settlement analysis, material investigations, design and hydraulic model studies and foundation design of the dams, barrages and related structures. Design of river training works including guide banks, marginal bunds, spurs and flood protection works on the basis of model studies. Specialized services for instrumentation of vital components of dams and barrages. Preparation of environmental studies and resettlement action plans, operation and maintenance manuals, construction supervision and contract management, periodic inspection of dams and barrages and designing remedial measures.

Irrigation Systems: Feasibility studies, designs, tender documentation and construction management of new irrigation systems as well as remodelling and rehabilitation of existing irrigation systems from canal head, down to the watercourse level. Planning and designing of state-of-the-art irrigation networks and related structures including micro irrigation systems like drip and sprinkler irrigation. Operation and maintenance manuals based on modern concepts. Studies for institutional reforms and development of farmers' organisations for participatory irrigation management in order to ensure sustainability of the systems.

Drainage, Salinity Control and Land Reclamation: Hydrogeological studies for estimation of drainable surplus, soil surveys and investigations for salinity/sodicity status and reclamation programme for deteriorated soils, infiltration, hydraulic conductivity and aquifer tests for the evaluation of drainage parameters of soil, design of horizontal sub-surface drainage systems and interceptor drains, design of vertical drainage systems through tubewells, design of surface drainage systems for conveying storm water and safe disposal of saline effluent, environmental impact assessment studies, preparation of resettlement action plans, construction supervision, contract management, preparation of completion reports, Operation and Maintenance Manual and benefit monitoring of drainage projects.

Groundwater Resources Development: Planning, investigation, development and management of groundwater resources. Planning, design and field supervision of groundwater investigations including drilling of test holes and pump out tests to augment the available data on aquifer geometry and its hydraulic parameters, monitoring network, quantification of various sources of groundwater recharge and carrying out water balance studies to determine the potential for additional development and design of well-fields.

Flood Management: Master planning, feasibility studies, detailed design and construction supervision. Economic and financial analysis as well as social and environmental impact assessment and

mitigation studies. Development of flood management projects based on integrated river management concept.

Flood Forecasting/Warning Systems: Development of rainfall-runoff models for rivers and streams, formulation of hydrodynamic river flow models and integrating these into one software with easy data input and results display. Developing various components of Flood Forecasting and Warning Systems including rainfall-runoff modelling, hydrodynamic river flow modelling, telecommunication network, bathymetric surveys, flood plain mapping and preparation of guidelines and manuals for operation of the system. Development of flood forecasting system for the Indus River System by installing new radar at Mangla and upgradation of radars at Lahore and Sialkot. Strengthening of Telemetry and HF Radios network, Scale/Physical Model Testing, Flood Plain and Inundation Mapping, Development of Rainfall Run-off and Hydrodynamic Models.

Flow Measurements of Rivers, Canals, Distributaries and Watercourses: Measurement of discharges of canals, distributaries and water courses, etc. State-of-the- art equipment has been acquired for this purpose.

Hydropower (Low, Medium and High Head): Studies related to hydrology, hydraulics and sedimentation for the hydropower development projects.

Institutional and Social Development: Social assessment, socio-economic studies, planning social mobilisation, community development (farmers' organisations, community-based organisations), training/ capacity building, popularising appropriate sustainable technologies, institutional reforms, communication strategy, resettlement action plans, gender and institutional components, monitoring and evaluation of irrigation and agricultural projects.

EXPERIENCE

Water Resources Planning: As many as 35 water resources planning projects within Pakistan as well as abroad, involving an area of more than 15 million hectares.

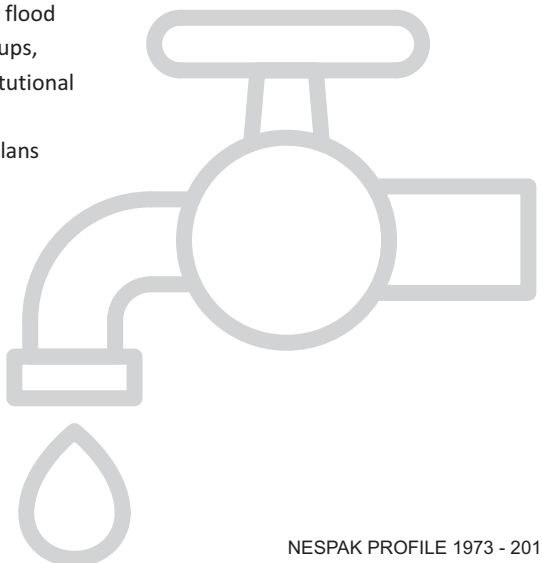
Dams and Barrages: As many as 154 dam and barrage projects. The cumulative gross storage of the reservoirs is more than 21,500 MCM which provides dependable irrigation water to more than 7 million hectares of land

Irrigation Systems: As many as 141 projects covering an area of more than 65,000,000 hectares and designed/supervised the construction of canals system having a total length of about 35,000 km.

Drainage, Salinity Control and Land Reclamation: As many as 32 projects involving laying of about 4,300 km of subsurface drains/tile drainage systems and surface drainage systems over a length of about 3,500 km for the improvement of an area of about 2.0 million hectares.

Groundwater Resources Development: As many as 45 major projects resulting in the improvement of an area of 37,500 hectares through groundwater development.

Institutional and Social Development: More than 40 irrigation and agro-socioeconomic projects involving social assessment, socio-economic studies, social mobilisation/community development, formation of farmers' organisations, flood protection associations, women groups, etc., training/capacity building, institutional reforms, communication strategy development, resettlement action plans and evaluation.



Punjab Irrigated Agriculture Investment Programme

The Punjab Irrigated Agriculture Investment Programme (PIAIP) is jointly financed by the Asian Development Bank (ADB) and Government of the Punjab with a total project cost of Rs. 276 billion. A NESPAK–led joint venture namely PIAIP Consultants has been providing consultancy services for various irrigation jobs under this mega project. The NESPAK-led joint venture has completed feasibility studies and detailed designing for the rehabilitation and upgradation of the Suleimanki Barrage, Trimmu Barrage, Panjnad Barrage, Pakpattan Main Canal and Distribution System, Thal Branch Canals and Distribution System, New Khanki Barrage, Balloki Barrage and Lower Bari Doab Canal system under this project. The New Khanki Barrage, Balloki Barrage and Lower Bari Doab Canal projects are at completion stage while rehabilitation and upgradation of the Suleimanki Barrage, Trimmu Barrage, Panjnad Barrage and Pakpattan Main Canal are under the implementation stage. NESPAK has also completed feasibility studies for controlling seepage and water logging along the Trimmu-Sidhnai Link Canal, Rehabilitation of Rasul-Qadirabad, Qadirabad-Balloki, Balloki-Suleimanki Link Canals and Water Resources Development in Smaller Cholistan. The feasibility study and detailed design of “Extension of Irrigated Agriculture in Greater Cholistan” are in progress.

Sindh Water Sector Improvement Phase-I Project

A NESPAK joint venture has completed monitoring and evaluation for the Sindh Water Sector Improvement Phase-I Project (WSIP-I) as per schedule.

The project costing Rs. 18 billion was funded by the International Development Association for the Sindh Planning and Development Department. The key elements of the project strategy included strengthening of irrigation and drainage institutions particularly the farmers' organisations, Sindh Irrigation and Drainage Authority and Area Water Boards and investments to improve physical infrastructure.

National Drainage Programme

NESPAK in association with two foreign firms has rendered consultancy serviced for the National Drainage Programme (NDP) funded by the World Bank, Asian Development Bank and the Japan International Cooperation Agency. The two-phase programme was carried out in all the four provinces of Pakistan. The scope of services included feasibility study, detailed design, tender documentation, construction supervision and expert advice for this Rs. 25 billion project. The objective of the NDP, which was wrapped up in 2007, was to improve the irrigation and drainage and ensure its sustainability in Pakistan.

Punjab Irrigation System Improvement Project

A NESPAK-led joint venture has completed design and construction supervision services for the Punjab Irrigation System Improvement Project.
The project covered three sub-project areas located in three irrigation zones, i.e., Bahawalpur, Dera Ghazi Khan and Faisalabad Irrigation Zones. This important project was initiated by the Punjab Irrigation Department at a cost of Rs. 12 billion. A selected system of channels including associated structures has been lined/rehabilitated and upgraded under this project funded by the Japan International Cooperation Agency (JICA).

Kachhi Canal Project Phase-I

A NESPAK joint venture is providing design and construction supervision services for the Kachhi Canal Construction Project

Phase-I amid hostile security situation. The project costing Rs. 80 billion aims at developing and irrigating 290,000 hectares of agricultural land in Dera Bugti, Naseer Abad and Jhal Magsi in the Balochistan Province. This canal off-takes on right side of the Taunsa Barrage in the Punjab Province having a total length of 500 km out of which 300 km is in Punjab. The rest 200 km falls in Balochistan. The Phase-I consists of Main Canal & Distribution System up to Dera Bugti.

Remodelling of Warsak Right Bank Canal System

A NESPAK-led joint venture is rendering detailed design and construction supervision services for Remodelling of Warsak Canal System Project in Peshawar and Nowshera Districts of the Khyber Pakhtunkhwa province. Awarded by the KPK Irrigation Department, the project entails the construction of an auxiliary tunnel, a 300 cusecs pump house for lift irrigation, cross drainage structures, cross regulators, head regulators, aqueducts, outlets, and bridges. With the initiation of this Rs. 12 billion project, NESPAK has made strong foundation in the water sector in the KPK Province.

Lower Chenab Canal System Project

NESPAK has carried out design, tender documentation and construction supervision services for Rehabilitating Lower Chenab Canal System Project as per contract obligations. The project costing Rs. 12 billion was awarded by the Punjab Irrigation and Drainage Authority and financed by JICA. Main works comprised rehabilitation/re-section of canal prisms and raising & strengthening of canal banks.

Trimmu-Panjnad Barrages Improvement Project

A NESPAK–led joint venture has been entrusted with the project management, tender documentation design review and construction supervision for the Trimmu-Panjnad Barrages Improvement Project (TPBIP). The TPBIP is aimed at rehabilitation and upgrading work of Trimmu and Panjnad Barrages. The project costing Rs. 16 billion is jointly funded by the Punjab Government and the Asian Development Bank.

Rehabilitation & Modernisation of Jinnah Barrage

A NESPAK joint venture has reviewed design and supervised construction works for the Rehabilitation & Modernisation of Jinnah Barrage near Kalabagh in District Mianwali. The project costing Rs. 12 billion was awarded by the Punjab Irrigation and Power Department.

Alborz Integrated Land and Water Management Project, Iran

The Alborz Integrated Land and Water Management Project Sari, Iran was completed according to schedule in seven years. Awarded by the Mazandaran Golestan Regional Water Company, the World Bank-funded project was a landmark for NESPAK in the field of integrated water resource management. NESPAK prepared feasibility study, project planning and detailed design for this pilot project in the Alborz Basin in the Mazandaran Province in northern Iran on the eastern Caspian Coast. The project costing US$ 120 million was the largest overseas project won by NESPAK.

Mangla Dam Raising Project

A NESPAK-led consortium of local and foreign firms undertook feasibility study, detailed engineering design, tender documentation and construction supervision for this project of immense national importance. The purpose of Rs. 102 billion expansion project is to regain the reservoir capacity lost due to sedimentation, store more water and increase power generation. The Dam has been elevated from 1,234 feet to 1,264 feet with an additional storage capacity of 2.88 MAF.

Wadi Dayqah Dam, Oman

The Wadi Dayqah Dam is the highest dam in the Sultanate of Oman with a total height of about 75m and a huge reservoir containing adequate amount of water to feed the water supply system for the downstream users. NESPAK provided detailed design and construction supervision services for this dam project in Wadi Dayqah, costing US$ 290 million. The project, which was completed in December 2009, aims at supplying water to Muscat, Mazara, Hayl-al-Ghaf, Daghmar and adjoining areas for drinking and irrigation purposes.

Mirani Dam Project

This 40m high earth-filled dam was constructed across the Dasht River in the Balochistan Province to create a reservoir having a 400 MCM storage capacity. NESPAK carried out engineering studies, project preparation report, economic evaluation of the project and PC-I followed by the detailed design of the dam, spillway, a 2m dia tunnel, irrigation system, cost estimates, tender documentation, technical specification and management consultancy services. The Mirani Dam Project costing Rs. 7 billion was put into operation in 2007.

Obudu Dam Rehabilitation Project, Nigeria

NESPAK in a joint venture with a German firm carried out “The Rehabilitation of Obudu Dam” Project in Obudu -Cross River State in Nigeria under the 2nd National Urban Water Sector Reform Project. The project aimed at guaranteeing the safety and integrity of the reservoir for enhanced urban water supply.
The consultancy contract service for “Engineering Supervision of Obudu Dam Rehabilitation Works” was awarded by Nigeria's Federal Ministry of Water Resources and financed by the World Bank.

Dams in Southern Region of Saudi Arabia

NESPAK is providing design review and supervision services for 15 under-construction dams in the Kingdom of Saudi Arabia. The job is divided into two different contacts i.e., “Dam Projects in Jizan, Aseer & Najran” and “Qanunah & Yabah Dam Projects.” The Ministry of Environment, Water and Agriculture, Riyadh has awarded NESPAK the two projects at an overall cost of US$ 217 million. The purpose of these dams is to control the floods and supply drinking water to Aseer, Jizan, Najran and Makkah Al-Mukarramah Regions of the Kingdom.

The types of the dams being constructed are concrete gravity, earth-filled and roller compacted.

Zarqa Ma'een Dam Project, Jordan

NESPAK in a joint venture with a Jordanian firm is providing construction management and supervision services for the Zarqa Ma'een Dam project in Jordan. The project was awarded by the Ministry of Water and Irrigation, Jordan Valley Authority. Work on this project costing US$ 15 million is continuing at a good pace.

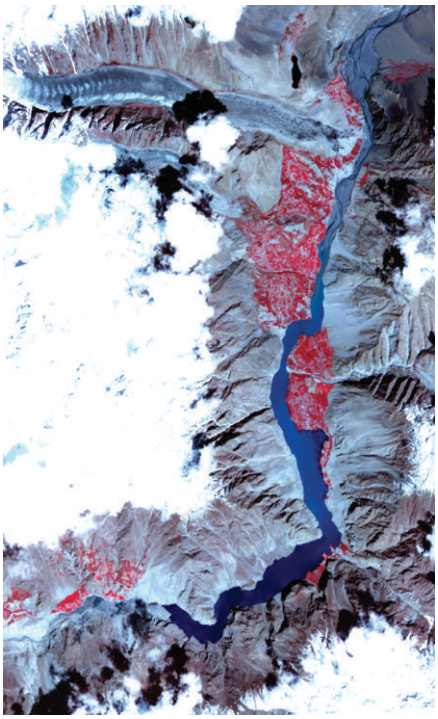
Nai Gaj Dam Project

The Water and Power Development Authority has entrusted NESPAK with "review of feasibility study, preparation of project planning report, detailed engineering design and tender documentation for the Nai Gaj Dam Project, District Dadu, Sindh."

As per the latest detailed design study carried out by NESPAK, the dam will be an earth-core rockfill dam, located 65 km north-west of Dadu city on River Nai Gaj at the terminal ridge of Kirther Range. With a 59m height the dam reservoir will spread over an area of about 5,000 acres having a gross storage capacity of 0.300 MAF with live storage capacity of 0.160 MAF. The dam is meant to irrigate an area of 28,800 acres through high-efficiency drip irrigation system. In addition, 4.2 MW of hydropower will be generated. NESPAK completed consultancy services for this Rs. 70 billion project in 2011.

Attabad Landslide Dam

The Attabad Landslide Dam was completed with the required spillway deepening to El. 2,368 metres and the construction of ferry track. NESPAK was engaged to provide consultancy services for the supervision of spillway deepening works, design and construction supervision of ferry track and preliminary feasibility study for lowering the Attabad Lake water through tunnel (s) under this Rs 1 billion project.



Al-Jufainah Flood Protection Dam, Oman

NESPAK won this Flood Protection Dam Project in Wadi Al-Jufainah in the Sultanate of Oman. The project costing US$ 116 million was awarded by Oman's Ministry of Regional Municipalities and Water Resources in 2015. NESPAK scope of services includes design review and construction supervision. The project features a 30m high and 2.46 km long plastic concrete-core earthfill dam with gross storage capacity of 16 million cubic metres.