中興社大地工程研究中心

Geotechnical Engineering Research Center (GERC)

地工維安組

大地工程研究與技術服務所涉及之領域廣泛，例如工址調查與試驗、隧道工程、水壩工程、坡地工程、基礎開挖等，而隨時代之進步，大地工程技術發展重點亦隨之變化，近年來公共工程結構物延壽、環境保育與綠能產業等議題興起，乃以傳統地工技術為基礎，進一步發展建立新時代之地工技術，包括離岸基礎工程、隧道鄰近地下水資源影響評估、高岩覆應力破壞模式分析、營運隧道維護管理與檢修技術、蓄水壩安全風險管理、新科技調查技術(地層甲烷氣體紅外線光譜檢測、3D透地雷達、水下攝影)等，持續提供高品質之技術服務。

新時代隧道工程技術研發

◆ 特殊困難技術研發

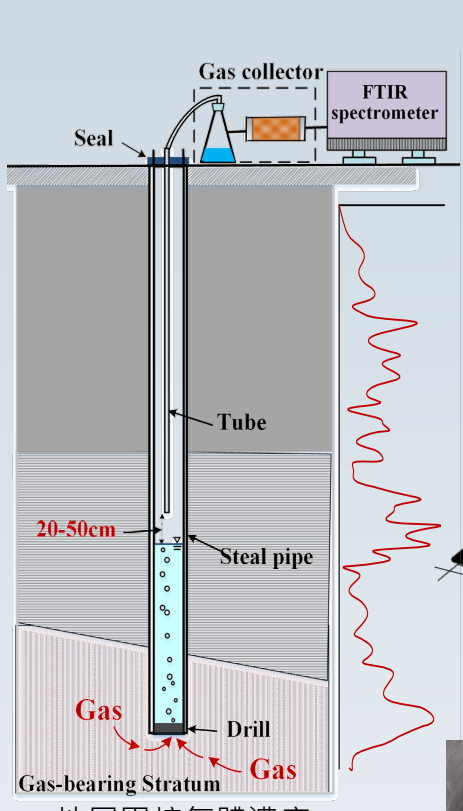
針對隧道施工遭遇之特殊困難，例如高岩覆(>1000公尺)開挖所衍生之脆性剝裂或爆裂破壞，以及隧道開挖遭遇可燃性氣體所衍生之氣爆風險，研發相對應之分析模式與調查評估技術。

◆ 工程與地下水資源保護

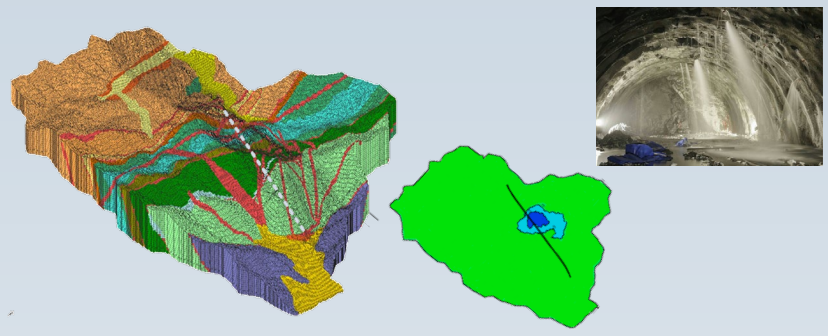
透過隧道鄰近區域水文地質調查、儀器觀測與模式分析，率定建立區域三維水文地質模式，進而評估隧道工程施工及營運對鄰近區域地下水資源可能造成之影響。

◆ 營運安全與維護管理

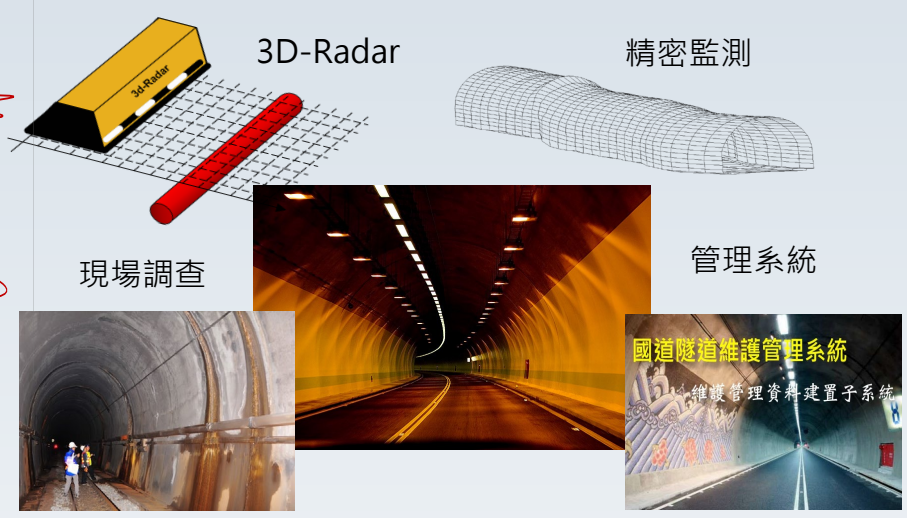
應用隧道工程累積多年之技術與經驗，進行隧道營運安全評估、管理系統開發及老舊鐵路隧道電氣化工程等。



▲ 地層甲烷氣體濃度紅外線光譜檢測



▲ 隧道鄰近地下水資源影響評估



▲ 營運隧道安全評估與維護管理

新時代蓄水壩安全風險管理

◆ 新監測技術發展應用

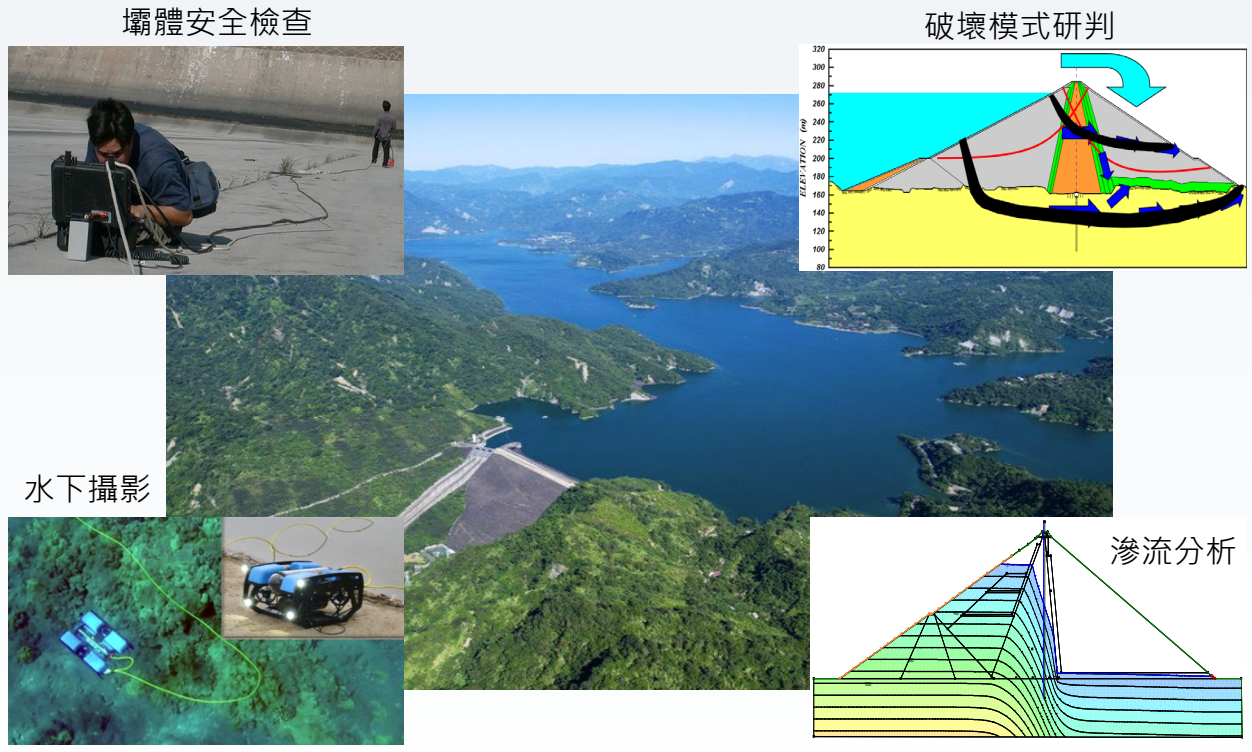
持續發展應用各種新型監測技術，例如利用水下攝影(ROV)協助瞭解水下結構狀況及淤積情形，並利用空拍與數值地形建立，研判庫區邊坡可能地形變動問題。

◆ 全生命週期安全監測

考量蓄水壩生命週期及氣候變遷影響，並導入風險概念，規劃蓄水壩安全監測系統與分析評估。

◆ 破壞模式與營運風險評估

根據蓄水壩設計、施工、營運及監測等各階段資料，判釋可能之潛在破壞模式，進而研提相對應之管理與因應作為等。



▲ 蓄水壩安全監測與風險管理

地址：臺北市內湖區新湖二路280號 | 電話：(02) 8791-9198 | 傳真：(02) 8791-1536 | 網址：http://www.sinotech.org.tw/
E-Mail：fuyuan@sinotech.org.tw |

中興社大地工程研究中心

Geotechnical Engineering Research Center (GERC)

Geotechnical Analysis Group

Geotechnical research and technical service involves a wide range of fields, such as site investigation, tunnel construction, reservoir structure, slope stability and foundation excavation. With the progress of the times, geotechnical development focus is changing as well. The issues of infrastructure life extension, environment conservation and green energy industry are becoming increasingly important. Therefore, the traditional geotechnical knowledges are used as the basis to further develop modern technologies, including offshore foundation investigation, groundwater resource evaluation in neighboring area of tunnels, rock excavation failure assessment under high overburden stress condition, operating tunnel repair and maintenance, reservoir safety risk management, innovation technology application (stratum gas concentration detection by FTIR spectrometer, 3D ground penetrating radar, and underwater inspection using remotely operated vehicle). These modern technologies may provide clients with professional consultation and service.

Modern Tunnel Technology and Service

◆ Difficult Technology Research

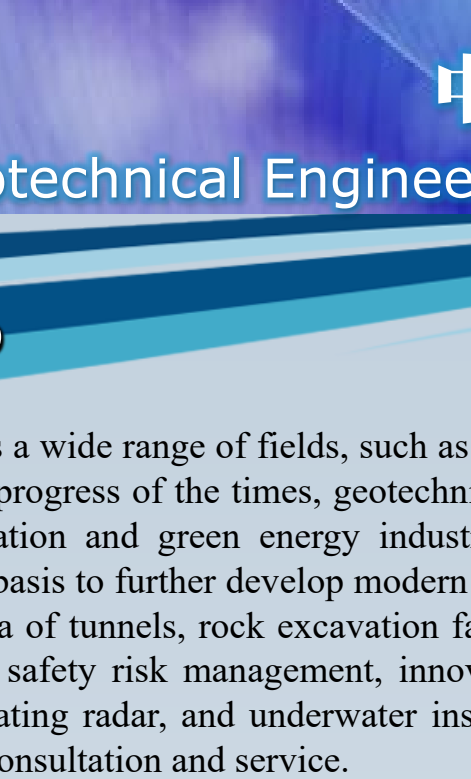
Some special tunneling difficulties, such as violent rock burst or spalling failure under a high overburden stress condition and tunnel explosion hazard induced by combustible gas inflow were studied. And the available investigation method and analysis model are proposed.

◆ Groundwater Resource Conservation

The measures of hydrogeological survey, instrument observation and numerical analysis are adopted to install 3D regional hydrological model. The possible impact of tunnel construction and operation on the groundwater resources in the neighboring area can be assessed.

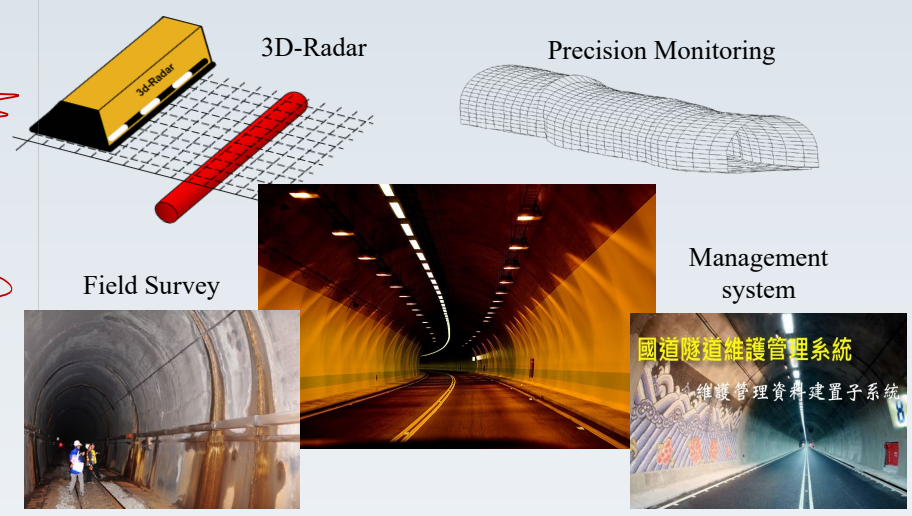
◆ Operating Tunnel Maintenance

The large amount of experiences and professional technologies are applied to assess operating tunnel safety condition and to propose appropriate repair method. Furthermore, the management system for tunnel operation are developed.



▲ Stratum Gas FTIR Spectrometer Detection

▲ Groundwater Resource Evaluation in Neighboring Area of Tunnels



▲ Operating Tunnel Safety Assessment and Maintenance

Modern Reservoir Safety Risk Management

◆ New Technology Application

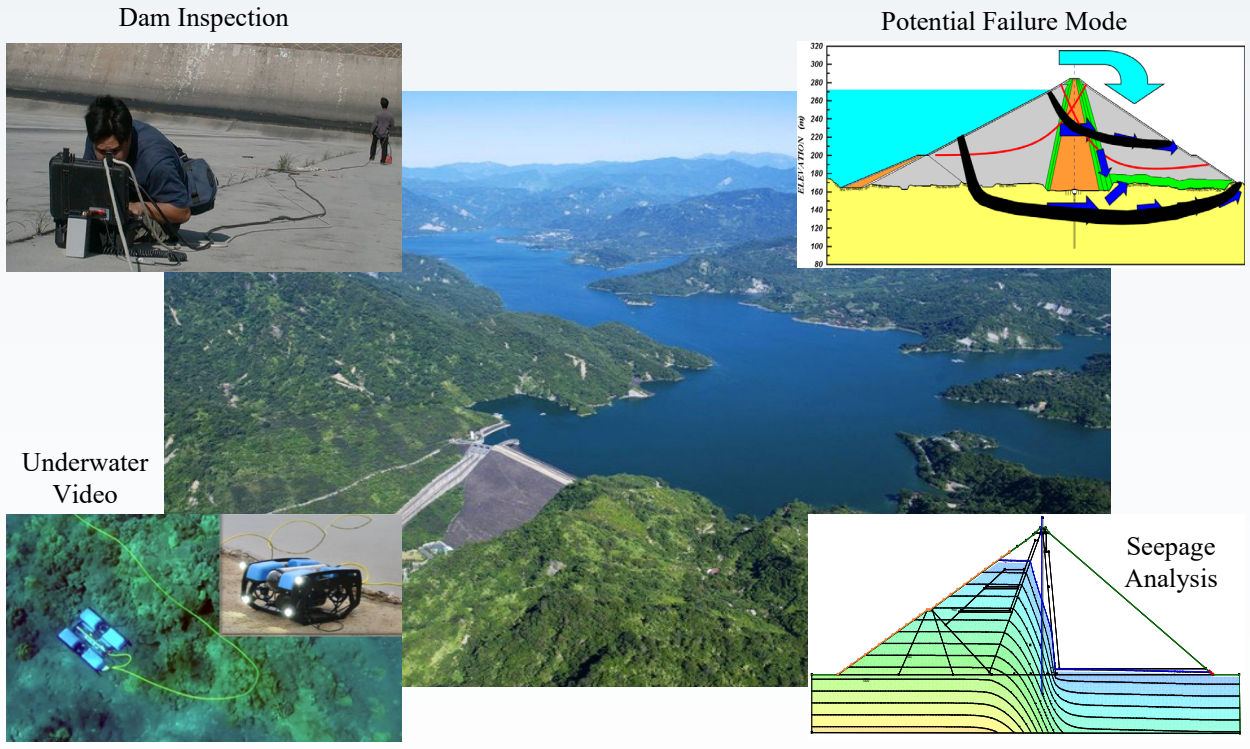
New technologies are adopted to assess reservoir status. For example, the device of remotely operated vehicle is used to examine underwater structure condition and reservoir deposition degree. And the UAV inspection and digital elevation model are used to assess possible topographic variation of slope in reservoir.

◆ Lifecycle Safety Assessment

The factors of structure lifecycle, climate impact and risk concept are combined to assess reservoir safety and to arrange monitoring system.

◆ Failure Mode and Risk Management

According to the data obtained in design, construction and operation, the potential failure modes of dam were identified and the required management measures are therefore proposed.



▲ Reservoir Safety Assessment and Risk Management

| Address: No. 280, Xinhu 2nd Road, Neihu Dist., Taipei City, Taiwan (R.O.C.) 11494 | http://www.sinotech.org.tw/ |

| Tel: +886-2-8791-9198 | Fax: +886-2-8791-1536 | E-Mail: fuyuan@sinotech.org.tw |